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Orbital Elements of Photographic Meteors

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This paper presents an analysis of the trails and the distributions of the orbital and physical parameters for 2,529 meteors photographed simultaneously from two camera stations in New Mexico. The two Baker Super-Schmidt cameras of the Harvard Meteor Project were located at the Soledad Canyon and Doña Ana stations, separated by a distance of 28.6 kilometers. The sample reported here comprises 70.4 percent of all meteors photographed during 1,125 hours of exposure by two cameras, operating simultaneously, during the period February 1952 to July 1954.

The data

Of the meteors included in this analysis, 2,059 were analyzed by the method of graphical reduction (McCrosky, 1957). A partial graphical reduction has positively identified as shower members an additional 115 meteors comprising 108 Geminids, 5 Perseids, and 2 Taurids. We have also included 355 meteors reduced by Jacchia (Whipple and Jacchia, in press) that would have been accepted for a graphical reduction had they not already been treated by the more accurate technique.

The orbital elements for all the fully reduced meteors were computed by the method described by Whipple and Jacchia (1957). We have assigned the mean orbital elements of the appropriate shower to the 115 meteors identified by partial graphical reduction.

The graphical reduction method was used to obtain geocentric velocities and radiants. All meteors were accepted for graphical reduction except those excluded by limitations inherent in the method.

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Determination of the radiant by this method requires the superposition of the two films, and one image must be dense enough to be visible through the other film. Some very faint meteor trails (10.4 percent of the total) did not meet this requirement, and hence were not used.

The method also requires the selection of a common point on the two meteor trails—the same point in space as seen from the two stations. Finding a common point precisely enough on the two films is not always possible, particularly if the meteor begins or ends outside the field recorded by the camera, or if a part of the trajectory lies on the outer 12 percent of the field that is not occulted by the rotating shutter. This difficulty in finding a common point led us to reject 13.8 percent of the meteor trails. We also excluded 0.6 percent of the meteors because of an ambiguity of 180° in the position of the radiant. Other meteors (4.8 percent) could not be reduced by this method because the photographic records had been affected by instrumental faults, clouds, and other random factors.

Reliability of the method

The speed of the graphical method results, in part, from the use of a common point—which involves human judgement in its selection—instead of detailed measurements alone. The consequent possibility that systematic errors or selection effects were introduced by the human computer, affecting the reliability of the method, warrants investigation.

Effects of selection.—A random selection of 360 meteors reduced by the short trail method (Hawkins and Southworth, 1958) includes 254 meteors that were reduced independently by the graphical technique. The short trail reductions

are more accurate than the graphical by an order of magnitude. Comparisons of the results of these two sets of reductions have been made to determine the errors and selection effects in the graphical reduction.

The velocity distributions of the meteors chosen for short trail and graphical reductions, shown in figure 1, indicate that the choice of meteors was essentially random with respect to velocity. The larger errors inherent in the graphical method result in a greater diffusion into the hyperbolic velocity range, but the percentages of high velocity meteors (V greater than 60 km/sec) are similar in the two sets of data. The elimination of the very faint meteors from our data does not represent a new selection factor but merely places a slightly lower limit on the limiting magnitude than is already imposed by the observing technique. The distributions of maximum and minimum magnitudes are given in table 1. The influence of selection in meteor brightness becomes effective at magnitudes fainter than $M_{ps}=1$, for discovery of the meteor on the film is no longer a certainty. The distributions given here therefore apply to meteors whose magnitudes have a median value of $M_{ps}=0.8$.

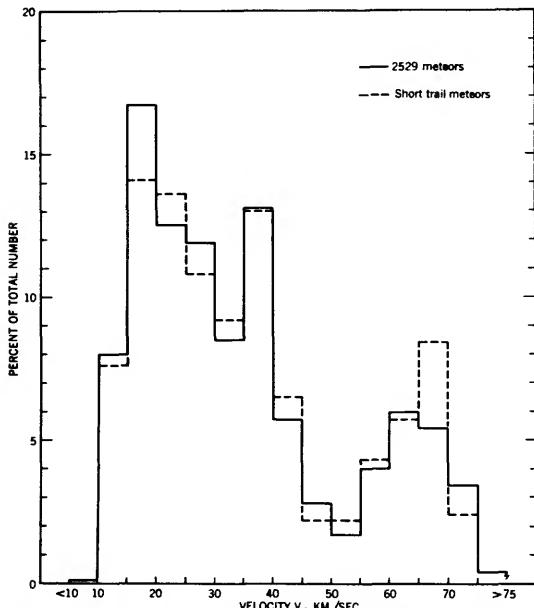


FIGURE 1.—Velocity distribution for meteors reduced by the graphical and short-trail methods.

TABLE 1.—Distribution of maximum and minimum magnitudes of 2,529 meteors

Photographic magnitude (M_{ps})	Percentage of meteors with Maximum magnitude within range in M_{ps}	Minimum magnitude within range in M_{ps}
<-3.0	0.3	
-2.5 to -3.0	0.6	
-2.0 to -2.5	0.9	
-1.5 to -2.0	1.8	
-1.0 to -1.5	3.0	
-0.5 to -1.0	7.0	
0.0 to -0.5	7.2	
0.0 to +0.5	19.3	
+0.5 to +1.0	22.4	
+1.0 to +1.5	18.8	
+1.5 to +2.0	11.9	1.5
+2.0 to +2.5	5.2	8.7
+2.5 to +3.0	1.1	18.1
+3.0 to +3.5	0.5	32.3
+3.5 to +4.0		34.4
+4.0 to +4.5		4.9
>+4.5		0.1

The rms errors in geocentric velocity and apparent radiant, as derived from comparisons of the short trail and graphical reductions, are 3 percent and 3°, respectively. These and the mean and median deviations determined for inclination (i), eccentricity (e), perihelion distance (q), and longitude of perihelion (π) are given in table 2. There is no systematic error in the geocentric velocity or the orbital elements.

The apparent degree of error in the elements is misleading, since most of the error was

TABLE 2.—Errors in elements of graphically reduced meteors

Element	Absolute deviations Mean $ \Delta $		rms deviations
	Median		
i	2°0	1°0	
e	.078	.032	
q	.029 a.u.	.011 a.u.	
π	6°0	2°0	
V_∞			3%
Radiant			3°
$1/a$.14* a.u.

*See p. 17.

contributed by only 5 percent of the meteors, whose measurements show deviations of more than five times the mean. The median of the deviations is less than half their mean. Most of the extremely large errors are attributable to poorly determined radians. It was not possible to discover any criteria for rejecting these cases.

The error in $1/a$ —the reciprocal of the semi-major axis—is a function of geocentric velocity and elongation λ , the angle between the heliocentric velocities of the earth and the meteor. For an error of 3 percent in geocentric velocity, the computed rms error in $1/a$ varies from 0.10 to 0.18 (a.u.) $^{-1}$. However, for most of the meteors in our sample, the computed error in $1/a$ due to the velocity error lies between 0.13 and 0.15 (a.u.) $^{-1}$. Errors in the radiant generally contribute smaller errors to $1/a$ except in the extreme cases mentioned above.

The error in q' , the aphelion distance, will be similar to that in a .

Cosmic weights.—The orbital data can be weighted to remove some of the effects of physical and observational selection which prejudice our view of matter in space. These effects include (1) the dependence of mass on velocity for meteors of a given luminosity; (2) the law governing the increase in meteor numbers with increasing magnitude; (3) the velocity dependence of the photographic technique; and (4) the probability that meteors of a given orbit will collide with the earth. When the data are weighted for the first three factors, the resultant distributions refer to meteors of uniform mass. For these effects we have adopted Whipple's (1954) weighting factor of $1/V_\infty^2$, where V_∞ is the velocity of the meteor outside the earth's atmosphere. The uncertainties in the velocity-mass law and in the number-luminosity law are such that attempted corrections for these effects will probably be in error by at least 1 in the velocity exponent. In Whipple's earlier work a weight of $1/3V_\infty^2$ was applied for meteors with $V < 19$ km/sec, to compensate for the greater length of the trails, and for a possible decrease in the luminous efficiency in low velocity meteors. The low velocity meteors in our data are not characterized by exceptional length and, con-

sequently, the $1/V_\infty^2$ factor has been used for meteors of all velocities.

Öpik (1951) has investigated selection effect "(4)", above. On the basis of his analysis we will write the probability of collision as follows:

$$P \approx \frac{V_\infty^2}{V_\infty \sin i} \left(2 - \frac{1}{a} - p \right)^{-1/2}, \quad (1)$$

where i is the inclination, a the semi-major axis, p the parameter of the orbit, and V_∞ the geocentric velocity of the meteor. When the data are weighted by the factor $1/P$ the resultant distributions of orbital elements are proportional to the number of meteoroids with such orbits that pass perihelion per unit time. The product of these two weighting factors, $1/PV_\infty^2$, has been called the "cosmic weight" and is used here to weight the observed numbers of meteors.

Distributions of orbital elements

Figure 2a,b presents the distribution of the reciprocal of the semi-major axis of the orbits of our meteors. Figures 3 through 6 present distributions—based on numbers of meteors (solid lines) and on numbers weighted by the cosmic weight (dotted lines)—for the orbital elements i , e ; for perihelion distance q , and for aphelion distance q' . In each case the weighted distribution has been normalized to the observed distribution. Various two-dimensional distributions of these parameters appear in figures 9 to 14. Shower meteors include members of all major streams, as well as the seven new showers revealed by these data (McCrosky and Posen, 1959).

Inclination.—The distributions demonstrate the existence of a large number of direct, small meteor orbits of low inclination. The median inclination of the observed distribution is 18° , that of the weighted distribution 21° . The steady decrease in weighted numbers of orbits below $i=5^\circ$ is due, in part, to an obvious inexactness in the weighting function at very low inclinations. Öpik showed, however, that the weighting function is accurate within 10 percent for orbits with inclinations greater than 0.3° ; hence the decrease must be attributed to the fact that these orbits have been eliminated by planetary collision and perturbations.

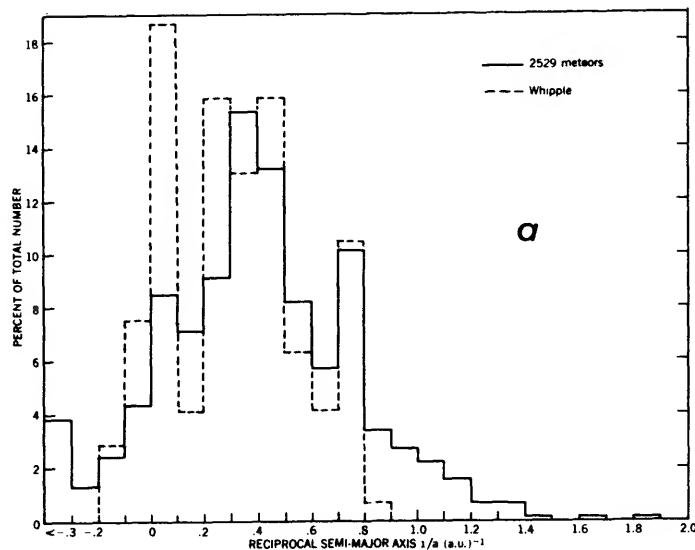
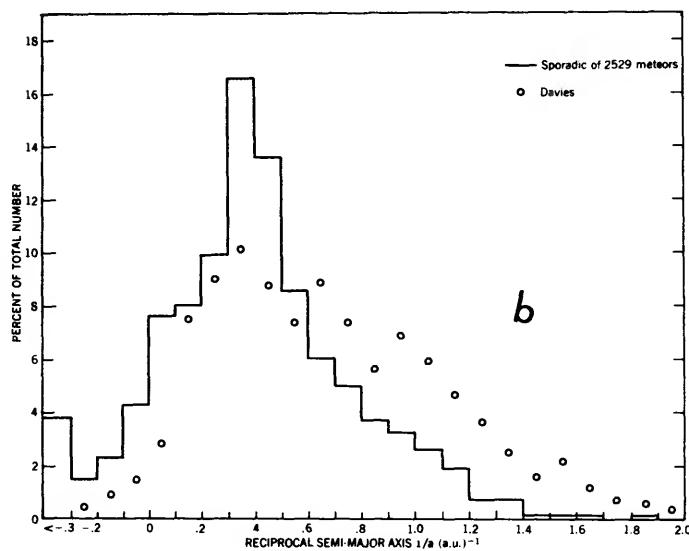
**a****b**

FIGURE 2.—Distribution of meteor orbits in reciprocal semi-major axis: *a*, the 2,529 meteors compared with Whipple's bright photographic meteors; *b*, the sporadic component of the 2,529 meteors compared with Davies' radar data weighted for observational selection.

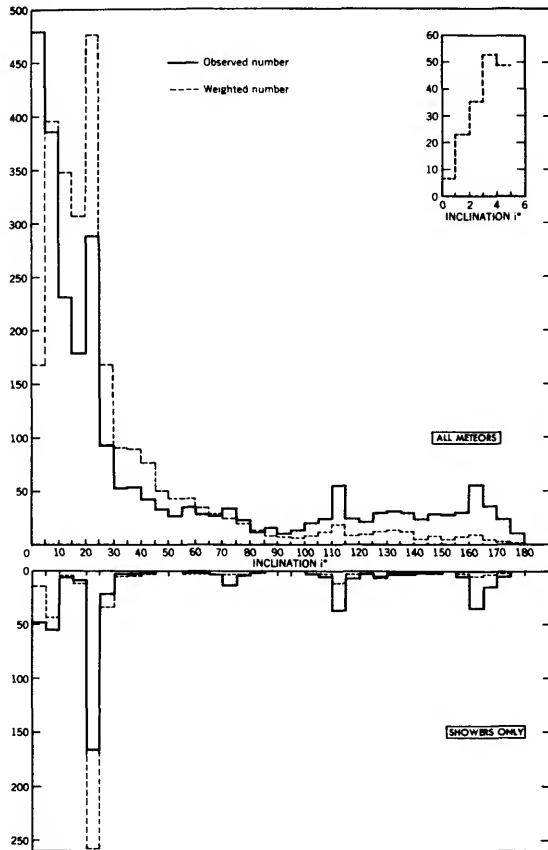


FIGURE 3.—Distribution of meteor orbits in inclination, i° .

Figure 9, which gives the observed distribution of meteors in inclination and aphelion distance, shows that the ecliptic concentration is limited primarily to small orbits with $q' < 8$ a.u.

The paucity of orbits at $i \approx 90^\circ$ was also noted in the data on brighter meteors (Whipple, 1954) and radar meteors (Davies, 1957). Orbita of both large and small aphelion distance exhibit this gap, although the latter group shows it more markedly. Of our 2,529 meteors, the number of short orbits ($q' < 10$ a.u.) with $80^\circ < i < 100^\circ$ is 12 as opposed to 41 with $70^\circ < i < 80^\circ$, $100^\circ < i < 110^\circ$. For long orbits ($q' \geq 10$ a.u.) the corresponding numbers are 39 and 61. An inspection of the weighted numbers of meteors at various inclinations shows that the decrease in numbers at $i \approx 90^\circ$ is primarily a result of observational selection.

In the radar meteors, which are observed at magnitudes of about $M_{p,t} = 6$, and have an average maximum brightness of somewhat more, possibly $M_{p,t} = 5$, Davies observed a bi-modal distribution of inclination for $q' < 3$ a.u. and $e < 0.3$. The maxima occur at 60° and 140° ; there are almost no meteors with $i < 30^\circ$. The reverse situation occurs in our faint photographic meteors; the smaller and less eccentric the orbit, the more pronounced the ecliptic concentration. Our data include 146 meteors whose aphelion and eccentricity lie within the limits specified by Davies. Only 8 of these have inclinations greater than 30° . The medians of the observed and weighted distributions are respectively 11° and 14° , both substantially lower than those found for the sample as a whole.

Semi-major axis.—Figure 2a shows the distribution of the reciprocal semi-major axis $1/a$ for our sample, compared with that for the brighter photographic meteors analyzed by Whipple (1954). The median absolute photographic magnitude for the bright meteors is -3.8 . Shower meteors, representing over 50 percent of Whipple's data, are included in both histograms.

The difference between the two sets of photographic data suggests that orbital characteristics vary considerably with meteoroid size, a conclusion supported by other evidence to be presented. The bright meteors do not represent a completely random sample. A very few meteor trails with closely spaced shutter breaks were not suited for measurement, and possibly a few slow meteors—those whose semi-major axes are statistically small—were excluded. Nevertheless, the two samples exhibit about the same percentage of orbits with mean distance greater than 5 a.u. The major difference lies in the distribution of short orbits; except for the Geminids, Whipple's data contain almost no examples with $a < 1.3$ a.u.

Davies (1957) has presented a distribution of $1/a$ for radar meteors, sporadic meteors weighted for observational selection but not for the probability of collision with the earth. Davies' weighted distribution and our observed numbers of sporadic meteors are compared in figure 2b. The sensitivity of the photographic technique is inversely proportional to the velocity

of the meteor. However, the greater area of sky observed at the greater heights where high velocity meteors occur compensates to some extent for the diminished photographic sensitivity. To place our data on a basis comparable with the radar data, we must weight the photographic data by a small power of the velocity, say $V^{3/4}$. Generally, this will give greater weight to meteors with small values of $1/a$ and will accentuate the differences seen. Figure 2a, b shows that the proportion of short orbits increases gradually as one proceeds from the bright photographic to the faint photographic to the still fainter radar meteors. However, in the progression to radar meteors the proportion of long orbits decreases abruptly (table 3). Whipple (1955) has suggested that rapid diffusion of the ion column of high altitude (high velocity) meteors inhibits their observation by radar. Since the meteors with long orbits enter the atmosphere at high velocity, statistically this abrupt decrease with magnitude may result from limitations in the experimental technique rather than from radical differences in the nature of the orbits.

The difference in orbital characteristics as a function of magnitude is further indicated by Whipple's (1954) empirical comet-asteroid criterion, K . He found that the parameter

$$K = \log_{10} \left[\frac{a(1+e)}{(1-e)} \right] - 1 \quad (2)$$

is positive for 96 percent of known comet orbits, and negative for all but 3 asteroid orbits. Of the 144 meteors in Whipple's analysis, only 8,

TABLE 3.—Proportion of long orbits in photographic and radar meteor data

Meteors	Photo-graphic magnitude (M_{ps})	Percent of orbits with $1/a < 0.2(\text{a.u.})^{-1}$	
		Sporadic and shower meteors	Sporadic meteors only
Bright photo-graphic	-3.8	33.3	
Faint photo-graphic	+0.8	27.5	27.4
Radar	$\approx +5$	13.1	

or 5.6 percent, had a negative K , a fact that suggested a cometary origin for most meteors. The faint meteors also are of cometary origin, as indicated by their fragility and the degree of fragmentation observed, but on the basis of the K criterion, 25.5 percent of their orbits are indistinguishable from those of asteroids (see fig. 15). The region of negative K embraces the orbits of small aphelion distance, and thus small semi-major axis. Any effect of selection for velocity in the bright meteor data is certainly not large enough to account for the appreciable difference in the proportion of meteors with negative K between the bright and faint photographic meteor samples.

Eccentricity.—The distribution of the eccentricity of meteor orbits is given in figure 4, which shows a smooth rise to a maximum at about 0.9. The 12.5 percent that filter into the hyperbolic range are an indication of the errors made in reduction. The number of sporadic meteors increases approximately as e^2 . The appreciable number of orbits with small values of e is characteristic of these faint meteors. Whereas only 8 percent of the sporadic orbits discussed by Whipple had e less than 0.6, 25 percent of our orbits are within this range.

Figure 10a shows the observed distribution of orbits as a function of the semi-major axis and the eccentricity. The areas of the circles are proportional to the numbers of meteors in a cell representing a range of values of the semi-major axis and eccentricity. The distribution is bounded by envelopes which are described by the limits on q and q' for observability at the earth. Figure 10b shows a similar distribution, for weighted numbers, for those orbits within 15° of the ecliptic plane. Both direct and indirect orbits are included. Figure 10c shows the same distribution as in figure 10b, but for those orbits with inclination between 15° and 165° .

A large majority of small orbits has both low inclination and low eccentricity. The tendency of small orbits to exhibit low eccentricity is also evident in figure 11, and is particularly striking in view of the small area in the $a-e$ plane available at low eccentricity. The Geminids are responsible for a large number of orbits at $a=1.25$ and $e=.775$. Other showers are all but indistinguishable in these distributions.

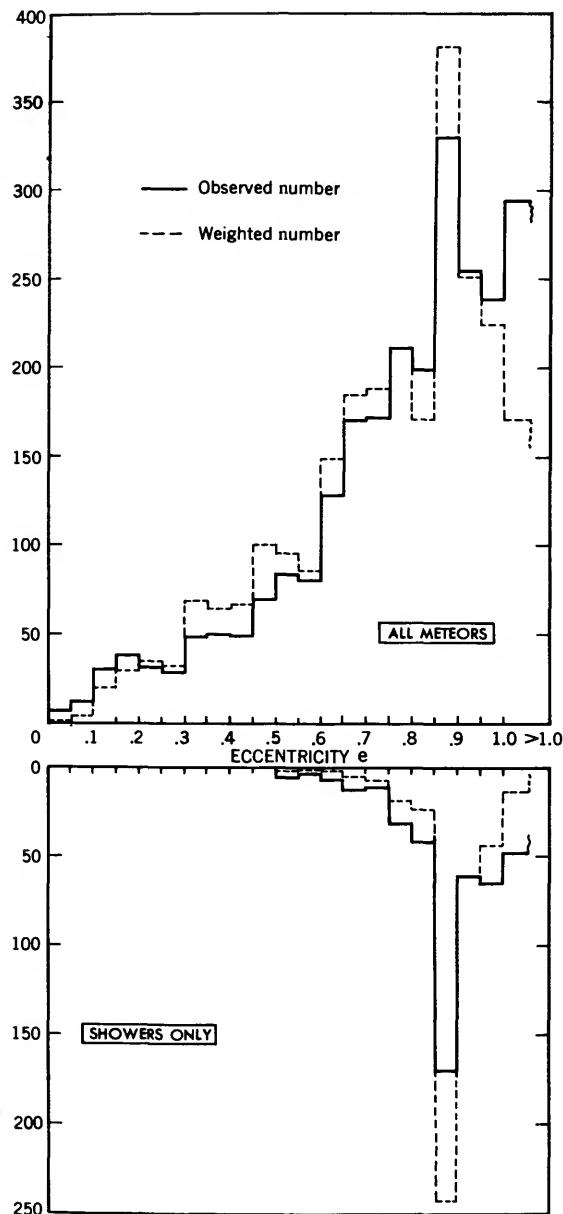


FIGURE 4.—Distribution of meteor orbits in eccentricity, e .

Perihelion.—Perihelion distance q is a particularly well-determined element and details of the distribution (fig. 5) are worthy of scrutiny. The observed and the weighted distributions of perihelion distance are both approximately linear with q if the shower component is neglected. This relationship holds for both long and short orbits. There is a slight depar-

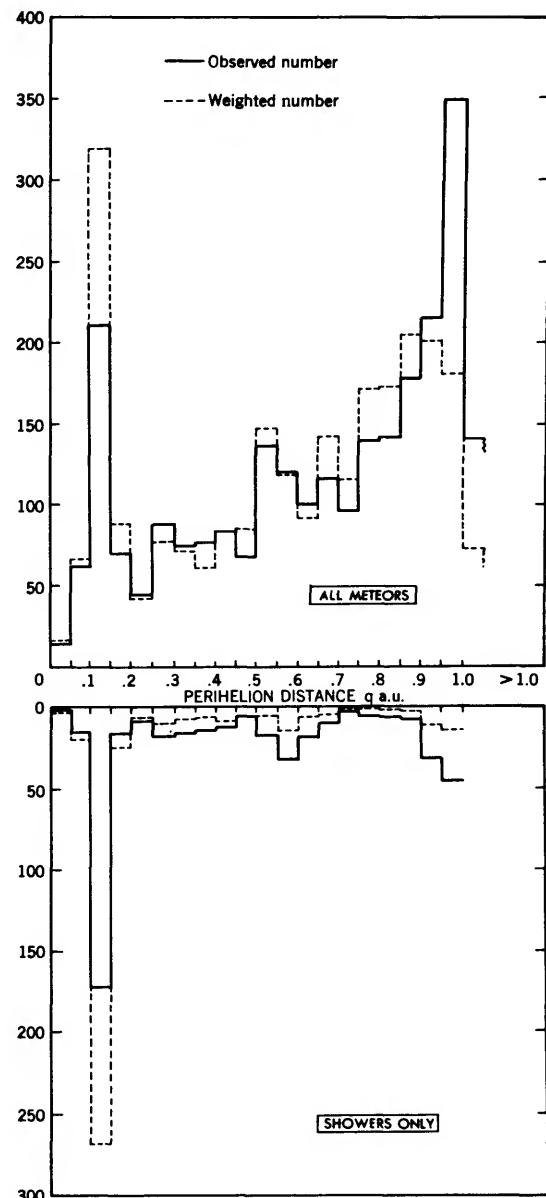


FIGURE 5.—Distribution of meteor orbits in perihelion distance, q (a.u.).

ture from linearity in the vicinity of Venus (.72 a.u.), perhaps because there is a relatively high probability of capture by Venus for meteors with perihelion in the vicinity of the planet.

A comparison of the distribution of perihelion for meteors with that for comets is of interest. Figure 7 shows the distribution of

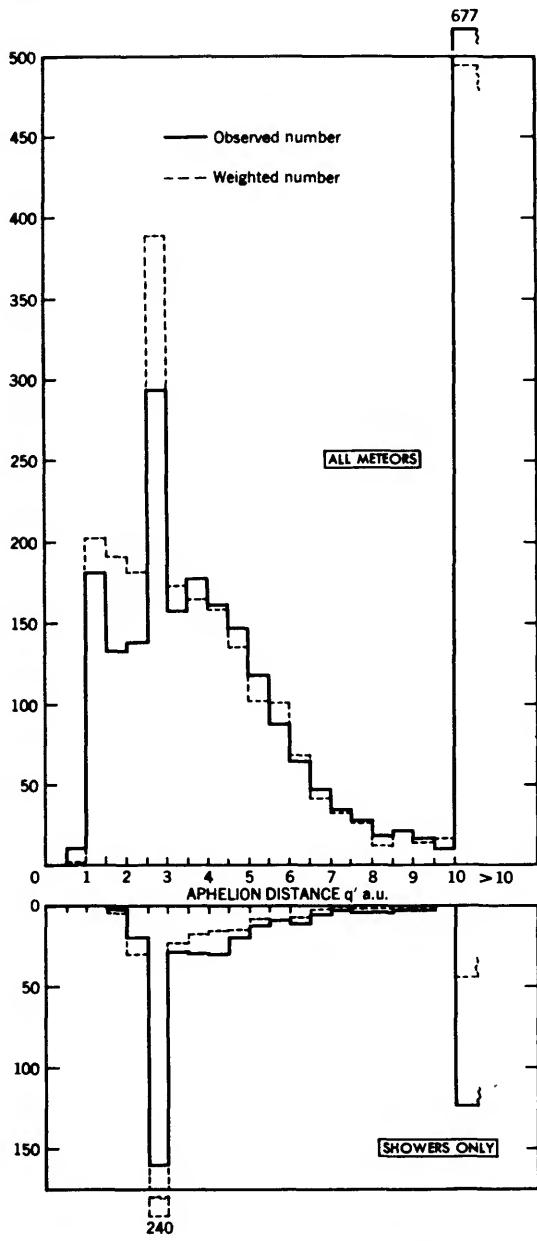


FIGURE 6.—Distribution of meteor orbits in aphelion distance, q' (a.u.).

cometary perihelia for 369 comets with $q < 1.9$ a.u. and discovered since 1800, as listed in the Baldet and De Obaldia catalog (1952). These are observed numbers and should be corrected for observational selection. One expects comets with small perihelion to appear brighter than

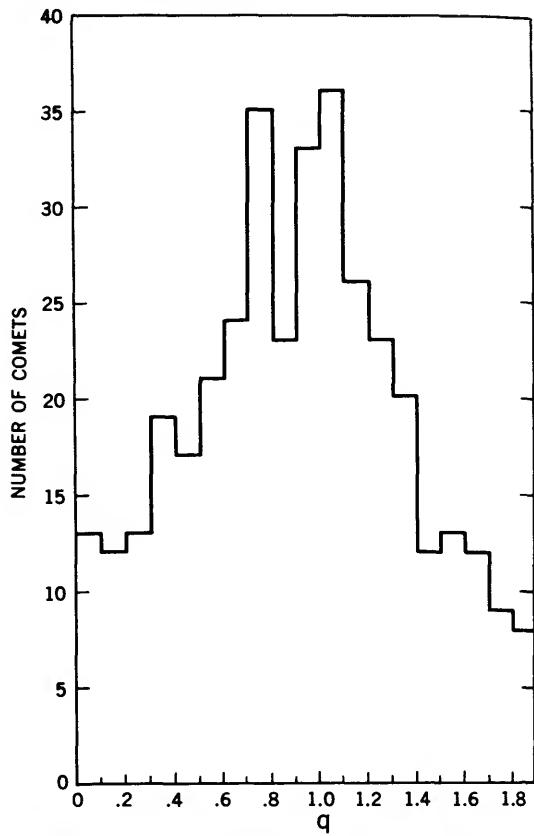


FIGURE 7.—Distribution of perihelia for 369 comets with $q < 1.9$ a.u.

average; on the other hand, observations may be hindered by their small elongation from the sun. Comets of large perihelion may have a wide range in brightness, depending on the earth-comet distance. The observational selection factors are complicated and an empirical approach is indicated.

R. J. Dunn has kindly supplied a previously unpublished analysis of cometary brightness as a function of q . Figure 8 is Dunn's compilation of the absolute magnitudes of 83 comets derived by Bobrovnikoff (1941, 1942) and Vessvártzky (1925). When both catalogs give the brightness, Bobrovnikoff's value is chosen. It should be noted that this plot represents a select list of well-observed comets, with apparent magnitudes less than the average. They represent only a fifth of those shown in figure 7, and are not necessarily representative of all observed comets. Had absolute brightness played a role in observational selection, one would

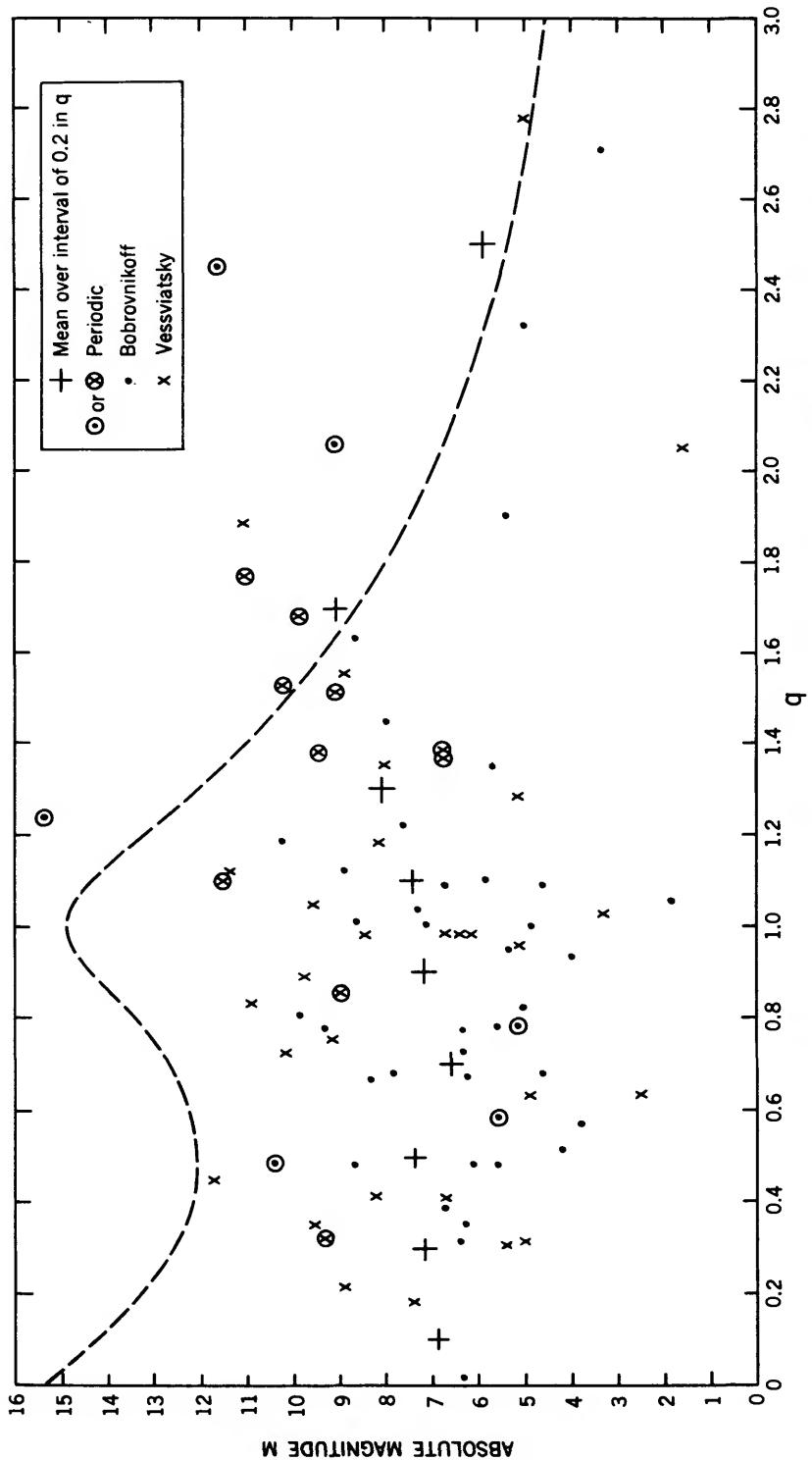


FIGURE 8.—Cometary brightness as a function of perihelion distance, q . The mean M over an interval of 0.2 a.u. in q is plotted with the symbol +. The broken line defines the relationship between M and q that would be expected if absolute cometary brightness influenced observational selection.

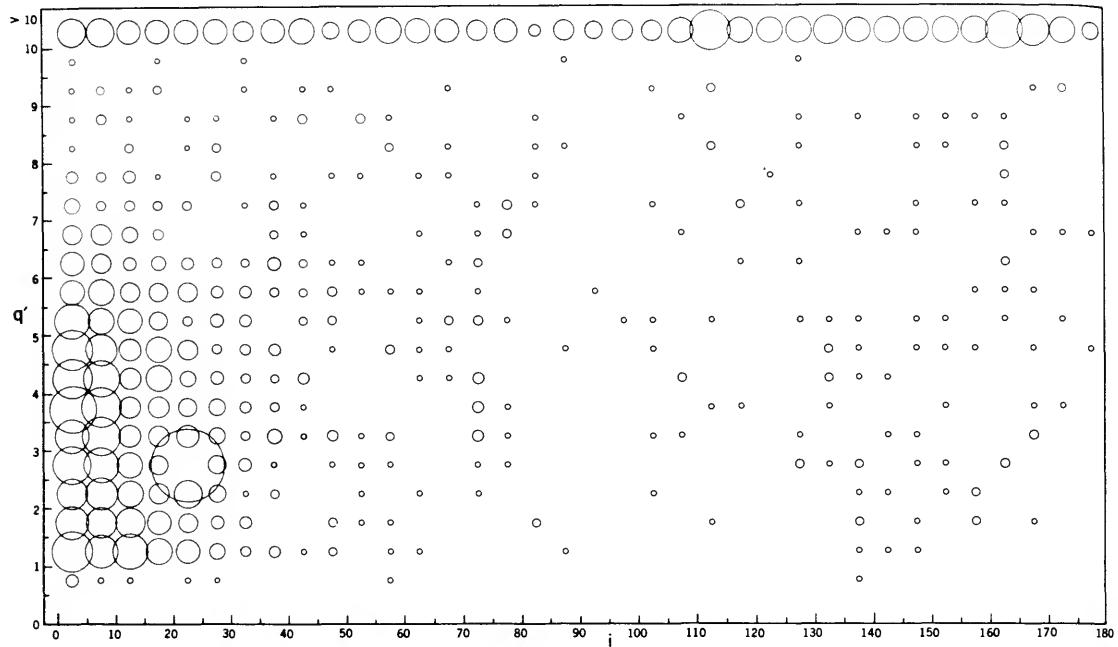


FIGURE 9.—Distribution of meteor orbits in inclination and aphelion distance.

expect the mean magnitudes to be distributed with q somewhat in the fashion indicated by the schematic dotted line in figure 8. In fact, the absolute brightness of the comets in any given range of q is relatively constant. One can, then, accept the observed distribution of perihelia of comets as a true distribution out to 1 a.u., excepting at very low q where the photometric data are sparse. With the exception of the marked and unexplained peak at 0.75 a.u., and the neighboring minimum at 0.85 a.u., the distributions of the perihelia of comets and of the meteors they have presumably produced are essentially identical.

Aphelion.—The low accuracy in the determination of aphelia does not permit any significant conclusions. The distribution shown in figure 6 perhaps allows us to say that the meteor population is roughly constant with aphelion as far out as Jupiter's orbit, at which distance a substantial decrease in numbers occurs.

Line of apsides.—The tendency of asteroids to align their lines of apsides with Jupiter's is well known (see fig. 16). The asteroidal alignment is a function of aphelion distance. The ratio of the number of asteroids aligned within

15° of Jupiter to those similarly opposed is twice as large for asteroids with $3.5 \text{ a.u.} < q' < 4.0 \text{ a.u.}$ as for those with $q' < 3 \text{ a.u.}$, the proportions being 4.3 and 2.2. Of 29 short-period comets with $i < 30^\circ$ and with aphelion within Jupiter's orbit, twice as many are aligned within 90° of Jupiter as have their perihelia in the remaining two quadrants. It is of interest to look for this same alignment in meteor data.

The influence of Jupiter is largest for low inclination orbits with aphelia inside its own orbit. Therefore, we sought the effect only for those meteors with $i < 30^\circ$ or $i > 150^\circ$, and with $q' < 5 \text{ a.u.}$ In this range of inclination, the line of apsides and the longitude of perihelion, π , define essentially the same direction, and so the following distributions are based on the values of π for our meteor orbits. For meteors observed at the earth, π is a marked function of the time of year, 40 to 50 percent of the meteors recorded in any one month having a π within a range of 50° .

The data for each month were weighted for three effects: (1) the number of hours of exposure in each month; (2) the proportion of the observed meteors that were reduced in a

given month; and (3) the seasonal variation in proportion of ecliptic orbits observed, which results from the varying elevation of the radiants of ecliptic orbits. This last correction was determined empirically by noting the proportion of orbits with small i and $q' (i < 30^\circ \text{ or } i > 150^\circ, q' < 5 \text{ a.u.})$ to the total number of meteors reduced for each month. The reciprocal of this ratio was used as the weighting factor for "(3)."

While the correction for "(2)" was always small, there was a large variation in the weights applied for "(1)" and "(3)." Table 4 gives the weighting factors for each of these corrections, and the median π for each month. The weights for July—a month of short nights, low elevation of the ecliptic, and perpetual bad weather in New Mexico—are, of necessity, very high. The weighted distributions of the lines of apsides of low inclination meteors are given in figure 17 for meteors with $3 \leq q' < 5 \text{ a.u.}$, and in figure 18 for meteors with $q' < 3 \text{ a.u.}$

In both distributions, there is a minimum at 20° , where the asteroids exhibit a maximum. Since much of the contribution at this longitude comes during the month of July, the significance of this minimum may be questioned. However, the data for July have probably been overcorrected already. An additional multiplicative weight of 3, to reproduce the asteroidal maximum at 20° , is certainly not reasonable.

In our data, the aphelia are relatively ill-determined and so the data of figure 17 probably include orbits whose aphelia are, in reality, outside Jupiter's. Thus, figure 18 is a better representation of the alignment of our orbits inside Jupiter.

As a check on the reality of the distributions shown in figures 17 and 18, we have analyzed 106 meteors with $i < 30^\circ$ and $q' < 5$ that were reduced by Jacchia (fig. 19). The same weighting factors were used for seasonal effect and for proportion of low i , low q' orbits. The weights for the proportion of meteors reduced to those observed were derived from Jacchia's numbers. The correction factors are uncertain for so small a collection of data, but these data have the marked advantage of considerable accuracy in the determination of q' , and are not contaminated by those orbits whose q' is, in reality, greater than 5 a.u., which would not be expected to show the same degree of alignment. Figure 19 shows the same general features found for the fainter meteors reduced by the approximate method: minima at 20° and 190° and a significant maximum around 100° . The second maximum, centered about 315° , also shows to some extent in the faint meteor data. In fact, we must apparently account for a double-humped curve in the distribution of lines of apsides of meteors, rather than for the single-humped curve dis-

TABLE 4.—*Correction factors applied in the distribution of longitude of perihelion (π)*

Month	Weights applied to correct for variation in			Total cor- rection factor	No. meteors (with $i < 30^\circ$ $q' < 5 \text{ a.u.}$) reduced	Median π
	Number of hours of exposure*	Proportion of meteors reduced	Proportion of meteors with $i < 30^\circ$, $q' < 5 \text{ a.u.}$			
January	1.31	1.31	2.15	3.69	77	200°
February	1.46	1.59	1.72	3.99	71	235°
March	1.46	1.51	1.86	4.11	90	250°
April	1.00	1.35	1.83	2.47	142	270°
May	1.12	1.37	1.84	2.82	145	300°
June	1.27	1.43	2.21	4.02	95	310°
July	2.15	1.59	4.00	13.67	20	0°
August	1.19	1.50	2.69	4.80	62	80°
September	2.24	1.20	2.32	6.24	67	95°
October	1.18	1.44	1.93	3.28	110	120°
November	1.73	1.57	2.27	6.17	38	145°
December	1.19	1.40	2.10	3.50	66	160°

*Normalized to April=1.00.

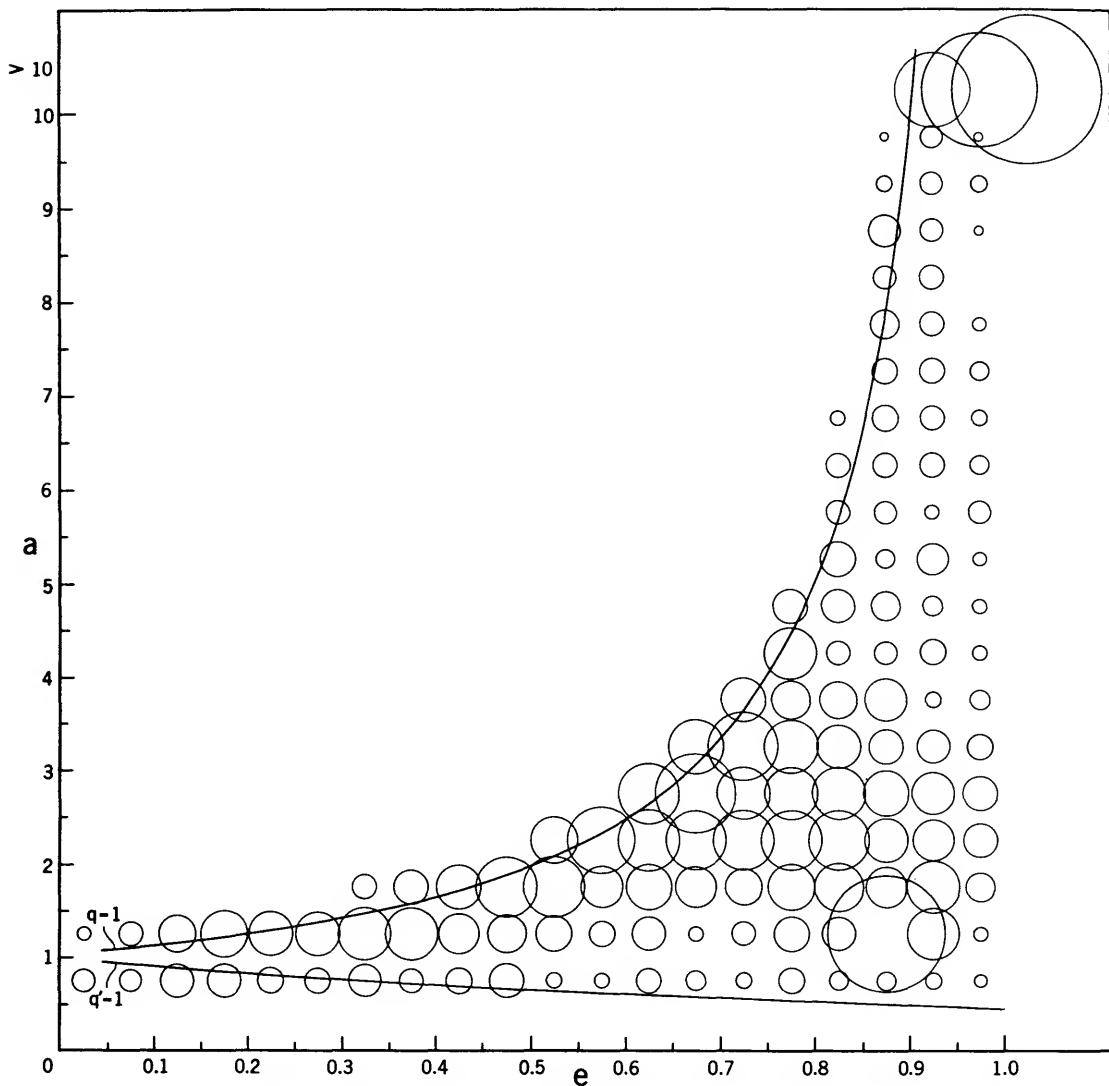


FIGURE 10a.—Distribution of meteor orbits in eccentricity and semi-major axis: observed numbers, all orbits.

played by the asteroids. There is a preferential direction for the line of apsides of small meteor orbits at about 90° from that of Jupiter.

We suggest that the observed distribution of the lines of apsides of meteors is a chance result due to contributions from a limited number of comets. The association between individual comets and meteor showers is well known. Nearly half the meteor showers are

attributable to known comets. Probably, however, the reverse correlation has not been sufficiently emphasized: a stream has been found for about half the known comets that might produce a shower (say, those approaching within 0.1 a.u. of the earth's orbit). Such comets may also supply meteors that are perturbed into broad streams and hence are not

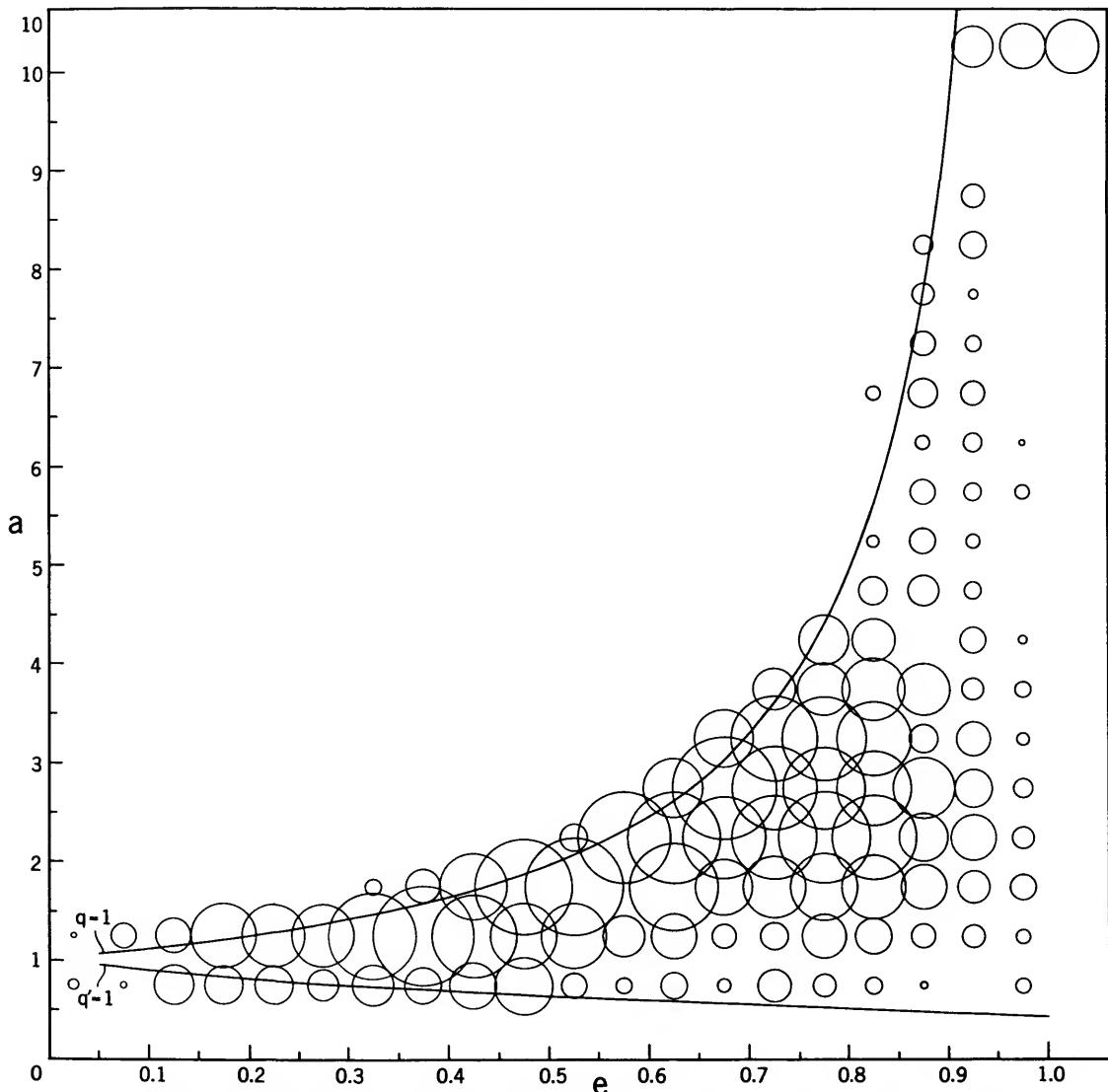


FIGURE 10b.—Distribution of meteor orbits in eccentricity and semi-major axis: cosmic-weighted numbers, orbits within 15° of the ecliptic plane. The areas in figures 10 b, c have been normalized to the same total.

recognizable as a distinct shower. The most difficult element to perturb is the line of apsides, and the streams associated with particular comets might maintain this partial identity with the parent comets.

Porter (1952) lists 19 approaches of short-period comets within 0.1 a.u. of the earth's orbit. Ten of these, including 1819 IV (see

McCrosky and Posen, 1959) and 1917 I (Whipple, 1954) have produced recognized showers. For 5 of the remaining 9, meteor radiants have been predicted at declinations south of -20° and generally out of the range covered by observatories making comprehensive photographic observations of meteors. Of the 19 close approaches, 8 are for comets with

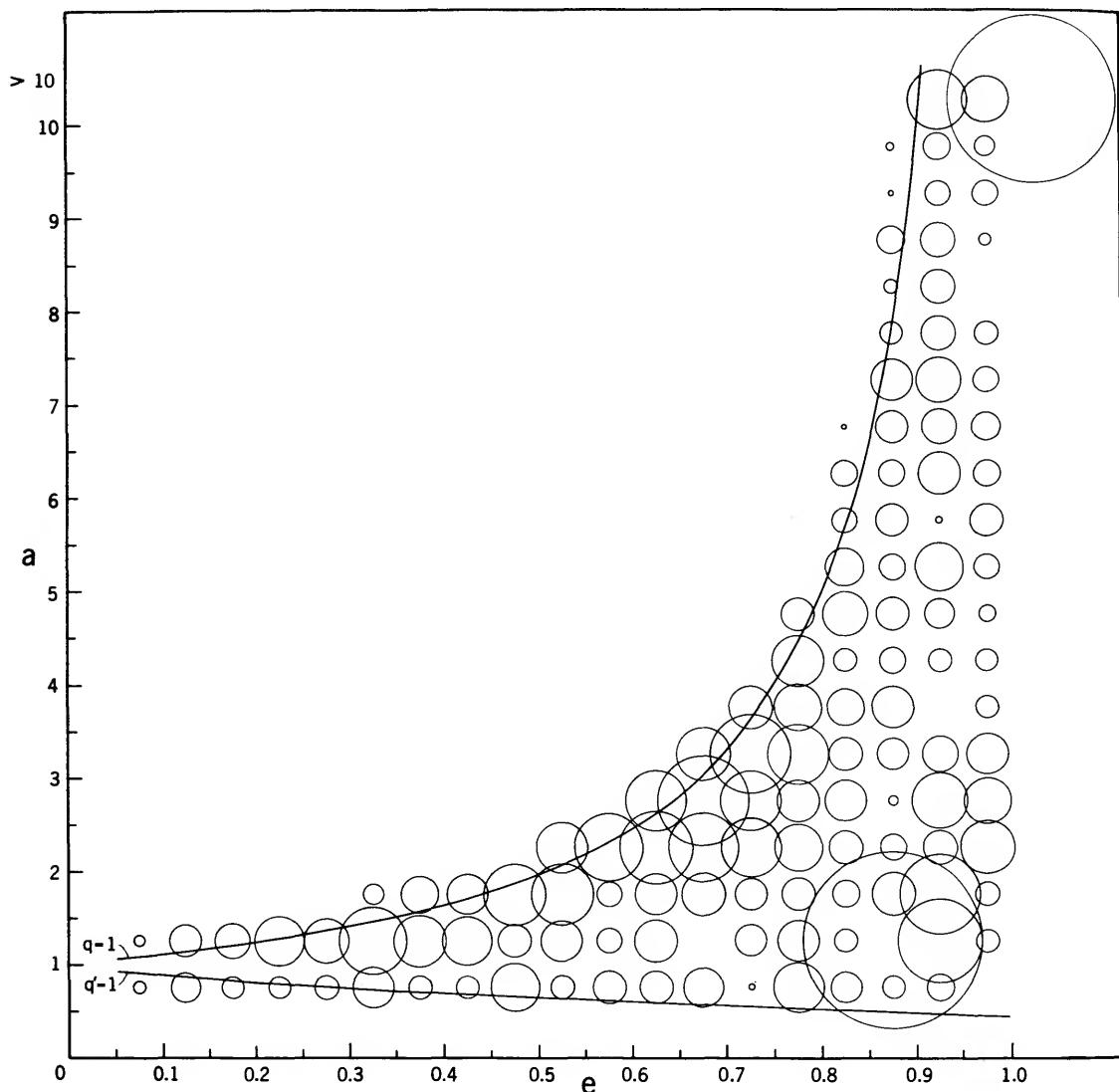


FIGURE 10c.—Distribution of meteor orbits in eccentricity and semi-major axis: cosmic-weighted numbers, high inclination orbits ($i > 15^\circ$). The areas in figures 10 b, c have been normalized to the same total.

$i > 30^\circ$, outside the ecliptic range considered in our distribution of the line of apsides. The values of π for the 6 approaches of comets with $i < 30^\circ$ and with radiants north of $\delta = -20^\circ$ are plotted with arrows in figure 19. The lines of apsides of all of these comets avoid the regions of minima around 20° and 200° observed in the

meteor data. Although the data on both meteors and comets are limited, one must consider the hypothesis that the distribution of the lines of apsides of meteors varies with time, and is related to the distribution of the elements of particular comets that chance to approach the earth's orbit.

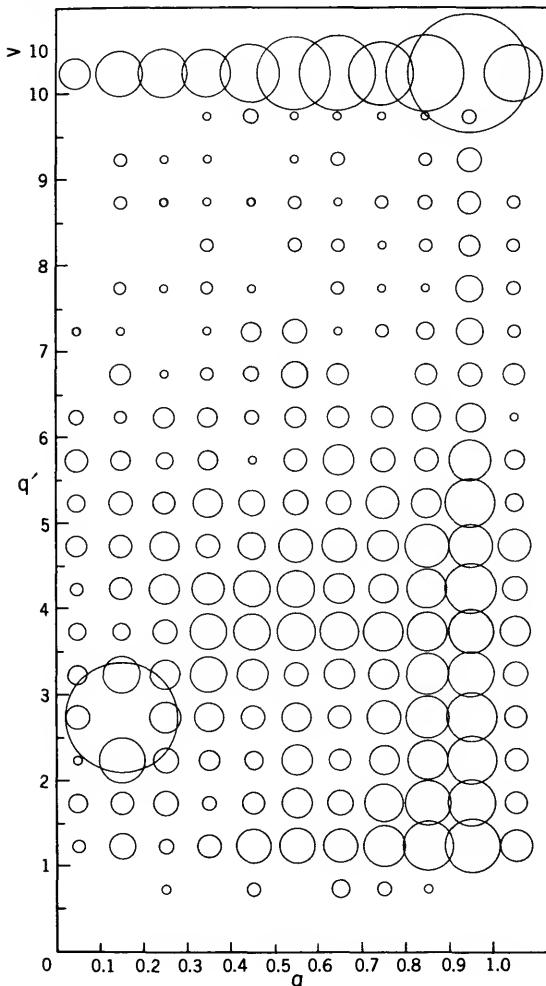


FIGURE 11.—Distribution of meteor orbits in perihelion distance and aphelion distance.

The table of data

A large number of the more important statistical relations among the orbital elements of meteors are given in the distribution graphs (figs. 2–6, 9–14). However, to facilitate the work of other investigators who may wish to analyze the data further, we present in tabular form (table 7) all of the geometrical and physical parameters of each meteor. Table 5 gives the code for identifying the shower meteors, and table 6 explains the column heads used in table 7.

It should be stressed, however, that because of the nature of the reduction method, these

data have only statistical significance. In our experience, when a meteor with anomalous parameters has been investigated more carefully, the cause of the abnormality has always been found in the approximate reduction and not in the meteor.

Masses have been determined from the integrated intensity, I , and the equation

$$m = \frac{2}{\tau_0 V^3} \int_0^T I dt, \quad (3)$$

where T is the lifetime of the meteor, and τ_0 is the luminosity coefficient. Integrated intensities have been derived from limiting and maximum magnitudes in the manner described by Hawkins (1957). Considerable uncertainty remains as to the proper value of τ_0 , and the masses given should be considered as only relative. The value of τ_0 used here is that determined by Opik (see Whipple, 1943) and the masses are therefore based on the same scale as others published by the Harvard Meteor Project. Scaling factors of as great as 220 (Cook, 1955) have been suggested.

The number given in the column for "abruptness" (4) refers to the special meteors discussed by McCrosky (1955), which show a pronounced discontinuity in the light curve, usually at the beginning of the meteor's path.

There was no precise criterion for establishing shower membership for the graphically reduced meteors. The orbital elements exhibit too much scatter to serve as a criterion. The radiants were plotted, and compact clumps of points with similar velocities were called showers. This particularly misrepresents extended showers like the Taurids, and overlapping showers like the ι and δ Aquarids and α Capricornids. Although some nonmembers of showers must have been erroneously included, the error is mainly one of omission.

For 31 meteors reduced by the graphical method, photometry was not possible. For these, the column entries M_{per} and m_{∞} have been left blank. Blanks throughout the table appear for those elements not obtained.

A dash appearing as an entry in the table represents an undefined element, such as q' and K , for those meteors whose computed orbits are hyperbolic.

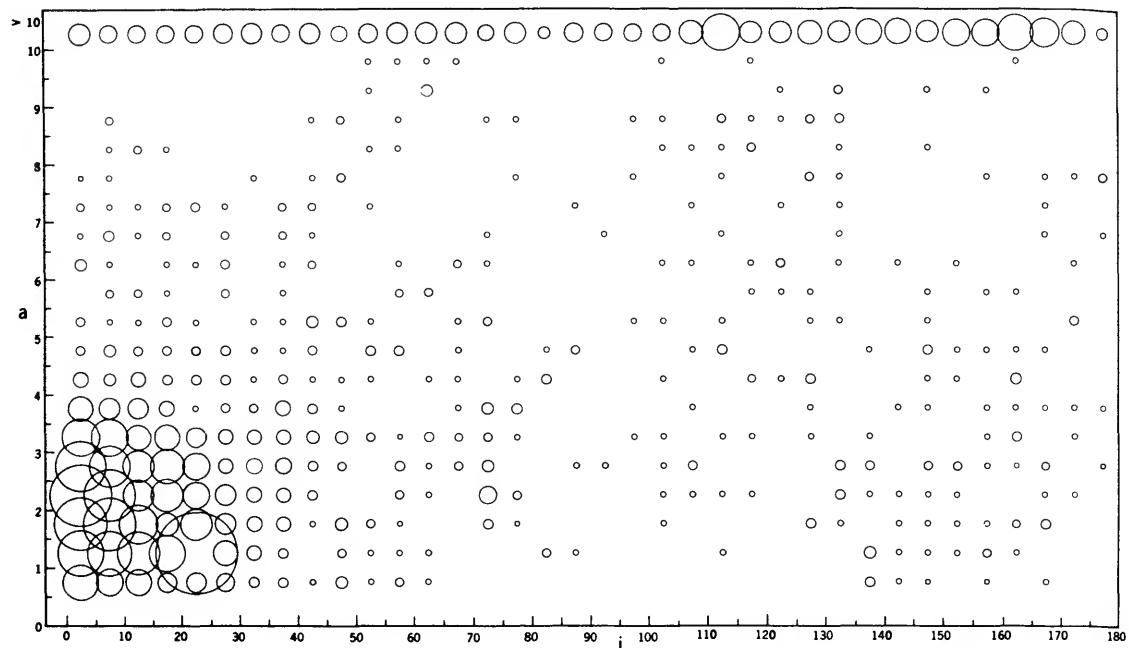


FIGURE 12.—Distribution of meteor orbits in inclination and semi-major axis.

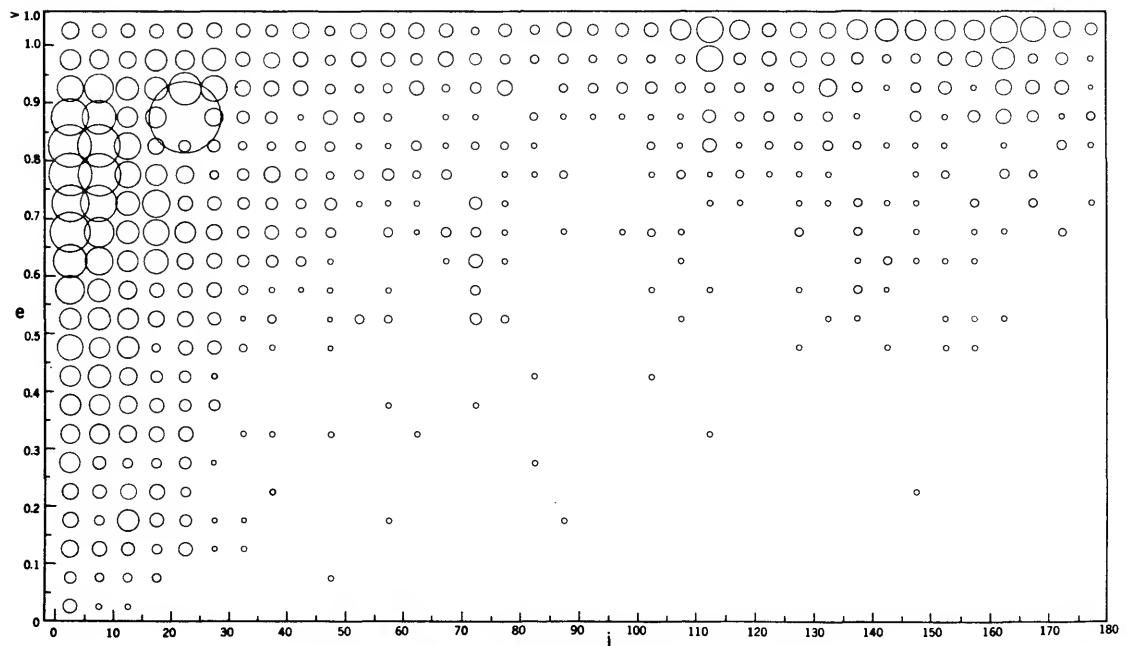


FIGURE 13.—Distribution of meteor orbits in inclination and eccentricity.

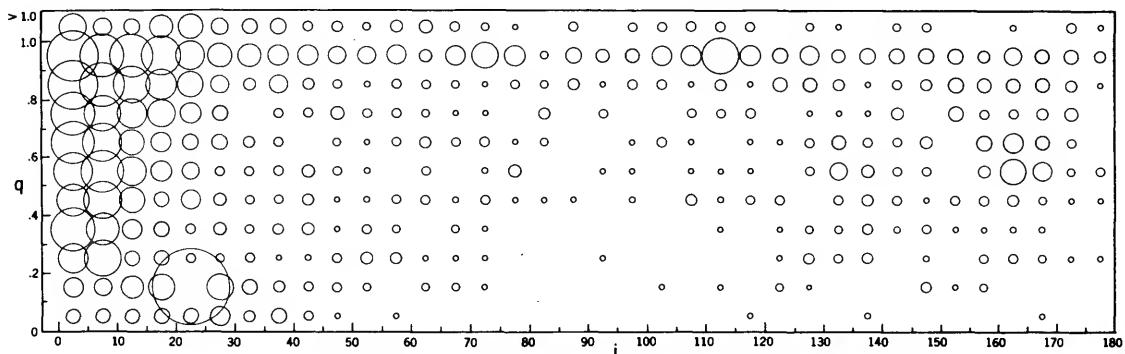


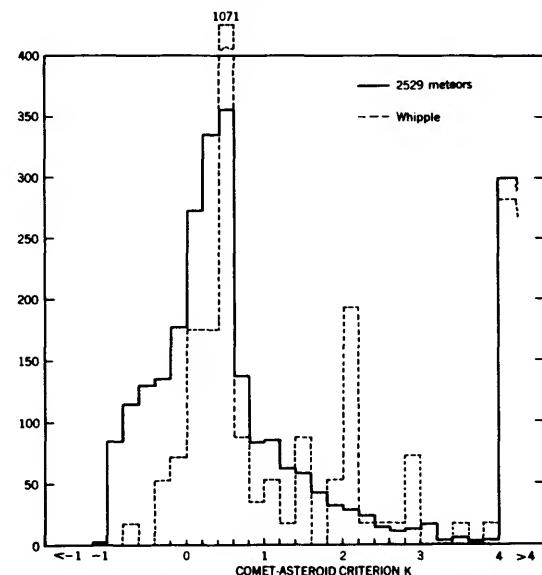
FIGURE 14.—Distribution of meteor orbits in inclination and perihelion distance.

TABLE 5.—Code for identifying shower meteors

- 1 α Capricornids
- 2 Southern Taurids
- 3 ϵ Aquarids (southern branch)
- 4 Geminids
- 5 δ Aquarids (southern branch)
- 6 Lyrids
- 7 Perseids
- 8 Orionids
- 9 Draconids
- 10 Quadrantids
- 11 Virginids
- 12 κ Cygnids
- 13 Leonids
- 14 χ Orionids
- 15 Ursids
- 16 σ Hydrids
- 17 Northern Taurids
- 18 Southern Arietids
- 19 Monocerotids
- 20 Coma Bereniciids
- 21 α Virginids
- 22 Leo Minorids
- 23 ϵ Geminids
- 24 μ Pegasids
- 25 δ Arietids
- 26 δ Aquarids (northern branch)
- 27 κ Serpentids
- 33 ϵ Aquarids (northern branch)

TABLE 6.—Explanation of column heads used in table 7

- Trail : Number of the photographic meteor trail; No. an asterisk preceding the number indicates that the meteor was reduced by Jacchia.
- Yr. : The year: 1950 plus the number given.
- Mo. : Month.
- Day : Day of the month and fraction of day expressed in Universal Time.
- Sh. : Meteor shower; identity given by the code number in table 5.

FIGURE 15.—Distributions of the 2529 meteors (solid line) and the bright photographic meteors (broken line) in the comet-asteroid criterion K . The areas under the two histograms are equal.TABLE 6.—Explanation of column heads used in table 7
(continued)

- δ, α : True radiant (equinox 1950.0).
- V_∞ : Meteor velocity (km/sec) outside the earth's atmosphere.
- V_g : Geocentric velocity (km/sec) of meteor.
- V_h : Heliocentric velocity (km/sec) of meteor.
- a : Semi-major axis (a.u.) of meteor orbit (equinox 1950.0).
- e : Eccentricity of meteor orbit (equinox 1950.0).
- q : Perihelion distance (a.u.) for the orbit.
- q' : Aphelion distance (a.u.) for the orbit.

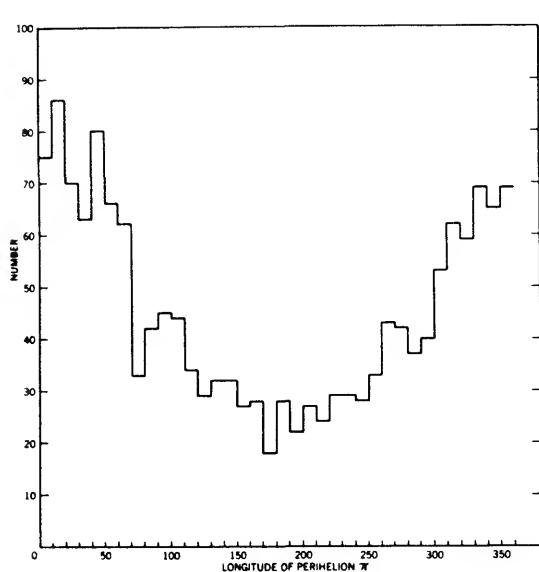


FIGURE 16.—Distribution of longitude of perihelion for asteroids.

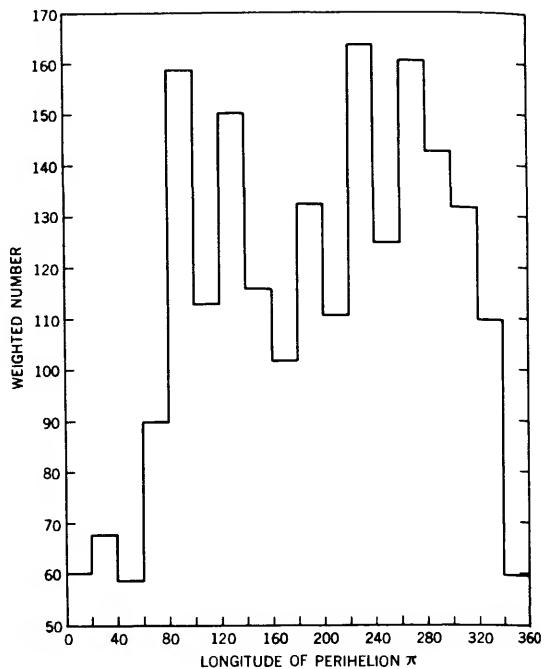


FIGURE 18.—Distribution of longitude of perihelion for meteors with $q' < 3$ a.u. The observed numbers of meteors have been weighted for seasonal observational selection. They were also weighted for the random variation throughout the year of the proportion rejected for graphical reduction.

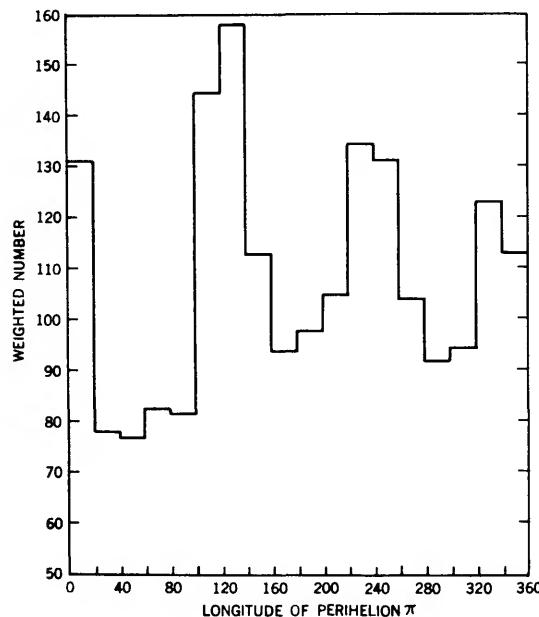


FIGURE 17.—Distribution of longitude of perihelion for meteors with $3 \leq q' < 5$ a.u. The observed numbers of meteors have been weighted for seasonal observational selection. They were also weighted for the proportion rejected for graphical reduction.

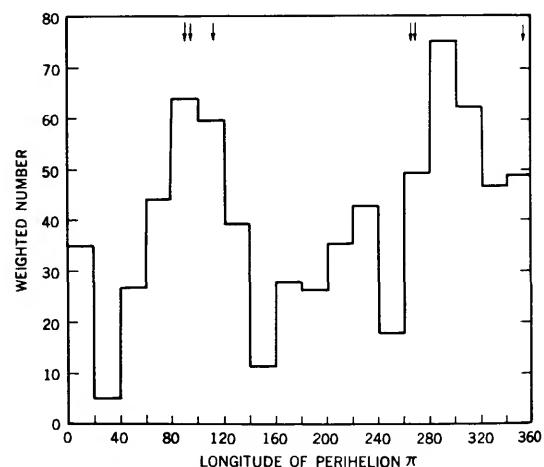


FIGURE 19.—Distribution of longitude of perihelion for accurately reduced meteors with orbits in which $q' < 5$ a.u. The observed numbers of meteors have been weighted for seasonal observational selection, and for the random variation throughout the year of the proportion accepted for reduction.

TABLE 6.—*Explanation of column heads used in table 7*
(continued)

ω	Argument of perihelion for the orbit (equinox 1950.0).
Ω	Longitude of ascending node for the orbit (equinox 1950.0).
i	Inclination of the orbit to the ecliptic (equinox 1950.0).
π	Longitude of perihelion ($\omega + \Omega$).
λ	Elongation: the angle between the true radiant and the apex of the earth's motion.
C.W.	Cosmic weight = $1/PV^2$ (see equation 1).
K	Comet-asteroid criterion (see equation 2).
CZ_R	Cosine of the zenith angle of the apparent radiant.
M_{ps}	Maximum photographic magnitude of the meteor trail (apparent photographic magnitude at a distance of 100 km).
m_∞	Initial mass of the meteoroid in grams (see text for mass scale). For example, 37-4 is to be read as .0037.
n	Number of shutter breaks visible on the trail (of the pair) used for photometry (1 shutter break = .0167 sec).
H_B	Height (km) above sea-level at beginning of trail.
A	Abruptness: The number of the shutter break at which the trail exhibited an abrupt rise to maximum light. A minus sign indicates that the light curve lies somewhere between normal and abrupt. A break number of zero indicates that the meteor was at maximum brightness when it just became visible on the film.

References

- BALDET, F., AND DE OBALDIA, G.
1952. Catalogue général des orbites de comètes de l'an — 466 à 1952. Paris Obs., Sect. Astrophys. de Meudon, 59 pp.
- BOBROVNIKOFF, N. T.
1941. Investigations of the brightness of comets. Pt. 1. Contr. Perkins Obs., vol. 2, No. 15, pp. 49-187.
1942. Investigations of the brightness of comets. Pt. 2. Contr. Perkins Obs., vol. 2, No. 16, pp. 189-300.
- COOK, A. F.
1955. On the constants of the physical theory of meteors. Astron. Journ., vol. 60, p. 156 (abstract).
- DAVIES, J. G.
1957. Radio observation of meteors. In, L. Marton, ed., Advances in electronics and electron physics, vol. 9, pp. 95-128.
- HAWKINS, G. S.
1957. The method of reduction of short-trail meteors. Smithsonian Contr. Astrophys. vol. 1, pp. 207-214.
- HAWKINS, G. S., AND SOUTHWORTH, R. B.
1958. The statistics of meteors in the earth's atmosphere. Smithsonian Contr. Astrophys., vol. 2, pp. 349-364.
- JACCHIA, L. G., AND WHIPPLE, F. L.
In Reduction methods for photographic meteor trails. Pt. 2. (To appear in Smithsonian Contr. Astrophys., vol. 4.)
- MCCROSKEY, R. E.
1955. Fragmentation of faint meteors. Astron. Journ., vol. 60, p. 170 (abstract).
1957. A rapid graphical method of meteor trail reduction. Smithsonian Contr. Astrophys., vol. 1, pp. 215-224.
- MCCROSKEY, R. E., AND POSEN, A.
1959. New photographic meteor showers. Astron. Journ., vol. 64, pp. 25-27.
- ÖPIK, E. J.
1951. Collision probabilities with the planets and the distribution of interplanetary matter. Proc. Roy. Irish Acad., vol. 54, sec. A, pp. 165-199.
- PORTER, J. G.
1952. Comets and meteor streams. 213 pp.
- VESSVIATSKY, S. K.
1925. On the brightness of comets. Russian Astron. Journ., vol. 2, pt. 3, pp. 68-84.
- WHIPPLE, F. L.
1943. Meteors and the earth's upper atmosphere. Rev. Mod. Phys., vol. 15, pp. 246-264.
1954. Photographic meteor orbits and their distribution in space. Astron. Journ., vol. 59, pp. 201-217.
1955. The physical theory of meteors. vii. On meteor luminosity and ionization. Astrophys. Journ., vol. 121, pp. 241-249.
- WHIPPLE, F. L., AND JACCHIA, L. G.
1957. Reduction methods for photographic meteor trails. Smithsonian Contr. Astrophys., vol. 1, pp. 183-206.

TABLE 7.—Orbital and physical parameters of 2,520 double-station meteors

Trail No.	No.	Day	Sh.	True rad.	V_{∞}	V_H	V_G	α	δ	q	q'	ω	Ω	i	λ	α_{H}	δ_{H}	α_{G}	δ_{G}	α	δ_{B}				
9873	4	1	1.26	10	63	20.5	17.3	39.0	3.12	.75	.79	5.5	.58	100	6	158	107	5.77	.34	1.4	44				
9875	4	1	1.27	26	58	12.6	6.4	34.6	1.47	.96	2.0	2.12	280	1	132	129	.75	-.51	2.0	26-3					
9877	4	1	1.27	18	79	14.3	9.2	34.3	1.41	.35	.92	1.9	4.2	100	10	142	.82	.74	-.9	71-3	14				
*	9880	4	1	1.32	-45	107	25.9	23.5	35.6	1.67	.47	.89	2.4	4.5	100	39	146	.82	.29	-.53	21-120	93-3			
9881	4	1	1.36	70	86	15.6	11.1	33.8	1.34	.36	.88	1.8	2.34	280	14	154	98	11.53	-.57	.81	11-2	20			
9883	4	1	1.40	44	102	15.6	11.3	32.6	1.20	.37	.76	1.6	2.62	280	8	182	91	9.02	-.59	.90	1-1	39-3			
*	9885	4	1	1.42	56	115	25.8	23.0	36.3	1.83	.65	.63	6.0	202	280	19	129	115	8.16	.42	.46-2	155	96-3		
9888	4	1	1.44	69	20	18.9	15.5	39.4	3.49	.73	.95	6.0	202	280	101	68	101	.49	1.1	10-3	25				
*	9889	4	1	1.47	55	229	40.0	38.2	38.7	2.92	.66	.98	4.8	181	281	66	101	68	1.77	.87	.6	49-4	20		
9891	4	1	1.48	19	134	40.1	38.8	35.1	1.55	.96	.06	3.0	336	281	6	256	60	1.77	-.87	.6	93-6				
9893	4	1	2.21	31	59	16.4	12.2	38.8	3.00	.70	.91	5.1	215	281	3	136	127	.32	.98	1.7	46-2	155			
*	9895	4	1	2.22	22	96	22.3	19.3	37.4	2.21	.70	.66	3.8	78	101	1	179	96	.10	.94	-.9	89-3	20		
9900	4	1	2.28	63	87	23.8	21.1	38.7	2.93	.66	.90	4.9	218	281	30	139	96	11.04	.20	.67	12-2	69			
*	9901	4	1	2.28	24	130	43.3	41.7	40.2	4.78	.98	1.10	9.5	524	281	16	246	64	1.64	-.6	.3	11-3	16		
9905	4	1	2.37	-3	158	69.6	68.6	46.0	-	2.33	1.17	.48	87	101	154	189	33	1.48	1.0	-.71	.1	13-4	16		
9907	4	1	2.37	10	50	227	44.1	42.5	39.5	3.65	.73	.98	6.3	175	281	74	97	63	.35	.37	1.4-3	34	101-9		
8761	4	1	2.49	52	182	47.5	52.6	56.4	-1.97	1.40	.78	-	215	282	138	137	27	.93	-.95	1.2	19-5	10			
9911	4	1	2.49	51	204	53.8	52.6	42.1	28.25	.97	.94	55.6	205	282	92	126	53	1.99	2.22	.89	1.1	109-8			
9913	4	1	2.50	19	105	21.5	18.3	34.9	1.51	.60	.60	2.4	92	102	3	194	88	2.36	-.22	.84	1.3	29			
9920	4	1	3.24	19	46	226	43.6	41.8	25.5	.77	.79	.16	1.4	27	282	101	309	37	7.43	-.16	.45	4-15	102-3		
9926	4	1	3.34	17	190	64.4	63.1	36.8	1.96	.55	.88	3.0	226	282	143	148	22	.74	-.17	.41	.2	19-4	17		
9928	4	1	3.36	10	47	235	41.6	39.9	38.3	2.63	.64	.96	4.3	160	282	70	82	64	2.25	-.07	.5	56-2	19-8		
9930	4	1	3.36	37	225	42.3	40.6	32.6	1.26	.26	.89	1.5	122	282	80	45	2.55	-.69	.24	.7	43-4	19			
9934	4	1	3.37	22	185	71.5	70.4	45.8	-3.01	1.27	.83	-	224	282	141	167	28	1.10	-.70	.1	52-4	20			
9940	4	1	3.41	46	226	43.6	41.8	25.5	.77	.79	.16	1.4	27	282	101	309	37	7.43	-.16	.45	4-15	102-7			
9942	4	1	3.41	10	50	228	43.1	41.4	38.9	3.06	.68	.98	5.1	174	282	72	96	64	1.79	.21	.45	.8	35-4	17	
*	9946	4	1	3.42	10	49	235	41.7	39.7	3.05	.68	.97	5.1	165	283	69	88	66	1.79	.21	.45	10-3	28	101-6	
9948	4	1	3.44	10	47	232	42.9	41.2	38.6	2.76	.53	.65	4.5	164	283	73	87	63	1.64	.10	.35	.7	23-4	11	
9950	4	1	3.45	24	179	61.8	60.7	38.2	2.56	.77	.60	4.5	265	283	134	187	31	2.21	.29	.9	1.0	74-5	12		
9954	4	1	3.45	27	168	60.7	59.7	41.1	2.76	.53	.95	15.2	285	283	127	208	40	3.72	.150	.98	-.5	36-4	18		
9955	4	1	3.47	10	51	221	42.6	40.9	37.7	2.33	.58	.98	3.7	186	283	73	109	62	.91	-.06	.7	14-3	31-3		
9966	4	1	3.47	10	48	230	41.4	39.6	37.3	2.15	.55	.97	3.0	165	283	71	88	63	1.42	-.13	.66	-.1	70-4	17	
9952	4	1	3.46	10	50	223	42.6	40.9	37.5	2.26	.56	.98	3.5	182	283	73	105	62	.00	-.09	.66	.6	48-4	19	
9954	4	1	3.47	10	49	229	42.5	40.8	38.4	3.24	1.13	.44	-	272	283	125	194	42	3.53	-.06	.69	-.3	19-4	13	
9956	4	1	3.47	30	167	64.2	63.2	45.5	-	2.69	.63	.98	4.4	178	283	74	110	63	.00	.66	-.1	70-4	18		
9962	4	1	3.47	10	50	221	42.9	41.3	38.4	2.64	.60	.98	3.9	187	283	74	100	62	.74	-.01	.79	-.5	15-3	25	
9964	4	1	3.47	10	51	221	42.6	40.9	37.7	2.33	.58	.98	3.7	186	283	73	109	62	.91	-.19	.72	-.13	31-3	102-4	
9966	4	1	3.47	10	46	231	42.6	41.0	37.7	2.31	.58	.96	3.7	161	283	73	85	62	1.05	-.06	.66	-.1	70-4	17	
9974	4	1	3.49	10	49	230	43.1	41.5	38.8	3.00	.67	.98	5.0	170	283	73	93	63	1.01	.19	.71	-.1	28-3	104-8	
9975	4	1	3.49	10	47	230	42.5	40.8	38.4	2.15	.72	.64	4.5	171	283	71	87	63	1.09	-.13	.75	-.2	97-6	22	
9980	4	1	3.49	10	47	240	42.6	41.0	40.4	2.45	.60	.98	3.9	159	283	69	81	67	2.54	.07	.70	-.3	104-3	21	
*	9983	4	1	3.50	10	49	230	43.0	41.4	38.8	3.00	.68	.98	5.0	170	283	74	95	64	1.07	.90	.78	.6	36-4	19
9986	4	1	3.50	10	46	230	42.1	40.4	37.3	2.14	.55	.97	3.3	163	283	73	85	62	1.60	-.14	.75	-.3	49-4	16	
9902	4	1	3.51	10	46	229	42.7	41.0	37.1	2.09	.54	.97	3.2	162	283	74	85	61	1.54	-.16	.78	-.6	32-4	14	
9988	4	1	3.51	10	47	230	41.5	39.9	37.3	2.15	.55	.98	2.5	165	283	71	87	63	1.09	-.13	.75	-.2	97-6	22	
9990	4	1	3.51	10	47	240	42.6	41.0	40.4	2.45	.60	.98	3.0	165	283	71	87	63	1.09	-.13	.75	-.2	104-3	21	
9996	4	1	3.52	10	50	231	44.9	43.4	40.8	6.47	.85	.98	12.0	172	283	74	95	64	1.07	.90	.78	.6	36-4	19	
9998	4	1	3.52	10	49	230	42.6	41.0	37.3	2.14	.55	.97	3.0	163	283	73	85	62	1.60	-.14	.75	-.3	49-4	16	
10001	4	1	4.42	-18	189	72.8	71.7	42.9	24.85	1.04	.98	-	3.53	104	104	157	97	14	.17	-.44	.5	11-4	19		
8753	4	1	4.50	35	136	41.0	39.8	39.3	3.00	.67	.98	5.0	2.05	114	193	40	234	67	10.36	1.05	.60	.9	104-6	2	
10007	4	1	4.52	35	136	41.0	39.8	39.3	3.00	.67	.98	2.0	6.6	310	284	19	244	92	14.51	-.44	.67	0	53-3	13	
10013	4	1	5.31	68	111	18.7	15.2	34.4	1.44	.43	.82	2.01	5.0	104	104	21	202	85	9.35	1.00	.66	.9	104-6	2	
10015	4	1	5.32	111	32.9	31.1	30.5	40.5	5.35	.92	.45	10.2	10.2	21	202	85	9.35	1.00	.66	.9	104-6	2			

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Tr. No.	Day	Sh.	True rad.	V_{∞}	V_G	V_H	α	δ	q	q'	ω	$\delta\ell$	i	λ	C.W.	K	GZ_R	X_{pg}	X_{lo}	n	H_B	A			
10020	4	1	5337	9	95	21.7	16.9	39.3	2.63	.73	.72	4.5	.69	104	8	173	100	7.15	.22	.79	1.4	16-3	18	86.7	-1	
10027	4	1	5442	45	86	20.6	16.7	39.0	2.63	.73	.72	4.5	.55	236	10	161	106	9.22	.34	.70	2.3	20-5	31	86.9	-1	
10029	4	1	5445	-2	171	70.3	69.4	42.9	-22.00	1.03	.64	-	.72	105	170	177	22	.42	-	.61	.5	66-5	12	113.6	-1	
10031	4	1	5447	71	106	14.5	9.6	32.5	1.19	.26	.88	1.5	.241	285	13	166	95	10.36	-.70	.75	1.1	40-3	11	83.1	2	
10041	4	1	6227	-23	105	32.8	30.9	42.0	21.57	.97	.72	42.4	.63	105	38	168	87	11.90	2.10	.57	1.0	93-4	25	94.7	1	
6059	3	1	825	-12	128	43.0	41.4	40.8	6.31	.94	.35	12.3	.109	108	55	217	.67	10.54	1.34	.56	.5	58-4	25	102.5		
10061	4	1	847	-2	138	46.5	45.4	39.9	3.46	.96	.13	6.8	.161	108	64	248	.59	10.54	1.26	.51	.6	30-4	19	97.5		
10064	4	1	850	9	137	49.0	48.0	42.7	-4.36	1.00	.05	4.0	.104	109	42	261	.61	7.68	-.70	.66	.6	23-4	16	102.6		
10067	4	1	9444	7	134	37.4	36.0	35.8	1.70	.91	.15	3.3	.141	109	22	250	.65	7.30	.57	.62	1.5	43-4	26	101.7		
* 6062	3	1	10413	-35	59	15.3	10.5	37.0	2.04	.52	.98	3.1	.11	110	13	121	122	3.41	-.19	.63	1.2	10-2	36	84.6		
6069	3	1	13330	22	119	26.6	24.2	37.4	2.20	.77	.51	3.9	.277	293	1	209	.86	.41	.23	.98	3.3	21-4	12	100.5		
6071	3	1	13331	25	208	62.4	41.3	9.31	.90	.96	.74	17.7	.199	293	121	132	35	.69	1.23	.23	.9	34-5	6	110.0		
6076	3	1	13332	53	144	16.2	8.9	29.8	.97	.23	.74	1.2	.288	293	10	220	.78	9.02	-.01	.34	.22	.5	22-3	10	105.0	1
6081	3	1	13335	20	124	30.5	28.5	38.1	2.54	.85	.39	4.7	.208	113	0	221	.81	.11	.48	.97	.34	2.2	14	88.5	1	
6083	3	1	13336	51	90	20.8	17.8	40.0	4.31	.81	.84	7.8	.228	293	13	161	110	10.16	.60	.84	1.0	57-3	39	96.2		
6090	3	1	13338	7	94	20.3	17.4	39.3	3.44	.77	.80	6.1	.55	113	8	168	108	7.17	.42	.68	1.3	61-3	53	89.8		
* 6093	3	1	13339	43	252	43.5	41.8	42.2	3.64	.98	.02	7.2	.046	150	293	68	83	70	4.07	2.46	.68	1.7	32	101.9		
* 6095	3	1	13442	43	223	29.7	27.3	27.3	.84	.18	.69	7.0	.10	349	293	56	282	.56	1.13	-.92	.64	-.3	53-3	42	95.0	
* 6096	3	1	13443	-22	192	47.5	46.0	18.7	.61	.62	.23	1.0	.176	113	139	289	16	.50	-.59	.48	.2	17-4	8	108.2		
6098	3	1	13445	43	123	25.7	23.5	37.5	2.24	.74	.59	3.9	.267	293	17	200	.88	11.23	.17	.82	.8	32-3	40	87.6		
6102	3	1	13445	34	124	24.6	26.7	38.5	2.75	.82	.59	5.0	.276	293	13	209	.85	7.76	.45	.55	1.8	16-2	33	92.3		
* 6105	3	1	13446	35	244	63.9	42.2	37.8	2.36	.63	.87	3.9	.135	293	75	68	60	4.05	.02	.55	.6	86-4	41	101.8		
6106	3	1	13447	29	221	52.7	51.4	35.5	1.63	.40	.98	2.3	.166	293	103	99	42	.50	-.42	.78	.2	19-4	10	97.6		
10073	4	1	13447	1	217	71.9	70.9	43.3	-12.60	1.07	.90	-	.146	293	154	78	19	.52	-	.66	-.1	10-5	12	115.5		
10075	4	1	13448	20	183	66.8	65.9	44.2	-5.78	1.10	.57	-	.259	293	137	191	34	2.19	-.16	.96	1.3	41-5	12	109.9		
6110	3	1	13449	37	222	54.5	53.5	40.1	4.50	.82	.98	16.1	.180	293	96	113	50	.46	1.14	.83	-.6	62-4	25	109.4		
6112	3	1	13449	62	237	36.4	36.0	40.2	4.50	.78	.98	8.0	.189	293	72	122	76	1.71	.57	.96	1.2	37-4	17	100.6		
6114	3	1	13449	82	356	47.8	46.5	62.1	-1	.43	.30	9.5	.197	293	45	130	106	2.86	-.75	.59	1.3	58-5	6	105.4		
6116	3	1	13451	28	118	13.5	8.2	31.2	1.07	.27	.78	1.4	.269	293	2	202	.89	2.07	-.73	.68	-.7	94-3	16	79.4	2	
10090	4	1	13451	24	117	19.2	35.3	1.59	.63	.59	2.0	.272	293	2	205	.88	1.98	-.16	.54	-.1	12-2	27	83.7			
10081	4	1	13452	55	234	39.0	37.3	38.9	3.06	.68	.98	5.1	.186	293	64	118	116	2.15	-.66	.20	.0	33-4	14	98.2		
10083	4	1	13452	20	19	184	65.7	64.8	42.7	-35.33	1.02	.66	-	.186	293	139	194	33	2.15	-.72	.1	37-4	10	111.6		
10085	4	1	13452	44	206	18.0	14.1	24.5	.74	.36	.47	1.0	.346	293	26	279	53	6.47	-.81	.96	-.2	79-3	14	82.8		
10088	4	1	13453	17	201	64.3	63.4	38.6	2.85	.68	.90	4.8	.218	293	135	150	26	.87	-.16	.96	-.1	29-4	11	98.6		
6119	3	1	14223	38	127	21.8	17.9	33.6	1.32	.55	.60	2.0	.276	294	11	210	.84	1.83	-.35	.6	47-3	25	84.1			
6123	3	1	14224	-1	91	17.4	13.4	37.2	2.12	.59	.66	3.4	.148	294	11	150	113	8.90	-.32	.85	3.3	28-3	27	91.9		
6125	3	1	14224	36	52	12.3	5.7	35.0	1.53	.37	.97	2.1	.115	294	6	229	78	2.67	.72	.95	1.2	35-4	13	87.3		
6129	3	1	14226	58	97	21.7	16.7	39.6	1.08	.78	.83	6.9	.229	294	17	163	106	1.21	-.48	.91	1.0	32-2	24	77.4		
6131	3	1	14228	-30	116	31.6	29.5	39.2	3.37	.78	.74	6.0	.64	114	20	234	72	13.69	-.39	.78	.6	22-3	19	86.1	1	
6133	3	1	14442	58	253	31.1	22.7	42.3	6.219	.99	.85	123.5	.44	114	23	158	105	10.40	2.96	.65	.0	50-3	30	96.9		
6135	3	1	14442	63	127	31.4	30.6	38.8	1.73	.47	.92	2.5	.216	294	11	150	113	8.90	-.32	.85	3.3	28-3	27	91.9		
6137	3	1	14444	15	14	33.4	33.4	31.6	3.02	.89	.33	5.7	.115	294	6	229	78	2.67	.72	.95	1.2	35-4	13	87.3		
6139	3	1	14445	6	141	45.5	44.2	40.3	5.04	.98	.08	10.0	.168	294	35	262	62	7.63	1.79	.88	0	56-4	20	105.8		
6143	3	1	14448	-6	129	23.8	21.2	31.1	1.06	.59	.64	1.7	.120	114	20	234	72	13.69	-.39	.78	.6	22-3	19	86.1	1	
6145	3	1	14442	58	253	31.1	28.8	37.6	2.28	.57	.98	3.6	.172	294	49	106	79	1.65	.08	.45	.0	50-3	30	100.0		
6147	3	1	14444	15	165	61.3	60.3	43.8	-	.87	.92	1.02	.177	105	106	117	21	1.67	3.10	-.31	.4	15-5	18	107.3		
6150	3	1	14446	27	167	67.6	66.5	45.9	-	.92	.94	1.32	.144	106	121	136	37	2.98	2.67	.95	1.2	35-4	13	107.5		
6152	3	1	14448	20	23	188	63.7	62.7	42.0	21.44	.97	.61	42.3	.120	129	191	36	2.17	.98	2.17	.0	63-4	11	105.2		
6154	3	1	14451	14	139	39.7	38.5	38.6	2.81	.95	.13	5.5	.141	114	4	295	67	1.18	1.07	.67	1.2	24-4	13	105.0		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Tr. No.	Day	Sh.	True red.	V_{E}	V_{G}	V_{H}	a	e	q	q'	ω	i	d_b	1	α	λ	C.N.	K	GZ_R	M_{PK}	M_{∞}	n	R_B	A	
6158	3	1	15.19	-17	119	12.1	4.5	29.9	.90	.11	.86	1.01	10.1	115	5	216	.81	2.15	-.91	.75	1.1	1.52	.25	76.0	1	
6160	3	1	15.21	19	65	16.0	11.8	39.8	4.16	.77	.94	7.3	106	115	1	140	138	.4	.51	.95	1.1	1.52	.25	90.6	1	
6162	3	1	15.24	28	111	22.0	19.0	37.4	2.21	.69	.68	3.7	256	295	3	191	96	.2	.96	1.6	2.55	35	87.3	23		
6164	3	1	15.31	8	125	34.2	32.4	40.0	4.42	.92	.36	8.5	109	115	14	224	79	.5	.95	1.02	1.85	3	22	94.2	77	
6166	3	1	15.31	-11	134	43.3	41.8	41.4	9.69	.97	.32	19.1	112	115	53	227	68	10.60	1.76	.71	.4	39.4	18	94.2	77	
6168	3	1	15.32	51	87	16.9	12.9	37.6	2.20	.60	.89	3.5	222	295	10	157	114	8.82	-.06	.88	.4	64.3	16	80.3	2	
6170	3	1	15.32	31	118	27.4	25.1	39.6	3.84	.57	.55	1.4	297	295	8	200	91	.5	.03	.68	.99	.9	1.1	21	88.3	1
6172	3	1	15.32	22	133	17.5	13.5	29.8	.97	.43	.55	1.2	265	295	2	232	75	2.47	-.61	.97	1.1	34.3	.18	84.4	1	
6174	3	1	15.37	28	157	48.9	47.6	40.7	6.22	.98	.12	12.3	320	295	69	255	58	9.81	1.79	.79	.9	12.4	11	112.3	1	
6176	3	1	15.39	21	126	27.8	25.7	36.7	1.93	.78	.43	3.4	286	295	2	221	81	1.20	.16	.93	.0	20.3	18	89.7	1	
6179	3	1	15.41	34	110	20.0	16.9	36.5	1.89	.62	.72	3.1	253	295	6	188	97	6.09	-.09	.84	1.1	47.3	17	98.1	1	
6184	3	1	15.41	9	180	13.0	6.6	24.6	.75	.34	.49	1.0	346	295	2	281	30	.90	-.82	.91	1.8	37.3	13	79.7	1	
6185	3	1	15.42	23	135	36.1	34.6	39.2	3.26	.92	.25	6.4	303	295	9	238	74	3.39	.93	.92	.5	12.1	31	103.3	1	
6187	3	1	15.42	24	123	34.9	33.7	33.7	1.33	.88	.16	5.5	322	295	20	257	64	7.35	-.31	.97	-.03	20.2	31	99.4	1	
6189	3	1	15.43	17	123	28.7	26.7	38.1	2.51	.82	.45	4.6	102	115	3	217	84	1.70	.41	.79	1.1	71.3	27	88.5	2	
6191	3	1	15.46	19	180	58.5	57.4	37.8	2.35	.87	.31	4.4	298	295	133	233	37	3.58	-.52	.97	.7	10.4	14	99.9	1	
6193	3	1	15.50	56	272	14.7	9.4	31.1	1.07	.09	.96	1.02	141	295	117	176	87	3.42	-.89	.65	.9	77.3	20	83.0	1	
6195	3	1	16.35	20	191	66.6	65.4	42.6	60.32	1.01	.67	1.6	248	296	136	184	31	1.86	.1	.96	.1	1.44	15	106.8	1	
6197	3	1	16.36	17	130	19.4	16.0	31.0	1.07	.50	.53	1.6	112	116	1	228	78	1.12	-.49	.1	1.7	21	22	86.9	7	
6199	3	1	16.37	6	118	26.2	24.0	37.5	2.25	.76	.55	4.0	92	116	12	208	87	8.18	.21	.84	1.4	50.4	10	90.1	1	
6201	3	1	16.38	-25	159	58.1	57.0	41.5	11.51	.95	.53	22.5	87	116	109	203	45	4.40	1.69	.53	-.2.8	31	106.8	1		
6204	3	1	16.40	26	155	54.5	53.4	40.5	5.44	.91	.51	10.5	207	297	49	5.67	1.05	.54	.2	1.54	10	108.5	1			
6206	3	1	16.40	34	155	42.6	41.2	39.0	3.15	.93	.22	6.1	308	296	51	244	64	10.94	.94	.99	.1	17	17	105.5	1	
6208	3	1	16.41	70	0	13.5	7.8	34.6	1.47	.33	.98	2.0	189	296	11	125	118	2.15	-.53	.54	.6	1.22	18	77.5	2	
6210	3	1	16.41	10	145	21.1	18.1	26.9	.82	.61	.32	1.3	141	116	3	257	62	2.35	-.47	.92	2.1	19.3	33	91.9	1	
6212	3	1	16.42	12	130	19.0	15.8	30.8	1.04	.49	.53	1.6	114	116	4	230	77	4.04	-.51	.86	1.4	74.5	54	92.5	1	
6214	3	1	16.43	12	130	63.6	62.6	42.6	59.64	1.00	.25	1.6	299	296	155	235	37	2.00	-.62	.85	.1	104.4	1	104.4	1	
6217	3	1	16.45	-1	211	72.7	71.7	42.4	21.6	6.00	4.32	3.0	170	296	162	106	111	2.00	3.98	.62	1.04	54.4	26	115.2	1	
* 6227	3	1	17.18	90	72	23.2	20.5	39.5	3.63	.74	.95	6.3	205	297	29	142	100	8.00	.38	.49	.2	12.2	32	88.2	1	
6231	3	1	17.29	-26	44	14.6	10.0	38.4	2.68	.63	.98	4.4	2	117	10	119	139	.00	.32	1.3	.25	2	69	74.2	1	
6233	3	1	17.31	18	97	16.5	12.5	36.5	2.57	.69	.84	2.9	53	117	2	170	110	2.25	-.18	.93	.1	70.3	14	83.9	1	
6237	3	1	17.35	12	114	29.9	28.0	42.1	30.73	.98	.56	60.9	82	117	8	199	93	4.55	2.52	.89	.1	11.2	18	112.5	1	
6239	3	1	17.38	14	150	40.6	39.1	35.5	1.64	.96	.07	3.2	335	297	6	272	60	1.70	.90	.95	.0	60.4	17	97.6	1	
6241	3	1	17.40	42	230	48.4	46.9	39.8	4.13	.76	.98	3.7	177	299	83	114	96	1.49	.52	1.0	1.25	24	94.7	13		
6243	3	1	17.41	20	18	59.7	58.5	40.5	2.30	.83	.40	4.2	289	297	134	226	34	3.02	.39	.68	1.0	64.5	10	108.0	1	
6245	3	1	19.19	31	102	19.3	15.7	38.6	2.57	.69	.81	4.3	236	299	4	175	108	3.36	-.14	.96	1.6	28.3	27	97.3	1	
6247	3	1	19.22	25	133	23.3	20.3	33.5	1.31	.62	.49	2.1	287	299	6	226	80	4.50	-.25	.82	-.7	11.2	32	88.3	1	
6251	3	1	19.33	10	152	41.2	39.6	34.9	1.52	.97	.05	3.0	158	119	7	277	58	1.98	.25	.95	.1	23.4	14	89.1	1	
6254	3	1	19.34	21	127	26.9	24.6	37.2	2.11	.77	.49	3.7	279	299	2	218	85	1.33	.21	.98	1.9	12.3	38	99.6	1	
6256	3	1	19.42	20	17	87	71.3	70.4	46.4	1.63	1.36	.58	-	253	299	142	192	34	1.66	-.75	.90	.3	69.5	12	114.5	1
6266	3	1	19.42	41	155	33.7	31.9	36.0	1.76	.78	.38	3.1	293	299	38	232	71	13.05	.16	.98	.8	92.4	25	103.1	1	
6268	3	1	20.26	31	75	15.2	10.6	38.2	2.56	.64	.93	4.2	210	300	2	150	132	2.04	.06	.94	2.9	43.3	46	86.5	1	
6270	3	1	20.28	35	124	33	23.2	20.7	36.2	1.59	.67	.60	1.04	269	299	9	208	91	4.50	-.25	.82	1.1	48.3	13	80.0	1
6272	3	1	20.29	0	98	17.7	14.0	37.3	2.05	.61	.85	3.4	234	299	27	273	59	7.31	-.05	.85	2.0	47.3	46	90.4	1	
* 6275	3	1	20.32	29	199	61.6	60.3	42.7	-4.94	1.02	.74	-	240	300	114	180	42	2.72	-.49	-1.1	1.0	11.3	34	113.0	1	
* 6276	3	1	21.30	67	59	17.5	13.7	39.1	2.50	.71	.95	5.6	203	301	15	144	71.7	.29	.73	1.3	29.3	14	87.8	1		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (Continued)

Trail No.	Mo.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	ω	Ω	i	π	λ	C.W.	K	CZ_R	M _{pg}	M _{oo}	n	H _B	A
556036	O - 61	- 4		6	182	36.2	34.4	40.9	7.12	.89	.79	13.5	235	301	51	176	.78	9.24	1.09	.74	1.2	73-4	97.4	
6278	3	1 21 33		64	178	41.8	40.2	41.4	9.90	.94	.64	19.5	235	301	60	194	.60	1.47	1.09	.47	1.9	35-4	29	
6280	3	1 21 34		54	151	40.3	39.7	36.8	1.99	.95	.00	3.9	328	301	8	269	.63	2.09	.91	.94	-.8	19-3	26	
6282	3	1 21 35		15	151	24	96	18.0	14.6	38.7	2.96	.71	.55	228	301	0	169	115	.31	.25	.80	11-2	47	
6284	3	1 21 36		24	107	20.5	17.5	18.8	3.02	.75	.77	5.3	241	301	2	182	106	2.02	.32	.83	2.2	19-3	31	
6286	3	1 21 38		27	107																	96.7		
6288	3	1 21 40		6	220	70.6	67.5	42.7	-47.27	1.02	.97	-	164	301	145	105	21	.27	.74	-.03	.60	1.3	95-5	
6290	3	1 21 40		-19	177	58.1	56.9	34.8	1.50	.73	.61	2.6	113	121	136	234	31	.21	.45	-.03	.60	1.3	93.3	
6292	3	1 21 41		24	131	27.1	25.0	37.1	2.08	.77	.48	3.7	281	301	5	222	84	3.56	.21	.00	0.0	20-3	16	
6294	3	1 21 43		43	153	27.1	24.9	33.8	1.34	.64	.49	2.2	288	301	27	229	75	14.46	-.01	.01	.96	1.6	20	
6296	3	1 21 43		34	128	23.5	21.0	36.4	1.87	.68	.60	3.1	268	301	10	209	89	8.31	-.01	.05	-.7	82-3	22	
6298	3	1 21 43		-19	56	11.9	5.3	34.4	1.44	.32	.98	1.9	7	121	5	129	139	.65	-.56	.1.5	71-3	15		
6300	3	1 21 44		63	204	16.5	12.2	29.5	.95	.15	.81	1.1	291	301	22	232	75	8.91	-.89	.85	1.6	16-3	10	
6302	3	1 21 45		12	143	40.0	38.7	40.0	4.41	.96	.16	8.7	135	121	5	256	70	1.59	1.37	.81	1.4	43-4	15	
6304	3	1 21 45		62	73	16.8	12.9	38.5	2.76	.66	.94	4.6	208	301	12	149	121	8.59	1.13	.52	1.5	61-3	87.9	
6310	3	1 21 47		7	147	41.4	40.1	38.2	2.61	.96	.10	5.1	146	121	16	268	64	4.61	1.13	.75	-.2	52-4	13	
6312	3	1 21 48		80	158	13.9	8.5	32.2	1.16	.19	.94	1.4	226	301	14	167	95	6.99	-.77	.78	1.8	33-3	12	
6315	3	1 21 49		-4	174	59.8	58.9	38.3	2.65	.92	.21	5.1	131	121	160	252	35	1.73	.82	.78	1.6	90-5	12	
6317	3	1 21 49		-46	232	47.8	46.4	41.7	1.98	.93	.93	2.70	185	301	79	126	62	1.90	1.58	1.7	1.04	7	107.3	
6320	3	1 21 51		-29	212	72.0	71.1	43.3	-12.54	1.07	.92	-.98	-	392	121	154	93	18	1.41	-.45	1.9	14-5	4	109.7
6322	3	1 21 51		22	225	68.4	67.4	47.0	-	2.15	1.46	.98	-	175	301	120	114	37	.30	-	.89	1.6	47-5	10
* 6326	3	1 23 37		31	136	34.7	33.0	42.2	51.98	.99	.63	103.5	278	303	16	221	84	6.70	3.10	.98	1.0	75-4	25	
6330	3	1 23 39		15	118	22.7	20.1	37.9	22.41	.73	.66	4.2	77	123	4	200	96	3.62	1.18	.81	1.7	30-3	40	
6332	3	1 23 40		10	139	33.4	31.7	37.4	2.22	.87	.28	4.2	122	121	8	245	74	3.36	.51	.88	1.6	69-4	23	
6336	3	1 23 41	20	18	191	64.0	63.9	42.3	83.98	.99	.51	167.5	269	303	133	212	36	2.71	3.44	.87	1.7	58-5	10	
6338	3	1 23 51		33	117	21.1	18.3	38.0	2.49	.71	.73	4.3	248	303	6	191	100	5.97	1.16	.56	1.1-2	22	101.5	
6340	3	1 23 52		55	280	13.5	7.5	31.0	1.06	.09	.96	1.0	135	303	14	178	89	3.23	-.90	.45	.90	2.2	81-0	11
6343	3	1 24 43		27	136	19.2	16.0	32.5	1.19	.50	.59	1.8	281	304	5	225	83	5.73	-.90	.73	1.0	30-3	40	
6346	3	1 24 43		-26	177	11.9	4.3	26.8	.82	.21	.65	1.0	124	4	292	35	.79	-.90	.77	1.4	19-2	30		
6348	3	1 24 43		67	220	17.9	14.0	31.1	1.07	.91	.91	1.02	245	304	25	189	80	7.35	-.85	.77	1.1	70-3	17	
6350	3	1 24 44		-18	124	18.0	14.6	32.1	1.15	.38	.71	1.6	90	124	17	214	84	15.48	-.59	.46	2.0	37-3	35	
6353	3	1 24 44		14	22	58.1	57.2	87.1	-.15	7.40	.98	-	174	304	3	118	171	.01	.01	.01	1.1-2	22	88.9	
6355	3	1 24 46		44	166	21.5	18.6	29.5	.95	.47	.51	1.4	301	304	24	246	70	16.07	-.58	.96	1.5	11-3	14	
6359	3	1 24 49		-58	232	42.4	40.8	43.0	-16.94	1.06	.97	-.95	304	65	139	73	2.30	-.80	.80	1.6	40-4	21		
6360	4	1 26 16		38	151	36.0	34.0	40.3	51.90	.92	.41	9.8	282	306	31	228	78	10.48	1.06	.52	1.6	31-4	16	
12182	4	1 26 18		46	102	18.0	14.6	38.0	2.62	.67	.87	4.4	224	306	9	170	114	7.56	1.12	.95	1.8-2	12	82-3	-3
12185	4	1 26 20		38	107	18.3	14.6	37.9	2.46	.66	.84	4.1	231	306	6	176	111	6.08	.07	.97	1.2	22-2	50	
12187	4	1 26 21		22	139	32.7	30.6	39.4	3.60	.89	.38	6.8	287	306	7	233	81	3.28	.81	.77	1.4	12	94-0	-2
12193	4	1 28 17		40	103	22.3	19.3	42.3	69.29	.99	.64	137.7	225	308	8	173	115	6.32	3.06	.95	1.0	65-3	12	
12195	4	1 28 17		42	116	16.4	12.0	35.4	1.62	.48	.65	2.4	236	308	7	183	106	7.27	-.34	.90	1.6	11-2	12	
12197	4	1 28 19		-6	349	12.3	6.3	34.6	1.48	.36	.95	2.0	328	128	0	96	130	.16	-.50	.31	2.0	58-3	14	
12212	4	1 30 36		34	113	21.5	18.6	40.5	5.59	.86	.60	10.4	234	310	6	184	110	5.05	.86	.87	-.7	52-3	14	
12214	4	1 30 36		56	131	14.1	8.9	32.9	1.24	.29	.88	1.6	237	310	9	187	109	8.14	-.65	.92	1.6	89-0	15	
12221	4	2 24 49		56	166	13.2	7.4	30.4	1.02	.16	.85	1.2	269	313	10	222	85	6.84	-.85	.91	1.2	40-3	8	
12223	4	2 3,36		1	119	49.5	48.7	61.8	-.44	2.38	.61	-.2	6.3	133	24	196	101	4.87	-.85	.06	1.76-4	27	106.5	
12231	4	2 3,32		45	291	30.1	27.7	40.2	4.87	.82	.89	8.8	142	313	41	96	88	8.51	.68	.53	.5	35-3	47	
12233	4	2 3,35		20	147	31.0	28.5	38.5	2.83	.86	.41	5.2	286	314	6	240	81	3.28	.56	.97	1.2	103-4	2	
12234	4	2 3,35		38	137	20.2	17.1	36.0	1.76	.55	.72	2.8	254	314	11	207	95	6.74	-.17	.98	2.0	89-0	15	
12235	4	2 3,36		32	175	45.1	43.7	41.4	10.85	.97	.31	21.4	293	314	59	247	65	10.30	1.88	.96	-.1	76-4	21	
12237	4	2 3,36		9	161	39.1	37.5	36.4	1.88	.94	.11	3.7	326	314	1	280	64	.44	.79	.91	.6	57-4	21	

TABLE 7.—Orbital and physical parameters of 2,520 double-station meteors (continued)

Trail No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	θ	μ	β	λ	$C.W.$	K	$G2_R$	H_{PG}	H_{BD}	n	H_B	A		
1299	4	2	3.38	26	216	62.3	61.1	43.8	.82	.82	-	228	314	112	182	42	2.32	-.1	.71	14	107.7			
1224	4	2	3.38	20	168	57.5	56.5	50.5	-.1	.91	-	315	314	69	269	63	7.81	-.1	.6	17	42.4	17		
1223	4	2	3.38	14	225	65.1	63.8	40.6	.97	.97	11.0	196	314	126	150	30	1.48	-.53	.53	18	32.4	18		
6363	3	2	4.14	50	159	22.3	19.1	30.1	1.47	.52	2.0	222	216	86	14.32	-.33	.54	2.1	71.4	14	88.9	1		
6365	3	2	4.15	13	168	13.1	6.4	27.7	.86	.24	.65	2.1	318	315	2	1.21	-.85	.51	1.4	44.3	12	76.9		
6369	3	2	4.15	25	103	10.8	1.8	31.4	1.07	.09	.98	1.2	208	315	0	1.63	122	1.01	-.97	2.0	15.2	46	55.7	
* 6316	3	2	4.16	13	147	10.4	7.7	30.3	1.57	.41	.93	2.0	144	315	4	1.25	2.60	-.43	.37	1.7	76.1	102.2		
6367	3	2	5.15	17	108	21.6	29.3	30.3	2.71	.86	.38	5.0	109	136	1	2.45	.80	1.39	-.1	.98	54	104.8		
6369	3	2	5.23	18	108	17.7	13.8	38.7	2.29	.67	.76	3.8	245	316	16	1.05	1.62	.06	2.3	.98	1.9	18.3	17	
6391	3	2	5.23	22	146	27.5	25.0	37.4	2.20	.78	.49	3.9	278	316	7	2.34	.85	4.10	-.24	.85	1.7	77.4	21	
12651	4	2	5.34	23	110	15.2	10.8	36.4	1.67	.53	.89	2.9	224	316	0	1.80	1.17	.93	-.22	.87	2.9	55.3	30	
12655	4	2	5.37	73	171	11.7	3.9	30.9	1.05	.08	.96	1.1	226	316	6	1.82	1.32	-.91	.86	1.1	11	77.0		
12659	4	2	5.39	-9	189	67.8	66.8	43.2	1.09	.34	.98	1.05	1.36	166	241	34	.93	1.71	-.7	.81	5	11	113.4	
12663	4	2	5.41	20	238	59.8	58.6	40.3	5.13	.81	.98	9.3	169	316	112	125	40	.43	.69	.57	.6	59.5	7	100.9
12670	4	2	5.46	14	154	23.4	20.7	31.6	1.11	.63	.41	1.8	300	316	2	2.57	.74	1.96	-.31	.81	2.1	10.3	24	
12672	4	2	5.50	11	153	32.6	31.0	37.2	2.14	.86	.29	4.0	121	136	0	2.57	.75	1.14	-.46	.62	2.1	10.4	6	
12677	4	2	5.52	47	180	33.8	32.2	31.8	2.0	.75	.59	4.2	266	316	45	2.22	.75	12.74	-.23	.87	1.9	46.4	22	
12680	4	2	6.25	31	135	20.0	16.6	36.4	1.87	.61	.74	3.0	251	317	7	2.08	.98	6.32	-.12	.96	-.7	81.5	14	
12682	4	2	6.34	36	138	23.0	20.3	38.3	2.69	.74	.71	4.7	251	317	11	208	.97	8.87	-.25	.98	2.0	11.3	24	
12684	4	2	6.34	-4	163	38.7	37.0	34.5	1.46	.92	.11	2.8	144	197	27	2.85	.61	7.85	-.57	.0	1.3	34.4	17	
12688	4	2	6.36	72	117	19.4	16.0	38.9	3.14	.70	.93	5.3	210	317	19	16.7	10.02	.25	.75	1.1	10	84.1	1	
12690	4	2	6.39	30	152	29.5	27.5	38.3	2.10	.82	.49	4.9	227	317	17	23.4	.83	8.98	-.44	.7	1.1	12.5	53	
12700	4	2	6.41	26	152	63.5	61.4	4.8	-2.6	1.23	.67	-	245	317	110	202	46	3.42	-.67	.89	0	17.4	13	
12704	4	2	6.41	56	135	13.4	7.8	32.9	1.24	.26	.91	1.6	231	317	6	188	104	6.55	-.67	.86	1.2	14.2	32	
12754	4	2	6.43	-15	129	10.2	9.0	30.3	1.01	.05	.96	1.1	231	317	8	188	104	6.55	-.67	.86	1.2	14.2	32	
12758	4	2	6.44	51	88	15.7	11.6	38.8	3.06	.69	.95	5.2	204	317	8	161	131	5.62	-.22	.95	1.4	56.5	9	
12763	4	2	6.50	34	231	56.5	55.5	43.5	9.62	1.10	.96	1.98	317	96	195	151	124	1.24	1.24	1.1	1.1	108.5		
12765	4	2	6.51	18	129	18.6	15.4	36.3	1.84	.59	.76	2.9	137	0	205	100	111	-.15	.41	1.1	14.2	37		
6393	3	2	7.18	11	127	21.0	17.7	37.7	2.37	.69	.74	4.0	138	4	205	101	3.05	.10	.83	-.3	24	87.6		
6395	3	2	7.21	-15	129	10.2	9.0	30.3	1.01	.05	.96	1.1	138	2	206	91	.26	-.96	.87	.22	56.3	12		
12771	4	2	8.36	8	179	33.5	31.5	27.6	.86	.90	.08	1.6	338	319	18	297	53	6.27	-.22	.91	-.1	14.3	18	
12667	4	2	8.42	60	257	37.3	35.5	43.2	-12.96	1.08	.99	-	181	319	55	140	82	.86	-.60	.3	17.3	34		
13288	4	2	8.52	45	282	32.5	30.3	39.0	3.24	.72	.90	5.6	141	319	48	100	80	1.11	-.15	.41	1.1	86.2		
13293	4	2	9.31	20	143	20.4	17.1	34.9	1.52	.57	.65	2.4	264	321	3	226	91	2.01	-.25	.98	1.6	31.3	32	
13301	4	2	10.40	37	168	16.9	14.8	36.0	1.80	.98	.47	36.3	274	321	38	235	78	11.29	2.15	.99	1.8	39	92.7	
13307	4	2	10.44	18	242	67.0	65.8	46.2	-2.62	1.37	.98	.50	4.4	276	320	2	236	86	1.54	.93	.97	.4	40.3	43
13295	4	2	9.35	0	124	18.2	14.7	36.3	1.85	.57	.80	2.9	62	140	8	202	102	8.46	-.17	.76	1.1	86.3	19	
13317	4	2	11.41	11	163	24.6	22.2	31.3	1.09	.67	.76	1.8	306	322	3	268	72	2.20	-.26	.90	1.9	21.3	40	
13319	4	2	11.41	-10	161	18.7	15.3	27.8	.87	.49	.45	1.3	133	142	11	275	66	9.38	-.60	.74	1.4	24.3	-1	
13324	4	2	11.43	35	108	13.3	25.0	41.8	16.87	.96	.70	33.1	246	321	16	208	98	9.22	1.90	.76	1.4	24.3	15	
13328	4	2	11.46	27	168	39.4	38.0	41.9	20.69	.98	.93	41.1	290	322	33	252	75	9.64	2.41	.91	.8	54.4	21	
13309	4	2	10.45	-18	208	76.1	75.2	47.8	-1.81	1.43	.78	-	50	141	168	191	19	.36	-.62	.75	1.0	46.4	24	
13317	4	2	11.41	11	163	24.6	22.2	31.3	1.09	.67	.76	1.8	306	322	104	153	46	.66	-.91	1.1	21.3	40		
13319	4	2	11.41	-10	161	18.7	15.3	27.8	.87	.49	.45	1.3	133	142	11	275	66	9.38	-.60	.74	1.4	24.3	-1	
13324	4	2	11.43	35	108	13.3	25.0	41.8	16.87	.96	.70	33.1	246	321	16	208	98	9.22	1.90	.76	1.4	24.3	15	
13328	4	2	11.46	27	168	39.4	38.0	41.9	20.69	.98	.93	41.1	290	322	33	252	75	9.64	2.41	.91	.8	54.4	21	
13332	4	2	11.47	5	168	41.8	40.6	38.7	3.01	.97	.09	5.9	327	322	1	289	64	.37	1.28	.75	1.0	46.4	24	
13335	4	2	11.49	28	237	60.4	59.3	44.2	5.62	1.17	.98	-	191	322	104	153	46	.66	-.91	1.1	21.3	40		
6393	3	2	12.26	25	156	24.9	24.4	32.7	1.97	.74	.51	3.4	278	323	12	241	84	7.37	1.9	.76	1.4	24.3	15	
6401	3	2	12.27	3	148	29.0	26.7	38.1	1.80	.82	.47	4.0	99	143	9	242	84	5.22	.41	.64	1.0	34.3	15	
6403	3	2	12.27	36	188	43.9	42.2	41.5	11.65	.96	.45	22.8	276	323	60	239	68	9.87	1.77	.70	1.4	24.3	15	

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	ω	Ω	i	λ	C.W.	K	GZ_R	H_{pg}	H_{∞}	n	H_B	A				
No. 6	1230	-	11184	18.9	15.5	36.0	1.78	.58	.75	2.8	70	143	3	213	99	2.92	-.18	.94	1.0	19-3	12	84-1	1			
6405	3	2	1232	180	25.9	26.2	.73	.16	.43	1.3	1.3	299	52	44	-.22	.74	-.07	1.1-3	14	.86	1	86-2	1			
6408	3	2	1232	224	12.3	4.7	.80	.24	.61	1.0	355	323	5	318	30	.55	-.89	.64	.9	88-3	13	74-4	1			
6410	3	2	1232	224	12.3	4.7	.80	.24	.61	1.0	355	323	22	254	76	11.19	-.02	.98	.1	16-3	17	92-5	1			
6416	3	2	1238	28	168	26.8	35.2	1.60	.74	2.8	291	323	0	255	78	.20	-.47	.82	.8	29-3	17	96-5	1			
6420	3	2	1243	10	157	19.7	16.6	31.3	1.09	.52	1.6	292	323	0	255	78	.20	-.47	.82	.8	29-3	17	96-5	1		
6424	3	2	1244	-16	142	32.5	30.9	6.18	.91	.55	11.8	86	143	29	230	83	11.94	1.12	.39	1.6	41-4	17	91-7			
6426	3	2	1244	45	245	13.6	7.7	27.7	.86	.14	.75	1.0	322	15	322	65	5.26	.36	.01	-.1	18-3	30	92-4			
* 6429	3	2	1247	9	174	35.4	33.8	1.26	.90	.13	2.4	327	323	14	290	62	5.26	.36	.01	-.1	18-3	30	92-4			
* 6430	3	2	1248	51	235	43.6	42.1	42.4	1.00	.95	.03	201	148	29	1.21	15.29	1.00	1.21	.86	-.7	48-4	25	113-2			
* 6433	3	2	1249	9	236	66.0	65.0	41.0	.89	.99	17.5	185	323	131	148	29	.00	1.21	.86	-.7	48-4	25	113-2			
* 6434	3	2	1250	15	268	11.1	59.9	46.6	6	2.37	1.29	.70	11.8	323	103	.82	50	3.74	-.62	.0	18-4	15	117-3			
* 6437	3	2	1251	-31	217	71.0	70.2	42.2	8.03	.99	.93	159.1	14	155	172	17	.27	3.14	.67	-.6	40-4	28	115-6			
6438	3	2	1251	20	220	60.6	59.6	41.3	.95	.92	.76	18.3	239	324	115	203	40	2.64	1.36	.99	1.4	28	115-6			
13339	4	2	1351	8	233	62.0	61.0	36.6	1.95	.51	.96	3.0	206	324	132	170	27	.55	-.22	.90	.6	56-5	7	115-3		
6440	3	2	1402	15	148	25.4	22.7	37.6	2.35	.76	.98	4.1	268	325	2	234	90	1.07	-.23	.98	2.0	73-4	20	95-6		
6443	3	2	1424	13	173	36.7	34.8	35.8	1.73	.90	.18	3.3	317	325	19	282	67	6.56	*50	.68	.7	70-4	22	99-2		
6447	3	2	1427	21	122	17.5	13.6	38.0	2.52	.66	.86	4.2	227	325	0	192	115	1.20	.09	.98	1.4	37-3	23	79-6		
6454	3	2	1431	28	153	14.8	9.0	31.7	1.12	.31	.78	1.5	265	325	5	230	90	5.52	-.67	.99	1.4	26-3	10	88-7		
6458	3	2	1720	12	146	24.6	21.8	38.2	2.68	.77	.63	4.7	81	148	1	229	94	.81	.30	.62	1.2	18-3	28	95-0		
6460	3	2	1721	26	160	28.2	25.7	38.4	2.76	.80	.54	5.0	271	326	14	239	86	8.12	.40	.78	-.4	33-3	22	90-1	2	
6463	3	2	1721	8	151	13.4	7.2	30.7	1.04	.23	.80	1.3	90	148	1	239	88	.81	-.78	.86	1.9	25-3	11	79-7	2	
6465	3	2	1723	22	125	17.9	14.1	27.7	2.72	.68	.86	4.6	227	326	1	195	115	1.08	.08	.98	1.7	63-3	48	90-9		
6467	3	2	1724	30	162	30.0	30.0	27.7	39.5	2.75	.86	4.5	7.0	270	328	19	238	86	9.31	.69	.87	.7	11-3	19	100-1	
6469	3	2	1725	63	205	20.8	17.5	33.9	34.7	1.51	.68	.49	1.9	285	328	17	253	80	10.40	-.11	.85	1.0	19-3	28	88-7	
6471	3	2	1728	37	231	51.0	49.5	41.7	16.57	.95	.90	32.2	215	328	85	183	57	3.08	1.77	.32	1.1	30-4	29	105-9		
6476	3	2	1822	2	146	26.6	24.0	38.8	3.08	.81	.59	5.6	84	149	9	234	91	5.70	.46	.80	-.4	37-3	21	89-6		
6478	3	2	1823	23	130	14.7	9.0	35.0	3.05	.43	.69	2.2	229	329	1	198	112	1.24	-.05	.95	.4	10-2	19	79-4		
6484	3	2	1835	19	155	24.1	21.5	36.6	1.94	.56	.59	3.3	270	329	6	239	89	4.36	.04	.96	1.02	22-3	29	95-0		
6486	3	2	1836	63	205	20.8	17.5	33.9	34.7	1.37	.35	.69	1.9	232	329	28	201	86	11.14	-.54	.82	1.3	19-3	20	87-7	
6488	3	2	1836	-4	176	29.4	27.3	29.2	.95	.80	.19	1.7	145	149	9	295	61	4.48	-.06	.81	1.6	92-4	37	107-0		
* 6491	3	2	1841	49	155	22.6	19.9	38.8	3.06	.81	.53	236	329	19	205	100	12.90	.31	.89	*4	11-2	50	90-3			
6494	3	2	1844	3	181	11.3	2.2	28.8	.92	.11	.62	1.0	320	329	0	290	59	.06	-.95	.94	.4	17-2	24	61-3		
6496	3	2	1846	-7	170	38.2	36.8	38.9	1.16	.94	.19	6.0	312	330	4	282	70	1.52	1.02	.74	2.1	23-4	21	103-9		
6500	3	2	1847	-25	225	71.5	70.6	41.5	13.09	.93	.92	25.3	32	150	166	182	12	.24	1.56	.52	*3	65-5	11	112-2		
6510	3	2	2038	12	113	11.8	5.0	33.4	1.11	.26	.96	1.6	29	151	2	181	128	.78	-.65	.71	2.1	13-2	33	61-0		
6512	3	2	2038	5	160	53.0	51.8	42.2	18.33	1.00	.98	6.8	106	151	1	257	81	1.30	.83	.52	1.4	16-4	22	104-4		
6516	3	2	2039	32	255	53.0	51.8	42.2	18.33	1.00	.98	6.8	169	331	90	140	55	2.54	3.83	.52	1.4	20-3	12	87-1	1	
6518	3	2	2047	13	224	77.8	56.3	-	.64	2.27	.92	.92	222	331	131	193	36	1.39	-.77	.63	1.6	26-5	10	113-0		
6521	3	2	2040	4	237	65.4	64.0	38.7	2.99	.68	.95	5.0	206	331	139	177	24	.55	.20	.59	1.3	31-5	8	104-9		
6523	3	2	2041	3	184	36.0	31.6	31.6	1.11	.92	.09	2.1	334	331	12	305	58	4.17	.41	.87	1.4	29-4	16	97-7		
6525	3	2	2042	47	242	16.2	11.6	27.8	.87	.15	.74	1.0	341	331	22	313	68	3.37	-.93	.84	-.2	13-2	19	92-5		
6527	3	2	2046	73	256	21.6	18.5	36.5	1.92	.49	.99	2.9	189	332	30	161	94	2.71	-.25	.72	1.2	87-1	1	95-9		
6531	3	2	2047	5	157	12.9	7.2	30.2	1.01	.23	.78	1.2	99	152	1	250	84	2.13	-.80	.73	1.8	82-3	13	79-1	4	
6533	3	2	2047	4	181	39.9	38.6	35.7	1.72	.95	.99	3.4	331	332	14	303	61	4.04	.83	.77	-.5	18-3	28	100-6		
6535	3	2	2047	56	312	23.6	20.6	36.7	3.03	.69	.94	5.1	152	332	30	124	98	6.36	.22	.44	1.6	23-3	35	93-3		
6537	3	2	2048	28	189	62.5	41.2	.920	.96	.36	18.0	287	332	53	259	68	10.95	1.66	.93	1.4	16-4	13	98-2			
6539	3	2	2048	4	183	44.6	43.5	38.6	2.91	.98	.05	5.8	336	332	23	308	60	5.40	1.51	.75	1.2	12-1	11	95-9		
* 10149	4	2	2111	77	12	17.0	14.1	38.6	3.21	.69	.99	5.4	179	332	19	151	115	1.62	.25	.77	1.1	93-1	11	63-1	2	
* 6546	3	2	2146	9	255	64.4	63.2	41.4	1.09	.92	.93	21.3	125	333	125	124	33	1.98	1.40	.69	-.6	43-6	25	108-0		
10151	4	2	2213	-2	117	15.0	10.0	36.2	1.03	.69	.93	2.7	36	153	6	189	120	5.36	-.27	.61	.2	88-3	13	80-7	2	

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True red.	V_{∞}	V_0	V_H	α	δ	q	q'	ω	J_0	i	π	λ	$C.M.$	K	GZ_K	N_K	S_K	n	H_B	A		
2982	2	2	24+32	12	153	23.3	20.6	37.5	2.32	.75	.65	4.0	261	335	0	235	94	.33	.16	.88	1.1	31-3	37	91+4		
3050	2	2	24+39	21	153	17.7	16.1	34.5	1.48	.65	.55	2.0	254	335	4	229	96	4.58	-.36	.89	1.8	51-3	21	79+0		
2996	2	2	24+40	28	251	56.0	45.7	43.1	-	17.30	1.14	.99	-	181	335	99	156	50	4.43	-.63	.67	.7	96+5	12	109+3	
10155	4	2	25+25	-11	136	27.7	25.5	43.0	-	13.05	1.06	.74	-	59	156	18	215	102	9.40	-.75	.3	38+3	36	105+0		
10160	4	2	26+26	-7	159	28.1	25.8	39.0	3.29	.84	.53	6.0	91	157	2	248	88	.92	.58	.87	.9	77+4	14	88+6		
10162	4	2	26+26	37	231	12.5	5.3	27.7	.87	.14	.74	1.0	337	9	338	59	236	94	.66	-.94	.52	1.7	30+3	8	82+9	0
10164	4	2	26+29	16	183	21.1	18.3	29.5	.97	.55	.64	1.5	305	337	12	282	71	9.56	-.48	.86	2.1	15+2	32	97+2		
2988	2	2	26+29	19	158	21.5	21.5	29.5	.97	.55	.64	1.5	305	337	5	238	93	3.56	.28	.89	2.7	35+2	12	86+9		
10168	4	2	26+31	4	153	24.4	21.8	38.1	2.62	.76	.63	4.6	81	157	5	215	337	101	192	49	2.25	-.51	.2	14+4	13	100+2
4020	2	2	26+34	27	236	59.0	57.7	44.1	5.58	1.16	.89	-	215	337	101	192	49	2.25	-.51	.2	14+4	13	100+2			
4018	2	2	26+35	3	117	13.7	8.6	32.6	56.0	-.06	.95	2.5	31	157	4	188	126	3.66	-.33	.67	1.1	18+2	40	79+0	-2	
4016	2	2	26+36	2	115	34.0	34.0	32.6	56.0	2.32	.97	-	35	157	12	191	127	3.89	-.3	.88	1.8	33+10	10	93+2	1	
2991	2	2	26+37	6	159	13.6	8.2	30.8	1.05	.26	.78	1.3	92	157	1	249	87	.86	-.75	.90	1.2	17+2	42	77+0		
4012	2	2	26+40	23	191	22.1	23.4	23.9	27.1	.72	.61	2.1	266	337	10	243	90	7.51	-.11	.75	2.1	27+3	20	88+0		
4010	2	2	26+41	33	191	37.6	36.0	40.2	5.19	.91	.50	9.9	273	337	45	250	75	11.70	1.02	.99	-.1	67+4	14	96+6		
4008	2	2	26+42	51	27	14.5	9.5	37.7	2.42	.60	.98	3.9	167	337	9	144	139	3.43	-.02	.21	2.8	13-2	100	86+4	-2	
10178	4	3	1+28	-6	62	13.1	7.7	36.9	2.06	.52	.99	3.1	4	160	6	164	149	.31	-.19	.53	1.1	11-2	14	82+0		
10187	4	3	1+31	-11	181	14.4	9.0	28.8	.92	.29	.65	1.2	301	340	3	281	73	3.38	-.92	.3	90+1	13	78+9			
10189	4	3	1+32	-19	161	29.8	27.8	37.0	2.17	.77	.49	3.8	99	160	25	259	80	11.90	.23	.66	1.2	13+3	31	95+8		
10193	4	3	1+37	24	159	23.1	20.5	38.6	2.95	.76	.70	5.0	251	340	8	231	98	6.78	.34	.93	-.3	11-2	42	95+5		
10196	4	3	1+39	36	184	12.3	5.5	29.9	.99	.14	.86	1.1	277	340	6	257	84	3.50	-.88	.99	3.0	34+3	20	78+1	-5	
10200	4	3	1+41	4	176	34.6	33.0	38.4	2.82	.90	.92	5.4	301	340	3	281	75	1.06	.04	.73	1.1	13-3	26	97+6		
10204	4	3	1+42	12	167	26.4	24.3	37.3	2.22	.77	.52	3.9	275	340	5	256	86	3.04	-.22	.80	1.5	14-3	22	90+1		
6766	3	3	5+15	15	160	19.8	16.1	36.0	1.80	.59	.74	2.9	252	344	3	236	98	2.83	-.16	.70	1.3	24	49	88+3		
6768	3	3	5+20	87	266	25.4	22.9	43.4	-	8.99	1.11	.99	-	185	344	30	169	110	2.01	-.60	-.27	2.4	1	97	99+6	
6770	3	3	5+20	11	131	16.7	12.5	38.3	2.78	.67	.91	4.6	37	164	2	202	123	2.02	.15	.95	1.7	11-3	8	83+5		
10208	4	3	5+21	16	156	21.1	20.4	37.3	2.23	.66	.76	4.7	247	344	3	231	101	2.68	.04	.81	1.8	29+3	33	92+9		
10213	4	3	5+29	-3	176	36.5	34.7	40.0	4.06	.68	.94	2.2	119	164	7	283	76	2.62	1.18	.79	1.9	34+3	15	87+0		
10215	4	3	5+30	13	114	13.0	7.3	25.9	1.77	.65	.97	2.6	21	164	2	186	139	1.11	-.33	.82	1.9	28+2	51	84+0		
10223	4	3	5+35	-7	141	18.7	15.5	37.4	2.27	.64	.83	3.7	55	164	9	219	106	8.89	.01	.66	2.1	23+3	26	90+4		
10225	4	3	5+37	29	251	54.5	51.9	41.7	17.43	.94	.97	33.9	197	344	94	182	51	1.04	1.78	.62	-.3	58+4	24	108+7		
2993	2	3	5+41	-8	217	22.9	61.1	42.1	59.13	1.00	.22	118.0	304	161	289	37	1.56	3.51	.74	3	90+5	11	98+5			
10237	4	3	5+45	40	180	27.8	26.7	40.1	4.85	.85	.71	9.0	247	344	161	266	231	92	12.81	.79	.87	1.5	21+5	22	91+1	
2995	2	3	5+49	-26	224	47.2	46.0	23.4	47.2	.86	.10	1.3	165	147	326	27	320	111	1.11	-.03	.53	1.6	97+8	9	97+8	
6778	3	3	6+44	0	136	27.1	23.3	20.9	1.38	.63	.60	2.2	106	164	5	270	81	4.23	-.21	.47	1.8	13+3	22	91+8		
10266	4	3	6+33	5	155	15.6	11.2	33.7	1.36	.41	.61	1.9	69	165	2	235	99	2.12	-.50	.68	2.3	12+3	10	76.5		
10270	4	3	6+36	17	163	24.3	21.9	39.0	3.31	.80	.67	6.0	255	345	6	240	96	4.53	.47	.92	.8	27+3	26	88+4		
10276	4	3	6+40	17	249	61.8	60.5	42.1	50.19	.98	.95	99.4	205	345	114	191	40	1.04	2.72	.71	.5	15+4	15	104+4		
10243	4	3	6+43	46	208	32.3	30.5	38.8	3.16	.76	.76	5.6	243	345	44	229	80	1.42	.37	.97	.7	55+4	12	90+9		
* 9815	4	3	8+30	17	242	59.7	58.3	40.9	2.74	.74	.71	4.8	230	347	111	217	41	2.31	1.15	.34	-2.3	32+3	24	103+8		
6779	4	3	6+34	2	150	18.4	14.8	36.7	2.04	.60	.61	3.3	60	167	4	227	105	4.41	-.09	.87	-.2	22+2	50	67.0		
10295	4	3	8+32	17	145	17.0	13.2	37.4	2.30	.62	.87	3.7	227	347	1	215	114	1.06	-.01	.91	2.1	11-3	10	84+0		
10297	4	3	8+35	-8	158	25.3	23.0	38.9	3.24	.80	.65	5.8	78	167	11	245	94	8.02	.47	.72	-.3	40+3	20	91+5		
10399	4	3	8+35	19	186	15.6	11.1	30.0	1.00	.33	.68	1.3	287	347	8	274	80	7.91	-.71	.98	0	70+3	10	81+2		
9809	4	3	8+38	-5	214	64.8	63.8	46.8	21.2	1.08	.18	-	306	347	148	293	44	2.31	-.07	.85	-.27	35+3	16	108+1		
16791	4	3	8+38	16	174	24.9	22.4	37.2	2.23	.73	.60	3.9	267	347	10	254	89	7.42	.16	.92	-.2	88+6	18	88+6		

ORBITAL ELEMENTS OF PHOTOGRAPHIC METEORS

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Day	Sh.	True red.	V_{∞}	V_H	V_G	V_{∞}	V_H	V_G	α	δ	ω	Ω	i	λ	$C.H.$	K	$C^2 H$	H_{pg}	H_{∞}	n	H_3	A			
10303	4	3	8.39	24	165	21.1	18.2	37.4	2.29	.68	.74	3.8	248	347	9	235	99	7.78	.07	.88	1.6	85.9	-1			
10285	4	3	8.48	11	255	62.3	39.8	4.45	.78	.98	7.9	192	122	180	34	120	9.9	.56	.87	-.2	.23-4	14	109.1	-1		
10267	4	3	9.25	56	198	14.6	9.4	31.9	1.16	.21	.92	2.5	348	14	223	93	8.10	-.76	.83	0	94-3	11	80.4	1		
10309	4	3	9.38	12	161	15.1	10.4	33.3	1.31	.37	.82	1.8	249	346	1	237	99	1.60	-.55	.96	-.2	11-2	13	95.0	-2	
10313	4	3	9.31	66	134	21.6	18.7	43.2	-10.73	1.09	.97	-	198	348	19	186	124	6.62	-.79	.8	18-3	13	85.9	-1		
10315	4	3	9.33	46	151	14.9	10.1	35.7	1.73	.46	.94	2.5	215	348	9	203	117	7.14	-.33	.94	2.0	70-3	44	80.9		
10317	4	3	9.36	33	183	25.1	21.2	39.0	5.32	.80	.67	6.0	255	348	23	243	90	5.62	-.16	.83	1.5	23-3	17	83.9		
10319	4	3	9.41	16	176	26.6	24.4	37.7	2.46	.91	.20	4.3	271	348	11	259	87	7.18	.29	.86	1.0	24-3	38	101.7		
10321	4	3	9.41	2	189	36.4	34.9	37.3	2.24	.91	.20	4.3	312	348	10	300	70	3.69	.67	.83	2.3	33-4	27	104.2		
* 9804	4	3	9.48	-17	253	72.7	71.8	42.3	-391.46	1.00	.97	-	196	348	169	184	8	.32	-	.61	-3.8	49-3	33	117.5		
6786	3	3	12.20	11	-1	181	29.8	36.2	1.88	.79	.40	3.4	111	171	1	282	79	.28	.20	2.0	79-4	30	99.0			
6788	3	3	12.21	15	173	21.2	17.9	35.6	1.71	.60	.68	2.7	261	351	6	252	93	5.62	-.16	.83	1.5	16-3	20	87.7	1	
6790	3	3	12.21	-9	128	15.3	10.7	36.9	2.10	.55	.99	3.3	311	171	8	203	123	6.17	-.14	.86	1.2	22-3	8	83.6	1	
* 6795	3	3	12.22	83	102	17.3	13.4	38.3	2.79	.65	.99	4.6	183	175	18	175	2.80	1.19	2.80	-.1	.85	1.7	85.7			
* 6798	3	3	12.25	11	4	184	32.7	30.6	38.1	2.69	.87	.35	5.0	293	351	6	285	78	.59	.75	-.2	12-3	15	90.1	2	
* 6801	3	3	12.28	19	236	55.6	54.8	56.4	40.9	8.19	.92	.65	15.7	254	351	100	245	48	4.37	1.30	.42	.9	20-4	22	110.4	
* 6802	3	3	12.28	23	236	41.7	39.4	41.7	20.78	.97	.69	40.9	247	351	95	239	51	4.54	2.09	.45	.9	25-4	24	109.0		
* 6805	3	3	12.29	23	137	17.2	13.4	39.6	4.11	.78	.92	7.3	213	351	2	205	128	2.15	.51	.92	1.0	16-2	74	93.4		
* 6807	3	3	12.30	11	-23	217	28.1	25.8	37.5	.80	.98	.42	280	351	0	271	84	.18	.32	.87	1.9	90.4				
* 6811	3	3	12.31	-23	217	61.2	60.0	41.2	10.67	.98	.18	21.2	131	171	156	303	39	2.18	2.11	.37	.9	18-4	23	100.4		
10330	4	3	12.43	25	155	11.4	3.8	31.6	1.13	.15	.96	1.3	224	351	2	215	112	.64	-.82	.82	1.4	85-3	13	77.6		
6814	3	3	13.21	16	151	32.6	30.7	50.7	-1.13	1.67	.76	1.7	232	352	3	224	114	1.22	-.21	.94	1.5	98-4	19	90.1		
6816	3	3	13.22	11	0	182	27.9	24.4	35.5	1.68	.75	.54	3.0	291	352	1	283	79	.60	.69	1.7	16-3	39	92.9		
6822	3	3	13.28	11	0	173	26.8	24.3	37.8	2.02	.79	.54	4.5	92	172	2	265	88	1.43	.32	.84		103.3			
6824	3	3	13.30	48	131	15.4	11.0	36.3	2.83	.66	.97	4.7	200	352	8	193	134	4.82	1.14	.88	.2	80-3	13	85.0	4	
6826	3	3	13.30	-5	137	15.2	10.8	36.4	1.92	.52	.92	2.9	39	172	6	211	119	5.74	-.21	.76	1.4	20-3	8	85.3	1	
6828	3	3	13.31	37	217	33.4	31.3	36.4	1.93	.66	.66	3.2	262	352	48	254	73	1.16	-.03	.84	1.1	87-4	13	94.0		
6830	3	3	13.33	25	182	31.1	29.1	41.8	2.08	.98	.90	4.76	259	352	21	251	90	9.64	2.28	.92	1.2	80-4	23	102.1		
6832	3	3	13.34	10	191	40.0	38.5	42.6	-27.73	1.01	.29	.97	294	352	23	286	76	7.05	-.2	.92	.2	91-4	25	104.1		
6834	3	3	13.34	22	132	13.3	7.8	35.7	1.75	.45	.96	2.5	207	352	1	199	133	.60	-.33	.80	2.1	36-3	16	80.3		
* 6842	3	3	13.38	-25	219	57.9	56.7	58.1	2.67	.94	.16	5.2	137	173	147	310	38	3.14	.94	.51	.5	32-4	26	109.6		
6843	3	3	13.39	24	218	41.2	39.7	42.4	2.02	.80	.44	4.0	285	353	63	278	63	10.66	.31	.93	1.1	18-4	12	95.1	-1	
6847	3	3	13.39	3	169	30.3	28.5	42.4	-7.04	8.01	.01	-.56	82	173	2	255	93	.86	-.74	1.8	63-4	24	102.4			
6849	3	3	13.39	4	187	20.5	17.4	31.0	1.08	.53	.50	1.7	295	353	4	287	77	4.17	-.45	.87	1.8	13-3	17	96.8	1	
6855	3	3	13.40	-4	197	13.9	8.6	27.4	1.86	.31	.59	1.1	316	353	1	308	64	.79	-.86	.82	1.4-2	18	79.0			
6857	3	3	13.41	-37	198	13.8	8.6	30.3	1.02	.82	.12	273	353	11	266	84	8.54	-.81	.51	.5	34-3	16	82.6	2		
6857	3	3	13.41	4	238	62.8	61.0	65.5	.93	.59	16.5	261	353	129	253	35	266	1.38	.78	.8	76-5	13	103.8	-2		
6859	3	3	13.41	42	191	14.2	9.1	31.5	1.12	.23	.87	1.4	252	353	11	245	91	.26	-.75	.96	.5	60-3	10	82.5	-2	
6861	3	3	13.42	36	194	26.8	24.5	37.7	2.47	.72	.70	4.2	254	353	28	246	87	13.80	.18	.96	1.0	84-4	14	89.8		
6863	3	3	13.45	48	232	14.7	9.6	29.1	.95	.12	.83	1.1	300	353	17	293	76	6.71	-.92	.97	.9	52-3	13	79.2	1	
6869	3	3	14.22	6	176	28.3	25.8	39.1	3.48	.85	.54	6.4	270	353	4	264	89	2.21	.62	.78	1.0	17-3	30	94.3		
6875	3	3	14.25	28	150	17.9	14.2	38.9	3.30	.73	.90	5.7	220	353	5	214	119	4.87	.32	.99	2.0	21-3	19	107.7		
6881	3	3	14.30	64	122	13.5	8.0	35.7	1.76	.44	.99	2.5	191	353	9	184	131	2.53	-.35	.82	2.1	19-2	66	78.3		
* 6882	3	3	14.40	65	113	12.7	6.4	34.7	1.53	.35	.99	2.4	187	353	7	180	134	1.25	-.50	.82	2.2	16-2	68	78.3		
6887	3	3	14.35	-6	192	30.2	26.2	32.9	1.26	.80	.25	2.3	133	353	1	306	69	.36	.05	.80	2.2	53-4	33	101.1		
6889	3	3	14.35	-9	184	23.3	20.6	31.7	1.14	.62	.63	1.9	118	173	5	292	75	3.97	-.31	.78	1.9	11-3	24	75.3		
6895	3	3	14.41	-9	265	71.6	70.4	42.0	60.59	.98	.99	120.2	175	354	156	168	14	.24	2.87	.41	.9	78-5	17	101.0		
6899	3	3	14.43	20	174	20.7	17.8	36.3	1.90	.62	.78	1.1	254	354	9	248	95	1.06	-.09	.78	1.0	37-4	25	87.6	8	
6901	3	3	14.44	31	271	48.3	46.8	38.5	2.06	.97	.98	4.9	163	354	86	157	100	1.21	.17	.78	1.1	107.0	17	107.7		
6907	3	3	14.44	15	204	12.1	5.1	28.4	.91	.16	.76	1.1	312	354	4	306	68	2.17	-.90	.96	1.8	65-3	19	77.7	2	

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True red.	V_{∞}	V_0	V_R	α	δ	q	q'	α	δ	i	ϵ	ℓ_0	i	λ	α	δ	C_N	K	C_N	K	C_N	K	R_B	A
No.	6	14.45	-1	235	59.6	58.5	39.6	4.42	.91	.39	8.4	7.4	354	129	.67	39	3.62	.98	.30	.6	338	.34	34	110.3	110.3	10		
* 6905	3	14.45	-10	235	63.6	62.8	39.4	3.86	.89	.43	7.3	283	355	156	276	29	1.47	.82	.74	-.1	10.5	10	10	111.1	111.1	10		
* 6915	3	18.22	31	172	20.3	18.9	29.3	3.78	.79	.81	6.8	235	357	13	232	105	12.94	.95	.2	2.2	2.3	2.3	2.3	91.8	91.8	13		
* 6918	3	18.24	6	164	21.6	18.6	30.6	3.05	.75	.81	5.3	64	177	0	242	103	.35	.34	.89	.4	2.2	2.2	2.2	13	97.3	97.3	10	
6921	3	18.26	41	205	15.7	11.0	31.0	1.09	.24	.83	5.3	264	357	15	261	86	11.21	-.75	.86	.5	4.3	4.3	4.3	10	84.4	84.4	1	
6927	3	18.34	25	173	17.1	13.2	35.1	1.62	.49	.82	2.4	241	357	8	239	102	8.14	-.32	.97	.9	47.3	20	89.9	89.9	1			
* 6929	3	18.34	-8	188	17.5	13.7	29.6	2.02	.55	.82	.96	1.4	117	2.2	295	76	2.50	-.61	.64	.31	3.9	3.9	3.9	3.9	79.8	79.8	1	
* 6932	3	18.35	59	241	18.1	13.7	29.6	40.2	5.05	.82	.96	9.7	202	357	11	229	99	4.90	-.73	.77	.3	26.3	3	26.3	3	100.5	100.5	1
6933	3	18.37	49	190	13.8	8.3	32.3	1.20	.23	.93	1.5	232	357	11	229	99	7.32	-.72	.97	.7	17.3	6	17.3	6	80.5	80.5	1	
6936	3	18.37	18	24.4	21.8	1.2	33.0	1.28	.60	.51	2.1	288	357	19	285	78	12.76	-.28	.97	.5	15.3	13	15.3	13	89.7	89.7	2	
6938	3	18.38	1	202	18.7	15.2	27.6	.87	.50	.44	1.3	313	357	6	311	67	5.89	-.59	.68	.67	11.3	11	11.3	11	85.1	85.1	2	
6940	3	18.38	11	169	21.2	18.4	31.9	2.60	.72	.74	4.5	247	357	3	245	101	2.97	.19	.80	.0	8.2	3	8.2	3	60	97.3	6	
6944	3	18.41	15	184	26.3	26.3	39.4	3.85	.85	.56	7.1	267	358	13	265	89	7.62	.69	.84	.3	84.4	21	94.6	21	94.6	5		
* 6946	3	18.41	21	214	21.1	18.1	20.5	.91	.47	.48	1.3	307	358	23	305	68	15.56	-.60	.71	.14	14.5	15	14.5	15	95.9	95.9	1	
* 6949	3	18.43	5	183	27.0	25.0	31.7	2.46	.79	.52	4.4	275	358	5	273	86	3.61	.32	.71	-.5	17.2	79	17.2	79	101.4	101.4	1	
6950	3	18.44	37	209	16.9	13.0	30.7	1.05	.28	.76	1.3	275	358	18	273	81	14.01	-.73	.97	.7	61.3	22	83.9	22	83.9	94.0		
6952	3	18.45	3	281	65.5	64.3	41.1	9.31	.91	.86	17.8	136	358	133	133	30	1.28	1.28	.56	.9	52.5	10	108.0	108.0	11			
6954	3	18.45	5	221	15.4	10.8	28.6	2.08	.76	.42	.44	1.1	332	358	9	330	52	1.21	-.73	.91	.2	83.5	22	83.5	22	83.5	11	
* 6959	3	18.46	23	308	46.7	47.1	42.3	-156.2	1.00	.56	-.97	358	77	94	62	7.05	-.7	.52	-.5	19.3	44	19.3	44	109.4	109.4	1		
* 6961	3	19.22	-53	117	20.1	16.9	36.8	2.09	.53	.98	3.2	20	178	26	198	100	6.52	-.17	.16	-.8	34.2	115	94.0	115	94.0	1		
6964	3	19.29	37	238	43.7	42.1	40.5	6.27	.87	.81	11.7	233	358	69	232	66	6.11	.96	.61	1.8	23.4	26	95.4	26	95.4	101.7		
6966	3	19.29	-8	178	21.8	18.4	34.2	1.45	.59	.59	2.3	95	178	5	273	86	4.55	-.25	.79	.6	25.3	42	88.7	42	88.7	2		
* 6971	3	19.32	27	175	21.6	18.6	38.4	2.91	.73	.78	5.0	240	358	12	239	102	9.28	.27	.79	.9	17.3	24	86.6	24	86.6	1		
6972	3	19.32	4	126	13.5	8.2	36.4	1.95	.50	.97	2.9	222	178	3	200	138	2.23	-.23	.67	2.0	23.3	10	84.4	10	84.4	1		
6975	3	19.34	13	218	28.1	25.7	28.1	.90	.67	.29	1.5	319	358	33	317	60	14.28	-.34	.87	1.3	70.4	17	93.1	17	93.1	2		
6977	3	19.35	22	126	35.8	34.4	61.2	-.45	.07	.93	-.7	204	358	1	203	144	3.30	-.14	.87	1.4	40.4	21	99.7	21	99.7	1		
6979	3	19.36	12	186	23.3	23.3	36.9	2.11	.74	.56	3.7	272	358	11	270	87	7.32	-.14	.83	1.0	27.3	42	101.7	42	101.7	1		
6981	3	19.36	21	174	17.9	14.3	31.6	1.64	.54	.81	2.7	243	358	7	242	102	7.60	-.24	.92	3.0	23.3	32	93.0	32	93.0	1		
6983	3	19.37	11	262	72.8	71.7	50.0	-	1.23	1.80	.98	193	358	126	192	35	5.51	-.46	.93	1.8	11.9	13	11.9	13	83.7	83.7	2	
6985	3	19.37	51	188	16.4	12.3	34.5	1.51	.39	.91	2.1	251	358	16	223	102	11.34	-.46	.95	2.5	11.3	13	11.3	13	83.7	83.7	2	
6987	3	19.38	13	180	18.7	15.4	34.6	1.47	.51	.71	2.0	260	358	6	259	93	6.39	-.63	.89	1.0	51.3	17	87.1	17	87.1	8		
6989	3	19.39	26	191	16.1	11.8	31.8	1.16	.34	.76	1.6	266	358	11	264	88	10.78	-.63	.82	1.0	51.3	12	83.0	12	83.0	2		
* 6992	3	19.40	21	172	24.6	22.3	40.9	8.49	.91	.74	16.3	243	358	10	242	102	6.84	1.27	.82	2.1	18.3	53	99.8	53	99.8	2		
6993	3	19.41	4	207	29.5	27.5	30.9	0.07	.77	.77	1.9	317	359	20	315	65	9.68	-.09	.53	1.8	32.4	24	107.2	24	107.2	1		
6995	3	19.43	5	170	22.3	19.8	36.3	2.84	.75	.71	5.0	251	359	2	267	90	1.24	-.09	.50	1.9	14.3	23	86.3	23	86.3	2		
* 6998	3	19.43	-9	174	30.2	28.5	41.2	10.28	.95	.54	20.0	87	179	9	266	90	4.95	1.58	.49	1.3	23.3	59	104.3	59	104.3	1		
* 6999	3	19.44	-70	314	22.0	18.9	31.8	2.31	.61	.97	4.0	160	359	29	159	99	6.47	-.02	.59	1.8	19.3	27	91.8	27	91.8	1		
* 7002	3	19.45	-13	210	31.4	29.5	27.0	2.15	.64	.86	10.6	156	359	33	155	93	13.64	-.24	.13	1.0	43.3	30	82.8	30	82.8	1		
3058	2	20.29	-5	199	39.8	38.1	39.1	3.48	.95	.84	9.4	316	360	23	242	93	13.64	-.02	.87	1.0	27.3	45	100.8	45	100.8	1		
3060	2	20.29	0	171	18.7	15.1	35.0	1.60	.54	.74	2.5	264	359	15	254	97	1.74	-.28	.87	1.5	19.3	16	87.3	16	87.3	2		
* 7019	3	20.35	-21	114	16.1	11.8	38.4	2.91	.66	.98	4.8	15	180	12	194	129	4.97	-.16	.67	-.5	10.1	122	94.5	122	94.5	1		
* 7022	3	20.36	67	25	128	13.8	36.9	2.11	.54	.98	3.2	199	360	1	198	144	1.72	-.15	.99	2.5	43.3	30	82.8	30	82.8	1		
* 7026	3	20.38	37	194	20.2	17.7	35.9	1.75	.64	.79	3.5	243	360	23	242	93	13.64	-.02	.87	1.0	27.3	45	100.8	45	100.8	1		
* 5668	3	20.39	-7	48	291	37.7	35.9	4.03	.75	.84	1.6	316	360	6	315	69	1.84	1.16	.72	-.2	77.4	16	95.2	16	95.2	1		
7005	3	20.42	-4	167	23.6	21.5	36.8	2.07	.71	.59	3.5	268	359	2	267	90	1.24	-.09	.48	1.0	29.3	37	92.5	37	92.5	1		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True red.	V_{∞}	V_Q	V_H	α	δ	q	q'	ω	Ω	i	λ	$G.W.$	K	GZ_R	M_{PG}	M_{∞}	n	H_B	A	
7035	3	20+45	49	292	17.0	12.7	29.4	-0.97	0.13	.84	1.01	.69	360	24	.69	75	7.48	-.90	.75	-1.1	33-2	25	81.5	
* 7040	3	20+46	37	186	22.1	19.4	27.8	.69	.80	.43	.288	.360	19	238	98	.64	1.14	.81	.6	.66	33	33	89.1	
7041	3	20+46	73	297	15.6	10.9	33.2	1.31	.25	.99	1.06	.63	360	19	.62	98	3.64	-.66	.73	.07	12-2	22	83.8	
* 7044	3	20+47	31	228	44.9	43.6	41.9	39.55	.98	.65	78.5	253	360	68	252	67	8.39	2.68	.98	-.9	12-3	22	108.1	
* 7046	3	21+35	-3	154	18.7	15.4	38.3	2.85	.70	.85	4.8	.50	180	6	230	112	5.59	.21	.66	1.01	88-3	57	95.2	
3067	2	3 21+36	57	207	24.0	21.3	38.4	2.93	.69	.92	4.9	217	1	30	218	96	10.47	.20	.97	-.9	15-3	15	89.7	
3069	2	3 21+36	63	201	21.4	21.9	40.4	6.17	.85	.94	11.4	208	1	29	208	102	8.95	.87	.87	-.87	50-3	17	89.7	
7047	3	21+38	3	209	44.8	43.4	40.8	7.49	.98	.14	14.8	317	0	42	318	64	9.05	1.90	.88	1.03	25-4	24	91.5	
* 7049	3	21+38	29	239	43.7	42.2	37.7	2.49	.72	4.3	254	0	74	254	60	6.99	1.18	.90	1.4	22-4	20	104.9		
* 7052	3	21+39	25	252	54.4	53.0	42.0	53.05	.98	.88	105.2	220	0	94	221	52	2.60	2.80	.81	-.3	31-4	18	110.9	
* 3072	2	3 21+40	-7	210	38.9	37.3	34+2	1.46	.94	.09	2.8	332	1	16	333	60	4.70	.68	.76	-.6	19-3	28	97.9	
* 7054	3	21+40	13	184	26.8	24.7	39.1	3.55	.83	.60	6.5	263	0	11	264	91	6.87	.59	.84	1.3	15-3	31	95.3	
* 3074	2	3 21+41	-31	213	55.3	54.3	42.0	6.40	1.00	.16	122.6	133	181	105	314	50	7.14	3.68	.64	-.8	13-3	33	100.5	
* 7058	3	21+41	-1	183	18.4	15.0	32.6	1.24	.48	.65	1.8	275	0	275	87	4.35	-.45	.68	-.4	10-2	30	87.1		
7060	3	21+43	-42	202	13.6	8.1	26.5	.83	.28	.59	1.1	148	181	9	328	58	6.36	-.83	.62	1.6	13-2	36	85.5	
* 3076	2	3 22+38	41	271	18.0	14.0	27.1	.85	.18	.70	1.0	6	2	28	7	65	1.31	-.92	.72	31-3	12	86.1		
* 3077	2	3 22+41	31	159	16.8	13.0	38.0	2.64	.65	.91	4.4	218	2	7	220	119	6.50	.10	.71	.9	30-2	81	92.0	
* 10342	4	3 26+28	73	129	13.1	7.2	34+7	1.54	.35	1.00	2.1	183	5	9	188	127	4.33	-.43	.63	-.10	46-4	25	118.9	
10346	4	3 26+30	26	188	33.8	31.9	46.3	-	2.41	1.28	.66	-	245	5	23	250	97	8.47	-.35	.77	1.0	28-3	31	97.7
10550	4	3 27+27	22	161	16.8	12.7	37.8	2.55	.64	.91	4.2	220	6	22	226	120	4.37	.37	.07	.98	46-3	17	83.3	
10553	4	3 27+33	-3	190	28.2	26.1	37.7	2.52	.81	.48	4.6	279	6	1	285	85	4.30	.38	.86	.9	13-3	19	90.0	
3079	2	3 28+23	71	281	25.7	23.2	39.0	3.49	.72	1.00	6.0	172	8	36	180	94	1.95	.32	.42	2.0	93-4	24	87.6	
4002	2	3 28+30	-41	121	31.0	29.3	49.0	-	1.41	1.69	.97	-	18	188	32	205	112	5.33	-.33	.62	1.3	27-2	60	78.5
3085	2	3 28+33	46	151	13.2	7.5	49.0	1.66	.41	.98	2.3	199	8	6	207	132	3.10	-.41	.60	1.1	60-3	13	106.2	
* 3088	2	3 28+34	69	288	25.9	23.3	38.4	2.94	.66	.99	4.9	168	8	37	175	92	3.18	.16	.56	1.2	49-3	62	99.8	
* 3046	2	3 28+36	33	210	20.3	17.0	33.0	1.29	.42	.74	1.8	262	8	22	270	85	15.07	-.50	.99	.3	21-3	9	85.7	
3042	2	3 28+43	46	214	19.7	16.4	33.9	1.42	.39	.87	2.0	238	8	24	246	90	13.41	-.49	.95	.5	65-3	30	83.4	
3038	2	3 28+45	22	275	54.1	52.9	38.5	3.01	.67	1.00	5.0	182	8	101	190	46	1.12	5.33	-.00	.4	90-4	14	98.0	
3040	2	3 28+45	40	214	29.1	31.0	39.1	3.58	.78	.64	2.0	247	8	36	247	87	12.56	4.47	.93	-.7	61-4	20	109.8	
3890	2	3 28+48	9	304	57.1	55.8	38.8	3.29	.85	.50	6.1	85	8	116	93	4.1	4.14	.60	-.07	4.4-2	22	88.7		
3892	2	3 28+48	4	298	66.7	65.6	44.1	-	5.24	1.14	.71	-	117	8	133	125	34	2.00	.64	.3	11-4	15	109.8	
3894	2	3 30+28	10	223	44.8	43.2	40.3	-	5.78	.95	.27	11.3	300	10	58	310	64	10.39	1.39	.71	1.2	17-4	16	106.2
* 3037	2	3 30+40	-46	235	59.9	58.8	42+1	21.01	1.00	.44	4.37	93	190	117	283	43	4.32	4.31	.02	.98	4	59	116.3	
* 3032	2	3 30+43	33	268	54.1	52.8	44+5	4.31	1.23	.98	-	195	10	88	204	57	1.22	-.90	.70	-.1	68-4	16	110.7	
3034	2	3 30+43	47	226	15.5	11.0	30.8	1.07	.18	.89	1.3	256	10	18	266	85	9.94	-.81	.87	-.7	26-2	21	80.2	
3028	2	3 30+46	26	239	30.2	28.2	30.2	1.03	.50	.52	1.5	297	10	49	307	63	12.06	-.51	.91	3.2	4	109.9		
10359	4	4 1+32	33	225	16.5	12.1	32.1	1.00	.99	.25	1.2	286	11	18	297	78	12.49	-.79	.93	.5	76-3	17	83.5	
* 3024	2	4 1+33	-7	273	68.8	67.6	40+4	6.36	.85	.95	11.8	208	12	150	220	18	1.44	.90	.22	.4	29-4	43	112.6	
3025	2	4 1+33	23	222	39.6	38.0	41.1	11.07	.95	.52	21.6	269	12	49	280	74	11.08	1.66	.93	1.0	22-4	12	97.3	
10361	4	4 1+34	8	232	25.6	20.8	37.2	2.26	.79	.38	1.01	328	11	13	339	57	8.50	-.75	.67	1.7	25-3	14	84.7	
3021	2	4 1+37	-2	207	29.1	27.0	34.6	1.53	.77	.35	2.7	300	12	10	311	75	5.31	-.82	.66	1.6	95-4	30	98.4	
10366	4	4 1+37	20	232	43.5	42.0	39.4	4.07	.88	.47	7.7	277	11	65	288	64	9.85	.82	.68	.68	29	107.9		
3048	2	4 1+38	26	190	19.3	16.1	36.4	1.98	.59	.81	3.1	240	12	13	252	101	11.40	-.12	.92	-.3	52-3	12	84.9	
3019	2	4 1+39	43	249	40.1	38.5	41.0	9.23	.90	.91	17.5	217	12	62	228	72	5.43	1.25	.93	.8	51-4	22	102.0	
3015	2	4 1+42	-10	184	23.2	20.8	37.2	2.26	.79	.38	1.01	3.9	82	192	5	273	93	4.06	1.13	1.4	11-3	14	84.8	
10370	4	4 1+44	15	215	32.9	31.1	37.3	2.31	.81	.44	4.2	285	11	32	296	75	12.60	-.35	.93	.8	70-4	17	106.7	
3013	2	4 1+46	52	14	14.8	9.6	34.2	1.47	.37	.92	2.0	135	12	11	147	109	8.96	-.49	.88	.8	16-2	35	84.9	

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	a	e	q	q'	ω	Ω	i	α	δ	ρ	λ	GM	K	GZ	K_p	μ_p	R_p	R_b	A			
10373	4	1.48	-35	6	276	39.9	38.2	11.1	.54	.87	.07	177	191	9	12	1.21	-.10	.37	.6	40.5	.37	.34	.13	105.6	2				
10377	4	2.33	-24	160	21.4	18.7	19.4	.60	.79	.08	7.2	150	192	15	242	107	11.18	.54	.62	.6	34.5	.6	34.5	.18	88.6	2			
*10380	4	2.34	-21	210	45.9	44.5	42.3	.60	.68	.04	.40	142	192	25	334	66	6.18	.62	.62	.6	89.4	.21	94.6	.18	94.6	2			
10381	4	2.36	13	216	16.1	11.7	28.9	.94	.34	.63	1.3	299	12	11	311	74	10.31	-.72	.96	-.6	15.2	.12	82.1	.12	82.1	2			
10383	4	2.37	-11	200	34.3	32.6	39.3	.93	.92	.33	7.5	114	192	4	306	78	1.57	.96	.69	-.3	41.3	.74	99.0	.74	99.0	2			
3009	2	4	2.38	-16	282	70.8	69.9	50.5	-.1	1.24	1.26	.30	-.9	285	13	165	298	39	1.08	-.93	.5	6.6	.13	97.7	.13	97.7	2		
3011	2	4	2.38	27	18	232	45.8	44.4	41.1	1.020	.96	.44	19.9	276	12	68	288	84	1.74	-.03	.79	.07	27.4	.13	103.4	.13	103.4	2	
10389	4	2.38	27	23	209	36.1	34.6	63.5	-.5	2.43	.59	1.00	3.9	259	12	34	271	85	10.95	-.52	1.03	.66	.5	68.4	.24	99.7	.24	99.7	2
3007	2	4	2.42	-15	219	41.3	39.9	35.9	.883	.97	.06	3.6	395	13	2	348	60	.52	1.03	.66	.5	68.4	.24	99.7	.24	99.7	2		
10395	4	4	2.44	7	284	62.9	61.7	38.7	.320	.69	.99	5.4	165	12	128	177	30	.44	.24	.69	.7	81.5	.22	101.4	.22	101.4	0		
3005	2	4	2.45	34	182	50.2	49.3	66.1	-.3	.34	3.29	.76	-.7	225	13	28	237	111	4.59	-.11	.64	-.1	51.5	.22	101.4	.22	101.4	0	
10400	4	4	2.46	46	205	22.2	19.5	37.9	.661	.66	.68	4.3	225	12	25	237	98	12.88	.11	.63	.1	49.3	.40	98.2	.40	98.2	2		
10102	4	4	2.47	9	269	64.6	63.6	43.6	-.7	.677	1.14	.93	210	12	124	222	35	1.12	.42	-.28	.66	.5	41.4	.19	105.1	.19	105.1	2	
10404	4	4	2.47	-14	271	64.6	63.6	35.5	1.70	.51	.84	2.6	239	12	163	252	14	.42	-.28	.66	.5	41.4	.19	105.1	.19	105.1	2		
10406	4	4	2.48	-6	189	19.5	16.5	34.2	.648	.55	.67	2.43	.86	192	1	278	91	.96	-.30	.45	.1.7	27.3	.25	70.0	.25	70.0	2		
*3001	2	4	2.49	31	213	33.1	31.0	61.8	30.49	.98	.69	64.3	249	13	36	261	86	12.20	2.48	.78	.7	11.3	.24	104.4	.24	104.4	2		
*7067	3	4	3.14	29	176	18.5	14.6	38.2	.286	.69	.69	4.8	222	13	10	236	115	7.79	.19	.83	.5	79.3	.40	86.5	.40	86.5	2		
*7069	3	4	3.19	69	222	27.6	25.1	39.0	3.47	.74	.61	222	13	36	235	90	10.22	.37	.66	.7	46.3	.43	90.3	.43	90.3	2			
*3000	2	4	3.46	37	288	49.5	48.2	42.1	-.1	1.00	.97	1.61	14	82	174	60	11.25	-.05	-.9	14.3	26	109.6	.26	109.6	2				
7070	3	4	4.15	81	199	20.7	17.5	39.7	4.53	.78	1.00	8.1	182	14	24	196	112	.00	.56	.66	.2.6	17.3	.41	89.5	.41	89.5	2		
*7073	3	4	4.17	-9	207	34.1	31.9	37.6	2.47	.68	.29	4.7	301	14	2	315	.75	.72	.60	.37	.1.7	93.4	.44	96.0	.44	96.0	2		
*7075	3	4	4.17	57	176	18.0	14.1	38.6	3.14	.69	.98	5.3	300	14	16	214	119	7.05	.23	.68	.1.6	41.3	.38	86.4	.38	86.4	2		
7076	3	4	4.21	36	109	13.0	8.8	38.4	2.97	.66	1.00	4.9	179	14	3	193	166	.23	.17	.83	.4	11.2	.25	81.0	.25	81.0	2		
10411	4	4	5.18	16	168	15.1	10.2	36.0	1.87	.51	.93	2.8	219	15	3	234	121	2.55	-.25	.95	.1	17.2	.25	80.5	.11	80.5	11		
*10414	4	4	5.20	-27	140	17.0	13.0	37.9	2.62	.64	.96	4.3	28	195	13	222	119	8.34	-.07	.58	-.9	32.1	.131	95.2	.131	95.2	2		
10417	4	4	5.21	-27	158	17.1	12.7	36.2	1.91	.53	.90	2.9	46	195	12	240	109	10.30	-.20	.67	.5	11.2	.25	86.7	.25	86.7	2		
10420	4	4	5.26	46	243	17.0	12.7	30.0	1.02	.14	.87	1.2	271	15	23	286	79	8.31	-.87	.73	.9	42.3	.15	87.2	.15	87.2	1		
10424	4	4	5.27	34	188	15.8	11.3	35.0	1.62	.44	.91	2.3	226	15	11	241	108	9.26	-.38	.99	.1.5	23.3	.12	82.6	.12	82.6	1		
10426	4	4	5.28	33	169	17.2	13.3	38.8	3.34	.72	.94	5.7	212	15	9	226	124	6.97	.31	.97	.1.1	16.2	.67	89.7	.67	89.7	2		
10430	4	4	5.30	-1	199	29.3	27.2	39.0	3.59	.86	.50	6.7	275	15	7	290	87	3.70	.68	.85	.1.9	93.4	.35	93.2	.35	93.2	2		
10436	4	4	5.37	60	196	19.4	16.1	38.2	2.82	.66	.97	5.0	203	15	21	218	109	8.33	.13	.67	.6	39.3	.20	82.3	.20	82.3	-2		
*10439	4	4	5.39	-15	207	34.7	33.0	37.8	2.58	.97	.49	4.9	123	195	6	318	74	2.50	.67	.65	-.5	70.3	.63	104.9	.63	104.9	2		
10441	4	4	5.39	8	182	19.3	16.2	37.4	2.37	.66	.80	3.9	240	15	4	255	105	4.17	.07	.73	.2.1	39.3	.43	94.6	.43	94.6	2		
*10447	4	4	5.61	-21	201	33.8	32.2	38.7	2.25	.89	.34	6.2	113	195	15	308	77	6.60	-.77	.49	-.6	55.3	.57	100.9	.57	100.9	2		
10108	4	4	5.62	-6	255	66.1	65.1	43.5	7.27	1.07	.50	2.4	268	15	143	283	34	2.17	-.75	.1	19.4	.18	112.2	.18	112.2	2			
10454	4	4	5.67	73	233	20.9	17.9	37.8	2.56	.61	1.00	4.1	187	15	27	202	102	2.38	-.02	.77	0.0	11.2	.70	89.9	.70	89.9	2		
10456	4	4	5.67	-31	253	67.6	66.7	43.6	6.68	1.07	.47	-.4	92	195	159	159	287	30	1.62	-.45	.4	20.4	.26	115.1	.26	115.1	2		
10458	4	4	5.68	5	267	69.5	68.6	46.5	2.24	.24	.86	-.2	221	15	130	236	33	1.43	-.68	.68	-.6	21.4	.13	110.5	.13	110.5	2		
7078	3	4	6.18	-38	119	13.7	8.4	34.5	1.52	.35	1.00	2.0	11	196	12	207	118	.37	-.50	.6	12.2	.18	84.9	.18	84.9	1			
10462	4	4	6.22	22	246	46.5	44.8	39.1	1.69	.42	.97	2.4	25	196	2	221	135	1.04	-.38	.92	.6	93.3	.13	80.3	.13	80.3	1		
10464	4	4	6.22	-10	214	45.2	43.7	43.6	6.81	1.02	.14	315	16	6	261	102	4.97	.30	.87	-.3	28.3	.10	84.8	.10	84.8	1			
*10468	4	4	6.26	-27	176	23.7	21.0	38.1	2.80	.68	.74	4.9	68	196	17	264	96	1.65	-.54	.54	1.6	31.3	.28	104.6	.28	104.6	2		
*10480	4	4	6.29	-43	161	22.7	20.0	37.8	2.24	.59	.67	4.3	51	196	24	247	97	1.35	-.12	.55	1.9	97.9	.12	97.9	.12	97.9	1		
10484	4	4	6.36	34	34	13.2	7.3	33.6	1.38	.34	.92	1.8	133	16	4	149	116	.56	.09	.76	.1.2	71.5	.15	84.6	.15	84.6	1		
10117	4	4	6.24	22	246	46.5	44.8	39.1	3.64	.84	.60	6.7	263	16	77	279	59	7.37	.61	.47	.8	49.4	.29	103.9	.29	103.9	2		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail Tr. No.	No.	Day	Sh.	True dist.	V_{∞}	V_H	α	δ	q'	ω	Ω	i	λ	C/N	K	CZ_R	N_{pg}	n_{lo}	H_B	A			
10488	4	6.39		59	15.5	11.0	34.2	1.48	.34	.97	2.0	207	16	17	223	105	7.22	.52	.90	1.5	63-3		
10490	4	6.42	19	226	13.0	28.5	1.92	.20	.74	1.03	306	16	9	322	73	6.17	.86	.97	1.1	15-2			
10492	4	6.43	56	337	14.9	9.7	31.3	1.12	.21	.89	1.03	110	16	16	126	90	9.85	.77	.59	1.1	14-2		
10496	4	6.47	72	270	15.9	11.4	32.9	1.29	.22	1.00	1.6	172	16	20	188	96	15.43	-.45	.88	3.0	30-3		
10498	4	6.47	9	234	24.7	22.2	27.0	.85	.61	.33	1.6	320	16	29	336	61	15.43	-.69	1.6	1.6	18-1		
7082	3	4	7.14	65	133	10.9	2.5	31.5	1.14	.12	1.00	1.3	175	17	3	192	134	.10	.84	2.1	52-3		
7084	3	4	7.23	-32	171	12.8	6.4	31.3	1.12	.19	.91	1.03	64	197	6	261	99	4.25	.78	.66	1.1	16-3	
7088	3	4	7.24	4	209	15.4	10.5	30.0	1.02	.32	.69	1.03	286	17	5	303	81	5.50	-.71	.61	.6	15-2	
7090	3	4	7.25	51	151	14.9	10.2	37.7	2.53	.61	.99	4.1	192	17	9	210	136	3.27	-.01	1.1	1.1	25	
7092	3	4	7.25	27	16	226	48.2	46.7	46.8	-.8	2.12	1.20	.43	272	17	57	289	72	8.57	-.72	1.5	1.0	25
10506	4	7.26	9	168	16.2	12.0	37.3	2.36	.61	.91	3.8	220	17	1	237	121	1.18	-.01	.94	1.9	41-3		
* 7097	3	4	7.28	7	218	32.7	30.6	36.4	1.98	.81	.38	3.6	293	17	27	310	74	11.09	.27	.82	0	27-3	
7098	3	4	7.28	30	211	21.7	17.4	34.4	1.51	.49	.77	2.3	252	17	20	269	90	4.27	-.37	.96	1.6	23-3	
10508	4	7.30	9	196	24.5	21.8	38.3	2.91	.77	.67	5.2	256	17	10	273	95	7.26	.35	.93	1.6	18-3		
7102	3	4	7.30	2	197	29.0	26.8	40.5	7.00	.92	.57	13.04	264	17	7	281	91	4.11	1.22	.87	.8	14-3	
7104	3	4	7.30	24	173	22.6	19.9	43.4	-.8	1.54	.46	8.8	-.2	219	17	9	236	120	6.26	-.94	-.02	52-3	
7106	3	4	7.30	14	189	16.3	12.1	34.6	2.19	.54	.65	2.2	241	17	6	258	103	6.21	-.39	.96	1.3	34-3	
10512	4	7.30	-11	206	18.8	15.2	30.4	1.04	.74	.45	1.5	294	17	0	311	78	1.10	-.53	.77	1.1	71-3		
7108	3	4	7.31	51	247	32.2	30.1	39.1	3.63	.98	.95	6.03	209	17	48	226	82	5.81	.38	.78	1.6	18-3	
7110	3	4	7.31	-4	175	17.6	14.0	36.7	2.08	.60	.84	3.3	55	197	2	252	109	2.46	-.09	.98	.5	51-3	
10514	4	7.35	77	53	13.8	8.4	34.7	1.56	.37	.99	2.1	162	17	12	179	120	4.57	-.47	.00	1.1	70-3		
10516	4	7.37	62	162	15.1	10.5	36.9	2.19	.55	1.00	3.4	241	17	12	208	126	3.65	-.13	.69	1.4	83-7		
10519	4	7.38	-14	212	31.5	29.7	34.7	1.56	.83	.27	2.9	298	17	1	325	71	.69	.22	.69	1.4	90-4		
10522	4	7.41	38	236	11.2	2.0	29.4	.98	.03	.95	1.0	324	17	3	341	78	.16	.98	1.9	21-2			
10524	4	7.42	0	201	26.7	20.6	37.4	2.37	.78	.53	4.02	275	17	7	292	86	4.73	-.26	.68	.3	24-3		
* 10531	4	7.46	31	267	21.5	24.9	36.9	2.17	.77	.99	7.7	208	17	86	225	57	4.46	-.51	.70	2.1	78-7		
7116	3	4	8.20	-6	202	20.4	26.2	36.7	2.09	.74	.94	3.6	280	18	2	298	84	1.43	-.23	.70	2.0	10-3	
7118	3	4	8.27	4	204	26.2	23.7	36.7	2.09	.74	.94	3.6	274	18	11	292	86	6.94	.14	.64	2.9	93-7	
9814	4	8.30	14	240	59.8	50.7	-.7	31.9	.88	.89	6.02	263	18	88	281	60	6.00	-.71	.36	1.9	13-3		
7114	3	4	8.35	-9	205	31.8	29.9	38.7	3.29	.88	.89	6.02	287	18	1	306	81	.50	.71	.74	1.6	10-3	
7120	3	4	8.36	-18	213	20.5	18.8	38.0	3.38	.94	.19	6.6	132	198	9	330	70	3.11	1.07	.65	1.2	10-9	
7124	3	4	8.39	26	198	18.8	15.4	35.8	1.82	.55	.83	2.8	240	18	14	258	100	12.16	-.21	.90	.8	32-3	
7126	3	4	8.40	9	186	16.7	12.9	35.3	1.69	.51	.83	2.6	240	18	4	258	105	4.55	-.29	.72	1.6	82-8	
7128	3	4	9.33	-8	208	28.4	21.4	37.6	2.47	.61	.97	2.04	204	19	33	223	93	6.7	.21	.19	1.6	87-2	
7133	3	4	9.39	-4	189	23.8	21.0	38.8	3.33	.79	.69	6.0	73	199	0	272	98	.00	.46	.82	1.3	25-3	
7135	3	4	9.35	22	188	21.1	18.0	39.2	3.84	.70	.83	6.9	232	19	11	251	108	8.99	-.50	.98	1.9	10-3	
7139	3	4	9.30	7	169	15.9	11.6	37.1	2.25	.59	.62	3.6	220	19	1	239	121	.70	-.05	.66	1.3	23-3	
7141	3	4	9.31	6	186	21.0	18.0	38.6	3.20	.76	.78	5.6	240	19	4	260	105	3.63	-.36	.69	.8	88-7	
7145	3	4	9.33	-5	190	23.0	20.5	37.9	2.67	.75	.65	4.02	275	19	4	309	80	2.16	.18	.78	1.5	62-4	
7149	3	4	9.34	33	317	49.1	47.6	42.1	-	1.00	.69	-	113	19	80	132	61	12.56	.20	.98	2.1	13-3	
7151	3	4	9.35	73	261	23.9	21.1	38.6	3.20	.69	1.00	5.4	179	19	33	198	98	.11	.24	.72	1.0	24-3	
7162	3	4	9.39	41	248	36.2	34.5	38.7	3.23	.73	.87	5.6	227	19	56	246	74	7.29	.32	.96	1.4	92-6	
7153	3	4	9.35	28	199	14.7	9.8	33.1	1.31	.32	.89	1.7	237	19	10	257	101	8.82	-.59	.98	2.2	42-3	
7155	3	4	9.36	28	212	20.5	16.0	36.3	1.80	.62	.83	3.02	250	19	23	269	91	14.42	-.08	.69	1.6	81-2	
* 7158	3	4	9.37	-5	190	23.0	20.5	37.9	2.67	.75	.65	4.02	276	19	1	275	96	.51	.26	.69	-.7	99-3	
* 7161	3	4	9.38	33	317	49.1	47.6	42.1	-	1.00	.69	-	113	19	80	132	61	11.40	-.32	-2.0	.87-3		
7162	3	4	9.39	41	248	36.2	34.5	38.7	3.23	.73	.87	5.6	227	19	56	246	74	7.29	.32	.96	1.4	102-6	
7164	3	4	9.32	80	150	15.7	11.3	36.6	2.07	.52	1.00	6.7	177	19	16	196	119	1.49	-.19	.65	1.6	85-7	
7166	3	4	9.43	53	234	23.5	20.9	36.1	1.91	.51	.94	2.9	215	19	33	235	89	9.15	-.23	.93	.9	28-3	
10534	4	9.44	74	340	22.1	19.1	38.4	3.03	.66	.96	5.1	154	19	28	173	102	8.58	.21	.57	1.3	86-2		
* 7169	3	4	10.14	49	33	18.0	14.5	38.1	2.80	.68	.90	4.7	138	20	13	158	115	11.23	.17	.39	1.2	86-5	

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail Tr. No.	Day	Sh.	True red.	V ₀	V _H	a	e	q	q'	m	β _A	K	C.H.	E ₀	E ₀₀	n	B ₀								
7170 3	4	10.19	32	136	1055	2.8	325.3	1.22	.18	1.00	185	20	1	205	155	12-2	45	77.0	5						
7179 3	4	10.25	53	186	1055	2.6	325.7	1.79	.45	.93	203	20	1	223	116	6.39	-.32	.95	1.0	75.0	5				
7184 3	4	10.27	5	197	23.1	20.2	365.6	2.04	.69	.63	204	20	1	284	92	1.07	-.06	.81	.6	89.1	1				
7185 3	4	10.28	3	219	23.3	20.4	31.2	2.01	.59	.44	208	20	1	318	74	10.37	-.07	.79	.6	89.4	1				
* 7188 3	4	10.34	29	232	38.9	37.2	41.9	6.24	.99	.68	126.0	20	1	270	77	10.03	3.06	.96	-1.5	3-3	27	106.0			
7190 3	4	10.35	27	209	29.6	27.4	41.5	19.77	.96	.73	384.8	20	1	264	93	11.99	.90	-1.6	15-2	45	106.0				
7191 3	4	10.36	46	264	36.3	34.5	38.2	2.85	.66	.97	4.7	202	20	1	259	73	3.33	.16	.82	.6	95.0				
10536 4	4	10.37	28	251	46.5	45.0	41.2	12.32	.94	.74	23.9	20	1	262	63	6.47	1.60	.91	.6	22.4	13	93.0			
10538 4	4	10.37	47	190	21.0	18.0	40.4	6.31	.85	.94	11.7	21	1	258	113	10.27	.90	.88	.63	1.5	25-3	28	91.1		
10542 4	4	10.38	1	182	21.2	18.5	39.4	6.12	.81	.74	2.88	20	1	258	107	10.01	.99	.66	2.1	68-4	28	89.5			
* 10545 4	4	10.39	-21	252	46.6	45.0	47.3	2.06	.87	.97	1.07	348.7	20	1	264	93	11.99	.90	-1.6	15-2	45	106.0			
* 10094 4	4	10.47	33	318	49.3	47.8	42.0	16.7	1.67	.70	1.00	68	20	1	256	109	6.46	3.02	.69	-2.6	10-2	56	112.0		
7199 3	4	11.14	16	110	10.3	13.0	32.7	1.26	.21	1.00	1.05	354	201	1	195	176	1.00	.72	.94	.0	11-3	38	103.9		
7201 3	4	11.16	15	200	22.4	18.9	45.3	2.03	.65	.68	3.01	260	21	1	281	93	6.06	-0.5	.63	1.75	1.5	94.0			
7202 3	4	11.20	26	152	15.2	10.5	38.6	3.22	.70	.98	5.5	199	21	4	220	143	2.02	.25	.99	1.6	70-3	26	90.6		
7205 3	4	11.21	-25	195	31.8	29.7	40.5	6.83	.93	.51	13.2	201	1	244	21	5	244	117	4.80	-0.8	.97	2.2	79.3	47	106.0
7218 3	4	11.27	-5	197	23.7	21.0	37.1	2.06	.69	.82	4.5	236	21	1	284	93	1.27	.15	.81	1.9	.43	10-3	21	92.5	
7220 3	4	11.28	14	170	12.8	6.5	33.8	1.42	.32	.96	1.09	214	21	1	235	124	1.21	-.56	.56	2.43	1.3	80.3			
7221 3	4	11.28	3	194	9.9	32.7	1.26	.74	.83	1.07	231	21	1	272	93	2.87	-.59	.91	2.2	12-2	19	80.3			
7223 3	4	11.29	22	207	16.9	12.7	32.9	1.30	.38	.80	1.08	234	21												

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Ir.	No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	a	e	q	q'	ω	Ω	i	κ	λ	$C.N.$	K	$C_Z R$	M_{pg}	m_{lo}	n	H_B	A	
7279	3	4	13+41	-9	204	26.2	24.0	37.2	2.332	.77	.53	4.1	.274	.23	1.1	.298	.87	.442	.25	.62	1.0	.32-3	.46	102.1		
7281	3	4	13+45	-2	312	69.6	68.4	44.9	-3.63	1.20	.74	-	.121	.23	144	144	29	1.40	.42	.52	.69	-.1	1.2-4	14	106.7	
7283	3	4	13+46	-9	282	65.5	64.4	37.0	2.22	.60	.69	3.5	.227	.23	154	250	17	.56	-.05	.69	-.04	.98-3	.13	109.6		
7285	3	4	14+17	-4	200	13.6	7.6	32.9	1.30	.25	.97	1.6	.213	.24	10	.237	.109	.485	-.66	.66	-.67	.98-3	.13	79.1		
7287	3	4	14+19	-2	194	21.7	18.0	37.3	2.38	.70	.73	4.0	.251	.24	2	.275	.99	1.72	.12	.74	.04	1.2-2	64	95.1		
7291	3	4	14+24	17	209	25.5	22.8	38.3	2.99	.77	.69	5.3	.253	.24	18	.277	.93	11.34	.36	.88	1.3	.62-4	11	89.2		
7293	3	4	14+24	41	180	16.7	12.5	38.0	2.72	.65	.96	4.5	.206	.24	12	.230	.123	7.39	.10	.99	2.1	.19-3	16	83.9		
7299	3	4	14+25	25	226	18.7	14.9	31.2	1.11	.36	.72	1.5	.275	.24	19	.299	.82	14.27	-.63	.63	-.67	.85-3	1			
7303	3	4	14+29	1	194	19.2	15.6	36.0	1.88	.59	.77	3.0	.249	.24	3	.273	.100	3.24	-.13	.88	2.2	.75-4	11	83.2		
7307	3	4	14+35	38	270	49.4	47.9	44.0	-5.23	1.19	.97	-	.202	.24	78	.226	.64	2.29	-.76	-.3	.68-4	23	112.4			
7316	3	4	14+40	33	292	53.3	51.9	42.3	-38.66	1.03	.99	-	.168	.24	91	.192	.55	.00	-.74	.8	1.2-4	13	104.3			
7318	3	4	14+43	25	286	44.9	43.4	32.1	1.21	.17	1.00	1.4	.192	.24	89	.216	.48	.35	-.77	.86	.3	.39-4	23	103.7		
7320	3	4	14+45	5	254	35.4	33.9	40.5	.91	.37	.90	2.0	.289	.24	28	.313	.76	10.30	.93	.64	1.0	.79-4	27	105.7		
* 7314	3	4	14+49	3	183	13.9	9.1	34.1	1.47	.39	.60	2.0	.230	.24	1	.254	.112	1.24	-.48	.85	1.2	.46-3	11	84.2	1	
7324	3	4	15+25	-7	180	19.4	16.0	38.5	3.11	.73	.84	5.4	.52	.205	3	.257	.111	2.55	.30	.82	1.9	14-3	17	87.9		
7326	3	4	15+25	11	133	10.9	8	30.4	1.05	.05	1.00	1.1	.350	.205	0	.195	.161	.00	-.93	.90	2.4	.98-3	27	77.7		
7328	3	4	15+27	43	267	42.4	40.7	40.9	9.68	.90	.97	18.4	.203	.25	68	.228	.69	2.92	1.27	.95	-.04	.37-4	8	107.8		
* 7331	3	4	15+28	35	218	25.6	23.0	38.4	3.01	.73	.92	5.2	.236	.23	28	.261	.93	13.00	.28	.66	.6	.26-3	29	86.9		
* 7333	3	4	15+29	-11	212	31.4	29.4	38.1	2.79	.86	.59	5.2	.289	.25	2	.314	.80	1.16	.57	.72	1.3	15-3	39	106.6		
7334	3	4	15+30	16	150	14.2	9.3	37.8	2.65	.63	.99	4.3	.197	.25	1	.222	.148	.47	.06	.75	.47	.51-4	18	90.0		
* 7336	3	4	15+31	-1	199	19.6	16.3	35.6	2.177	.59	.74	2.8	.254	.25	4	.279	.97	4.01	-.17	.82	3.3	.44	.90-6	20		
* 7339	3	4	15+33	-37	220	44.6	43.2	41.5	2.194	.69	.99	4.3	.223	.23	49	.329	.67	10.16	.263	.37	1.2	.46-6	24	108.3		
* 7344	3	4	15+35	83	54	19.1	15.6	38.8	3.41	.71	.99	5.8	.164	.25	21	.189	.114	6.35	.31	.55	.9	54-3	29	89.9		
7346	3	4	15+37	4	219	20.3	17.1	31.4	1.14	.50	.57	1.7	.288	.25	28	.313	.80	10.40	-.46	.92	1.7	16-3	19	86.7	1	
7348	3	4	15+38	-1	216	30.0	28.0	37.4	2.43	.82	.63	4.4	.285	.25	14	.310	.81	7.21	.39	.82	1.5	.51-4	18	90.0		
7352	3	4	15+39	-20	258	63.6	62.6	42.0	4.52	1.00	.25	90.4	.4	.300	25	.171	.325	.35	.63	.521	.57	.8	6-7-5	11	105.1	
7356	3	4	15+42	-8	193	20.5	17.6	36.8	2.14	.66	.73	3.5	.701	.205	1	.277	.99	1.18	.01	.51	.01	.51	.51	12	82.7	
7358	3	4	15+42	12	229	22.4	19.7	30.7	1.07	.52	.51	1.6	.295	.25	21	.320	.74	15.23	-.67	.92	.3	33-3	19	85.8	1	
7360	3	4	15+45	38	293	40.1	38.5	34.4	3.04	.83	.97	1.52	.25	.25	73	.178	.208	2.08	.49	.88	.07	.39-4	17	104.0		
7362	3	4	15+45	0	312	64.9	63.7	39.3	4.04	.83	.69	7.4	.108	.25	147	.133	.26	1.40	.64	.69	-.63	.14	11-3	36	112.7	
7364	3	4	15+46	8	277	61.6	60.5	40.1	5.65	.85	.85	10.4	.228	.25	122	.253	.35	1.79	.84	.88	.6	.75-5	11	107.1		
* 7367	3	4	16+13	-11	181	21.9	18.7	39.8	4.85	.83	.81	8.9	.206	.26	5	.261	.109	4.17	.73	.61	1.0	.53-3	48	94.8		
3204	2	4	16+14	18	152	52.5	51.3	77.9	-.21	.55	.94	-	.203	.26	5	.229	.147	.47	.97	1.5	.67-5	13	83.6	1		
* 7368	3	4	16+14	39	130	16.8	12.7	41.8	5.29	.98	1.00	10.1	.182	.26	6	.208	.159	.00	.272	.92	.02	12-2	23	83.4		
* 7372	3	4	16+16	-11	190	21.1	17.7	37.5	2.48	.70	.76	4.2	.66	.206	3	.272	.102	1.6	.63	.7	64-3	45	96.5			
3206	2	4	16+17	5	95	14.6	10.0	38.9	3.46	.71	.99	5.9	.346	.206	5	.193	.153	2.32	.31	.59	.2	18-2	21	80.9		
7375	3	4	16+21	14	196	20.0	16.6	39.4	4.08	.76	1.00	7.2	.192	.26	22	.218	.114	4.12	.67	.86	2.3	12-3	18	90.2		
7377	3	4	16+24	7	196	14.8	9.8	33.2	1.33	.36	.66	1.8	.243	.26	4	.269	.103	4.08	-.55	.91	2.0	.29-3	16	81.6		
* 7388	3	4	16+30	-5	203	23.5	20.7	36.8	2.16	.71	.63	3.7	.264	.26	18	.258	.92	8.94	-.72	.86	.2	12-2	23	87.5		
* 7389	3	4	16+30	-53	150	12.3	5.9	31.3	1.13	.13	.98	1.3	.39	.206	9	.245	.100	3.26	-.83	.36	1.1	.70-3	12	82.3	2	
* 7392	3	4	16+34	65	287	27.5	25.1	37.9	2.72	.63	.99	4.4	.167	.26	15	.264	.101	11.59	-.03	.97	1.6	15-3	17	87.4		
7383	3	4	16+27	15	197	17.1	13.1	35.3	1.70	.50	.85	2.5	.238	.26	8	.264	.104	7.83	-.29	.96	.0	.63-3	13	83.8	2	
7385	3	4	16+29	14	210	23.6	20.9	37.0	2.25	.69	.69	3.8	.256	.26	16	.282	.93	11.41	-.09	.95	.1	.89-2	12	109.8		
7397	3	4	16+35	-3	248	13.5	7.5	25.7	4.08	.80	.81	1.1	.234	.26	5	.360	.51	3.49	-.81	.90	2.1	.36-3	16	91.6		
7399	3	4	16+38	43	281	42.0	40.4	39.2	3.86	.74	1.00	6.7	.184	.26	70	.210	.66	.00	.41	.80	.8	48-3	25	107.3		
7404	3	4	16+40	58	305	15.3	10.3	29.5	1.99	.10	.89	1.1	.77	.26	20	.103	.79	6.44	-.91	.75	-.1	.93-11	12	82.1	1	
7406	3	4	16+40	-1	222	22.8	20.2	31.5	1.15	.59	.46	1.8	.296	.26	12	.322	.76	9.40	-.35	.82	1.1	14-3	15	87.4		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Tr. No.	Day	St.	True rad.	V_{∞}	V_0	V_H	α	δ	θ	θ'	λ	δ_{M}	κ	ω_{L}	n	H_B	A	
No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	
7410	3	4	16443	60	258	29.0	27.4	39.7	4.19	.76	1.90	7.4	19.1	26	44	217	.87	2.50	
7412	3	4	16443	6	230	15.6	15.6	28.7	.94	.98	.91	1.4	30.4	26	14	330	.71	12.72	
7414	3	4	16444	29	245	41.8	40.6	41.8	58.29	.99	.72	115.9	245	26	61	271	.71	8.92	
7416	3	4	17226	62	192	18.8	15.3	38.8	3.46	.71	.99	5.9	19.4	27	20	221	116	5.30	
7423	3	4	17336	66	287	31.1	29.0	40.7	7.95	.88	1.00	14.9	16.9	27	45	196	.88	2.81	
7428	3	4	17441	-10	218	33.6	31.9	38.4	3.07	.90	.32	5.6	296	27	7	323	.77	3.15	
7431	3	4	21336	61	262	33.4	31.5	42.2	4.19	.90	.89	7.5	221	31	30	253	.96	11.71	
7433	3	4	21339	39	309	42.1	40.4	35.7	1.82	.52	.87	2.6	126	31	75	157	.59	4.57	
7439	3	4	21440	18	217	22.1	19.4	35.9	1.85	.61	.73	3.0	255	31	18	285	.92	4.22	
7441	3	4	21440	6	211	11.7	4.4	30.2	1.04	.13	.91	1.2	261	31	3	292	.94	1.30	
7444	3	4	21441	6	268	47.4	46.0	41.6	42.33	.98	.90	83.8	218	31	77	249	.63	4.22	
7447	3	4	21443	6	270	47.3	46.0	41.4	17.03	.93	.91	93.2	216	31	78	247	.62	3.94	
* 7449	3	4	21445	-12	281	71.0	70.1	44.0	0	1.15	.75	—	238	31	159	269	.22	1.79	
* 7454	3	4	21445	25	347	47.2	45.5	41.6	28.23	.99	.31	56.62	66	31	68	97	.63	2.72	
* 7455	3	4	21445	-96	269	64.6	64.6	43.0	10.10	1.04	.42	—	96	211	151	309	.33	1.92	
7457	3	4	21447	36	241	35.4	42.3	35.4	35.21	1.02	.81	—	232	31	50	263	.81	9.28	
3210	2	4	22330	-12	221	30.0	27.9	36.7	2.13	.62	.39	3.9	232	31	4	323	.79	2.07	
3212	2	4	22331	46	241	16.7	12.5	31.4	1.14	.92	.14	242	32	21	274	.66	9.55		
* 3221	2	4	22332	31	221	16.4	12.5	32.8	1.30	.33	.97	1.7	243	33	15	276	.94	12.23	
* 3223	2	4	22333	6	272	47.3	42.0	40.9	10.12	.91	.92	19.3	215	32	79	247	.61	3.50	
* 3225	2	4	22442	6	285	56.0	54.8	37.8	2.66	.65	.92	4.4	217	32	108	250	.41	1.68	
* 3226	2	4	22443	6	33	271	48.0	46.7	41.7	31.64	.97	.92	62.4	215	32	79	247	.62	3.53
* 3227	2	4	22444	6	31	269	48.4	47.2	41.6	27.94	.97	.88	55.0	222	32	80	254	.61	4.38
11156	4	4	2324	71	210	13.1	6.9	32.6	1.27	.21	1.01	1.5	183	33	11	215	.11	0.00	
* 3228	2	4	23333	43	266	40.7	39.0	40.9	10.21	.91	.95	19.5	209	33	64	242	.72	4.05	
* 3234	2	4	23336	-3	227	28.9	36.8	35.3	1.71	.77	.40	5.0	293	33	15	326	.77	8.30	
* 3239	2	4	23440	17	213	23.8	21.3	38.6	3.22	.77	.75	5.7	246	33	17	279	.97	12.07	
11164	4	4	26220	43	245	30.8	28.5	38.9	3.58	.75	.89	6.3	223	35	44	258	.84	8.96	
* 3250	2	4	26233	-5	221	29.3	27.2	38.3	3.04	.64	.48	5.6	278	36	10	314	.85	5.97	
11168	4	4	26222	8	172	16.1	11.9	38.8	3.48	.73	.96	6.0	208	35	1	243	.134	1.05	
3242	2	4	26224	26	278	30.4	26.9	35.3	.85	.57	.1	318	36	64	254	.53	6.20		
3244	2	4	26228	-18	239	22.6	19.6	27.5	.88	.64	.32	1.4	319	36	2	355	.64	6.40	
3246	2	4	26229	-19	195	19.0	15.6	36.6	2.11	.62	.80	3.4	62	16	5	328	.65	5.46	
* 3250	2	4	26233	-5	221	29.3	27.2	38.3	3.04	.64	.48	5.6	278	36	10	314	.85	5.97	
11170	4	4	28330	21	168	63.3	62.5	63.0	-	.17	.579	.83	-	216	37	20	295	.125	1.96
11180	4	4	2831	68	317	12.1	31.3	1.14	.17	.94	1.3	124	37	22	161	.87	8.29		
11183	4	4	2833	18	231	29.3	39.7	4.84	.87	.63	9.0	259	37	32	296	.85	12.62		
11188	4	4	28335	4	162	15.3	11.2	39.2	3.98	.75	.98	2.0	221	36	1	237	.145	1.57	
11190	4	4	28335	2	204	19.6	14.6	37.4	.85	.44	.48	1.2	316	36	16	352	.65	13.73	
10130	4	4	28336	32	308	56.2	54.8	42.7	2.46	.70	.74	4.2	249	37	15	286	.97	11.30	
11194	4	4	28441	27	206	15.5	11.2	31.3	1.14	.17	.94	1.3	124	37	22	161	.87	8.29	
11196	4	4	28442	77	81	15.5	10.9	35.8	1.87	.47	.98	2.7	157	36	14	194	.117	7.25	
11198	4	4	28442	33	222	36.8	36.0	50.1	1.18	1.69	.82	-	226	38	38	263	.98	8.70	
11200	4	4	28444	31	255	41.8	40.4	42.0	-	1.00	.77	-	228	38	62	275	.165	7.53	
* 10127	4	4	28446	-3	240	37.5	36.1	37.9	2.73	.91	.25	5.2	305	36	32	342	.77	10.29	

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Mo.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	ω	$f\ell$	i	κ	λ	C.M.	K	CZ_R	N_p	η_p	n	R_B	A		
11206	4	29.19	27	181	16.6	12.4	39.0	3.68	.74	.97	.64	204	38	8	242	132	5.13	.38	.99	.3	14-2	32	87.2	-4		
11208	4	30.14	78	15.1	15.5	15.0	35.0	3.70	.98	.64	2.4	154	39	14	193	115	7.55	-.37	.44	1.7	60-3	25	86.9	0		
11213	4	30.16	5	193	12.9	6.8	35.9	1.87	.46	1.00	2.7	12	219	1	231	194	.36	-.29	.91	2.3	27-3	12	81.1	1		
11215	4	30.18	-16	206	29.4	27.1	42.9	-11.41	1.06	.64	-	73	219	4	292	98	2.13	-.15	.52	1.0	16-3	18	88.5	1		
11218	4	30.21	-20	221	23.9	21.0	34.2	1.51	.65	2.5	102	219	3	322	83	2.53	-.15	.52	1.0	16-3	18	89.1	1			
11223	4	30.25	43	307	12.9	6.2	6.2	27.1	1.22	.37	.77	1.0	263	39	11	55	61	2.31	-.91	.53	1.1	11-2	20	80.0	-7	
11229	4	30.29	8	223	16.3	12.0	32.0	32.1	4.93	.80	1.00	8.9	189	39	53	228	80	1.72	.64	.73	1.6	24-4	12	94.8	0	
11231	4	30.30	55	274	36.3	32.4	39.7	39.7	4.42	.51	2.1	2.1	264	39	11	304	90	10.50	-.36	.2.1	1.5	15-3	19	84.5	1	
11238	4	30.34	5	222	19.3	16.7	33.7	33.7	.86	.17	.72	1.0	2	39	13	42	62	.87	-.92	.85	2.0	22-3	8	82.1	1	
11240	4	30.36	41	291	13.1	6.7	27.0	27.0	4.42	.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1		
11774	4	30.42	-8	234	34.9	33.3	38.5	31.9	.91	.30	6.1	.28	40	16	338	75	6.57	.81	.82	.4	34-3	42	97.8	-13		
11781	4	30.43	41	253	22.5	19.7	32.6	32.6	4.04	.86	.86	1.7	244	40	34	284	80	11.51	-.61	.98	.4	18-3	11	97.3	1	
11783	4	30.43	16	262	37.0	35.6	40.4	35.9	4.57	.65	.55	2.6	81	40	45	308	76	12.17	1.25	.87	1.4	18-4	11	92.4	1	
11786	4	30.45	2	327	60.3	59.0	34.5	34.5	1.57	.65	.55	2.6	81	40	150	121	2.5	1.53	-.13	.51	1.6	17	98.1	1		
11788	4	31.32	17	194	19.5	16.3	40.5	7.52	.88	.91	14.1	217	40	9	257	121	6.99	1.07	.87	1.6	12-3	10	83.1	2		
11790	4	1.35	36	264	35.1	33.2	36.4	2.05	.59	.84	3.3	236	40	57	276	71	7.74	-.10	.92	1.1	85-4	27	102.4	0		
11794	4	1.36	6	198	14.9	10.4	35.2	35.2	6.69	.46	2.5	2.27	40	4	267	114	4.22	-.34	.79	1.5	80-7	15	90.7	1		
* 3265	2	5	1.37	51	329	41.4	39.7	40.9	10.35	.92	.93	19.9	130	41	64	171	71	6.93	1.39	.49	.1	14-3	33	103.5	3	
11797	4	1.37	5	231	15.0	10.3	30.1	1.04	.30	.73	1.3	282	40	8	322	83	8.53	-.72	.91	2.2	40-3	27	82.5	2		
11801	4	5	1.38	13	277	59.4	58.2	43.5	-6.69	1.11	.71	2.44	40	106	284	46	3.67	-.86	.5	.85-5	.9	95.5	0			
11803	4	5	1.39	-19	230	29.7	27.8	35.6	1.80	.80	.35	3.2	117	220	0	338	77	2.22	-.60	.1	.34	2.2	12.3	95.7	0	
11805	4	5	1.39	13	230	22.6	19.8	34.6	1.59	.46	.85	2.3	239	40	30	279	87	13.63	-.37	.98	.2	2.2	12.3	91.8	0	
11807	4	5	1.39	13	230	33.2	31.5	42.0	-18.83	1.00	.60	2.59	40	29	299	87	11.93	-.37	.98	.2	2.2	12.3	91.8	0		
11809	4	5	1.40	1	226	27.3	25.2	37.8	2.66	.79	.56	4.8	271	40	15	311	87	9.29	.36	.72	1.8	60-4	19	92.9	-3	
11811	4	5	1.41	15	226	23.6	21.1	36.7	2.14	.67	.71	3.6	255	40	20	295	91	13.64	.03	.83	.1	65-3	32	91.9	0	
11813	4	5	3.15	54	49	45	36.9	52.3	.91	1.87	.78	-	131	42	27	173	91	8.18	.22	.1.2	.9	44-4	17	101.1	1	
11817	4	5	3.18	34	105	16.0	12.0	40.3	6.58	.85	.98	12.2	161	42	3	203	149	2.27	.91	.63	.02	17-1	120	88.7	0	
11820	4	5	3.22	13	209	20.9	17.7	38.7	3.37	.75	.83	5.9	234	42	11	276	107	8.95	.38	.92	.4	49-3	25	88.6	-3	
11822	4	5	3.23	-57	202	15.7	11.2	31.0	1.12	.27	.82	1.4	84	222	42	12	9	64	3.92	1.07	.51	1.3	32-4	20	97.9	2
11824	4	5	3.24	21	214	23.5	20.7	37.8	2.69	.75	.67	4.7	257	42	2	299	96	1.44	.27	.74	.6	74-3	60	98.9	0	
11826	4	5	3.25	59	195	16.8	12.8	37.5	2.51	.60	1.00	4.0	290	42	17	232	119	3.35	-.05	.91	.1	61-4	19	101.1	0	
11828	4	5	3.26	74	201	17.7	13.9	37.3	2.39	.58	1.01	3.8	239	42	20	221	113	3.00	-.05	.80	.8	38-3	14	84.3	0	
11830	4	5	3.26	12	240	37.8	36.0	42.0	-16.57	1.00	.51	2.69	42	40	311	79	11.32	-.07	.81	.1	47-4	20	106.1	0		
11832	4	5	3.27	-18	246	41.0	39.3	37.4	2.67	.96	.10	4.8	327	42	12	9	64	3.92	1.07	.51	1.3	32-4	20	97.9	0	
11834	4	5	3.27	22	236	29.0	26.7	38.4	3.10	.78	.55	2.53	42	32	295	86	13.31	.39	.91	.1	65-3	12	90.4	2		
11836	4	5	3.29	71	252	11.9	4.4	30.5	1.07	.66	1.01	1.1	207	42	11	249	108	4.44	-.69	.86	.1	57-3	19	80-1	0	
11838	4	5	3.29	54	288	33.0	38.2	36.0	2.99	.66	1.01	5.0	178	42	57	220	79	11.58	.88	.92	.1	90-4	16	93.0	1	
11840	4	5	3.32	14	215	15.5	11.0	33.6	1.41	.39	.87	2.0	240	42	9	282	102	.24	.17	.62	.1	41-4	16	99.0	0	
11848	4	5	3.36	48	246	17.1	13.6	32.1	.22	.95	1.5	229	42	22	271	89	9.06	-.72	.97	.6	42-3	11	85.5	1		
11855	4	5	3.43	-15	281	21.1	17.9	17.3	.61	.77	.14	1.1	349	42	10	31	32	4.56	-.33	.57	.8	10-2	66	92.4	0	
11857	4	5	3.43	49	217	13.2	7.5	32.6	1.28	.23	.99	1.6	207	42	11	249	108	4.44	-.69	.86	.1	57-3	19	80-1	0	
11859	4	5	3.44	27	247	34.9	33.3	39.9	5.35	.87	.70	10.0	250	42	47	292	79	11.58	.88	.92	.1	90-4	16	93.0	1	
11861	4	5	3.45	-9	341	67.7	66.5	42.4	-22.04	1.02	.52	2.72	222	42	177	234	27	1.15	.24	.17	.67	10-3	22	94.6	0	
11863	4	5	3.45	18	222	23.9	21.5	38.6	3.32	.77	.77	243	42	20	285	97	13.10	.40	.68	.13	21-3	23	85.5	1		
11865	4	5	3.45	62	241	17.5	13.6	34.2	1.51	.34	1.00	2.0	194	42	23	236	98	4.05	-.52	.86	.1	21-3	13	84.8	0	
11867	3	5	4.17	62	86	15.7	37.0	2.29	.58	.96	.96	1.1	251	43	11	194	124	8.33	-.06	.62	.2	2.6	11-3	84.0	1	
7461	3	5	4.18	4	219	25.2	22.5	39.3	4.11	.83	.70	7.5	251	43	12	294	97	8.30	-.64	.72	.1	57-3	19	80-1	0	
7465	3	5	4.20	9	241	20.6	17.0	30.8	1.10	.46	.59	1.6	288	43	18	331	78	13.59	-.53	.62	.2	27	88.6	0		
7467	3	5	4.20	-24	219	30.7	28.5	40.4	7.22	.93	.51	13.9	223	8	314	88	4.30	1.29	.54	.9	23-3	43	87.4	0		

TABLE 7.—Orbital and physical parameters of 2,520 double-station meteors* (continued)

Trail No.	Frail No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	α	δ	i	π	λ	C.W.	K	GZ_R	N_{PS}	n_{∞}	n_{∞}	H_B	A		
11878 4	5	4.26	21	-18	214	20.4	17.1	35.3	1.74	.60	.70	2.8	.80	223	3	303	95	2.41	-.16	.69	.6	28-3	15	87.4	1	
11880 4	5	4.26	-21	202	12.1	31.2	1.73	.60	.73	1.3	.62	2.2	2.23	2	265	104	1.42	-.79	.79	.6	2.0	13	79.3			
11882 4	5	4.26	83	65	17.7	13.9	36.6	2.11	.54	.97	3.2	1.54	2.23	20	198	109	0.95	-.16	.67	-.12	31-2	25	66.2			
11884 4	5	4.29	-76	141	15.2	10.5	36.1	1.99	.49	1.00	2.9	1.66	4.3	14	21.0	221	4.40	-.25	.68	.21	76-3	41	83.3			
11886 4	5	4.29	-29	219	31.5	29.5	40.7	8.44	.94	.50	16.4	92	223	13	315	87	6.61	1.44	.52	.3	16-3	22	92.5			
11888 4	5	4.30	-8	218	26.6	41.2	14.3	.96	.60	28.1	5	260	43	5	303	95	3.19	1.82	.78	1.3	11-3	24	94.8			
11890 4	5	4.31	40	231	13.3	7.4	31.2	1.13	.60	.95	1.3	230	43	11	277	96	5.72	-.81	.79	1.3	95-3	17	92.8			
11892 4	5	4.32	30	198	16.0	11.8	37.1	2.21	.58	.96	3.7	210	43	11	253	121	7.66	-.06	.93	2.3	83-4	8	84.7			
11894 4	5	4.33	-2	283	61.5	60.3	39.9	5.27	.90	.51	10.0	2.4	228	43	132	315	2.95	2.01	.54	-.34	.91	.8	59-3	11	82.4	2
11896 4	5	4.33	14	207	15.5	11.1	35.1	1.68	.46	.90	2.4	2.0	272	43	111	7.48	-.34	.91	.8	45-4	31	107.1				
11901 4	5	4.35	-16	213	18.4	15.0	34.5	1.36	.53	.74	2.4	77	223	2	301	96	2.45	-.30	.63	.4	61-3	20	85.5	2		
11903 4	5	4.35	-18	245	36.7	35.0	35.4	1.76	.92	.15	3.4	322	43	7	255	66	2.35	-.60	.66	.9	29-4	10	95.4			
11907 4	5	4.39	63	231	19.1	15.7	36.4	2.07	.51	1.00	3.1	191	43	25	235	103	4.13	-.20	.85	-.5	13-2	15	87.0	5		
11910 4	5	4.40	45	240	26.8	24.5	39.0	3.72	.75	.92	6.5	217	43	36	260	92	9.63	.42	.95	-.10	48-3	15	90.9			
11912 4	5	5.19	21	-16	210	25.9	23.3	40.6	7.92	.91	.69	15.2	71	224	2	295	100	1.42	1.24	.63	-.8	96-3	31	67.4		
11914 4	5	5.19	19	54	32.3	30.7	47.1	1.92	1.33	.64	4.0	291	224	0	155	103	1.05	-.39	.96	0	32-3	36	89.8			
74669 3	5	5.28	-20	218	25.6	23.4	38.0	2.66	.79	.59	5.1	86	224	4	311	91	2.69	-.67	.76	.9	25-3	34	92.2			
7471 3	5	5.28	5	219	25.1	22.5	39.6	4.66	.85	.71	8.6	249	44	12	294	98	6.67	-.76	.90	1.1	15-3	20	100.5			
* 7474 3	5	5.28	-23	239	36.8	35.0	38.2	2.95	.93	.22	5.7	129	224	3	333	72	1.18	.88	.55	.8	15-3	40	104.5			
* 7476 3	5	5.31	-15	241	33.7	31.8	35.7	1.84	.87	.24	3.4	309	45	8	354	71	3.39	.42	.66	.2	40-3	57	103.4			
* 7478 3	5	5.31	-29	233	31.9	29.7	36.7	2.17	.84	.34	4.0	117	225	12	361	76	5.56	-.41	.51	1.4	21-3	46	103.6			
11923 4	5	5.38	3	220	16.6	12.7	33.6	1.39	.43	.79	2.0	253	44	7	298	97	7.95	-.45	.80	2.1	16-3	13	86.4			
11925 4	5	5.39	2	239	24.9	22.5	33.6	1.35	.63	.63	2.0	280	44	19	333	78	12.68	-.45	.82	1.4	13-3	22	88.6			
11929 4	5	5.43	-7	333	64.3	63.1	36.5	2.05	.70	.63	3.5	96	44	17	140	19	1.32	.36	.68	0.8	11-2	57	95.2			
11935 4	5	5.43	-22	239	35.3	33.8	37.4	2.67	.91	.23	4.7	129	224	2	353	72	1.96	.31	.07	.32	4	26	107.4			
11938 4	5	5.44	-4	339	70.6	69.5	44.7	3.64	1.17	.61	-	105	44	171	150	26	4.28	-.34	0	24-4	23	116.9				
11941 4	5	5.45	16	334	27.3	24.9	47.8	.62	.79	.13	1.1	13	44	47	57	11.93	-.28	.64	.5	23-3	26	91.4				
* 7480 3	5	6.15	-11	200	18.9	15.1	37.8	2.71	.69	.85	4.6	52	225	1	270	112	1.32	.16	.68	0.8	11-2	57	95.2			
7481 3	5	6.16	8	143	12.3	5.7	31.0	1.40	.61	1.01	2.4	225	45	227	170	19	3.94	-.69	2.1	6.1	19	80.2				
11947 4	5	6.17	-20	211	25.6	22.9	39.9	5.49	.88	.68	10.3	73	225	5	298	98	3.38	.92	.53	1.0	30-3	35	91.8			
11949 4	5	6.17	21	-4	214	23.0	20.0	38.7	3.41	.79	.73	6.1	248	45	5	293	101	4.28	.45	.69	.9	56-3	50	96.5		
11951 4	5	6.18	-33	123	16.9	13.2	39.2	3.97	.75	1.01	6.9	359	225	15	224	129	.56	.44	.29	1.1	18-2	65	90.7			
11953 4	5	6.19	-7	232	25.5	22.7	35.0	1.68	.70	.51	2.8	282	45	9	327	83	6.31	-.54	.81	1.1	33-3	23	88.5	2		
7485 3	5	6.20	49	241	16.5	12.0	32.5	1.27	.24	.96	1.6	220	45	20	265	79	7.92	-.68	.82	1.2	44-3	12	105.8	4		
11957 4	5	6.21	40	244	28.7	26.3	38.9	3.63	.76	.95	5.3	31	225	3	256	131	2.50	.40	.54	.8	12-3	39	97.9			
11955 4	5	6.22	-7	197	17.0	13.0	37.0	2.29	.61	.89	3.7	227	45	0	272	116	1.00	-.02	.82	.2	51-3	11	82.8			
11960 4	5	6.22	19	163	15.1	10.6	39.4	4.29	.67	.71	7.6	192	45	3	237	155	1.26	.51	.90	-.7	16-1	85	88.6			
11962 4	5	6.24	21	-18	209	21.0	17.9	24.2	.69	.75	4.1	68	225	3	294	101	2.85	.12	.66	-.2	44-3	12	105.8	4		
7487 3	5	6.26	-12	251	36.0	34.1	33.8	1.44	.89	.89	2.7	322	45	23	8	64	7.82	1.08	.40	.54	.8	12-3	39	97.9		
11964 4	5	6.27	-9	179	16.0	11.9	38.4	3.15	.70	.95	1.69	45	14	214	104	1.91	-.73	.81	.7	14-2	21	81.4				
11970 4	5	6.29	52	293	43.8	42.2	43.4	-	7.20	1.14	1.01	-	177	45	68	222	72	.67	-.67	-.4	15-3	32	111.9			
* 7491 3	5	6.28	38	229	25.8	23.3	40.3	6.58	.86	.90	12.3	220	45	29	266	99	11.32	.95	.98	1.6	12-3	28	90.9			
* 7494 3	5	6.30	-9	234	28.1	21.5	36.7	2.15	.67	.71	3.6	75	225	1	301	97	.46	.04	.72	1.4	42-3	37	108.0			
11972 4	5	6.30	-24	267	45.5	44.0	40.7	8.29	.70	.70	16.5	249	45	72	294	64	7.31	1.31	.78	-.10	44-3	38	108.0			
7500 3	5	6.31	-27	248	37.7	36.0	35.4	1.75	.93	.13	3.04	144	225	12	10	65	4.14	.65	.48	.5	46-4	14	92.6			
7504 3	5	6.31	44	205	17.9	14.2	38.1	2.90	.66	.98	4.8	203	45	17	248	117	7.95	.16	.95	2.1	20-3	20	84.4			
7506 3	5	6.31	24	226	22.9	20.1	37.7	2.67	.69	.82	4.05	238	45	22	283	97	13.56	.17	.98	2.6	42-4	12	90.6			

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Ir.	No.	Day	Sh.	True red.	V_{∞}	V_0	V_H	α	θ	q	q'	ω	δ_2	i	κ	λ	C/M_r	K	CZ_R	H_{pg}	M_{∞}	H_B	A				
11974	4	5	6.31	58	6	262	16.2	11.8	31.2	1.14	.12	1.00	1.3	203	.45	.22	.249	.87	.282	-.84	.86	.9	.47-.3	14	86.3			
7508	3	5	6.32	-30	251	38.5	34.4	1.54	.93	.11	3.0	1.49	2.25	20	.14	.62	.62	.63	.45	.62	.63	.3	.57-.4	16	94.1			
11976	4	5	6.32	-8	196	18.8	15.5	39.0	1.75	.77	.87	6.6	.47	225	1	.272	.116	.49	.65	.62	.62	.6	.69-.4	16	68.7			
11983	4	5	6.34	-18	238	33.0	31.2	37.0	2.28	.87	.30	4.3	301	.45	3	.347	.75	.1.43	.52	.67	.1.5	.76-.4	32	96.8				
11987	4	5	6.35	-27	311	56.7	55.3	39.6	4.79	.80	.98	8.6	160	.45	106	.44	1.05	.62	.52	-.4	.84-.4	34	115.3					
11989	4	5	6.35	4	243	37.5	35.9	40.4	6.99	.96	.39	13.6	285	.45	35	.331	.76	.10.91	.1.39	.88	-.7	.26-.3	30	95.7				
11991	4	5	6.36	-3	231	16.4	12.4	31.1	1.12	.38	.70	1.6	277	.45	.5	.323	.86	.1.60	.85	.1.2	.73-.3	.35	88.9					
11994	4	5	6.37	53	284	40.8	39.2	42.6	14.51	1.07	1.01	-.1	185	.45	63	.230	.75	.1.57	-.6	.66	1.1	.29-.4	15	100.0				
11996	4	5	6.39	-17	242	24.7	22.2	30.6	1.08	.68	.35	1.8	308	.45	13.8	.223	.46	17	.269	110	.10.61	1.06	.96	1.1	.25-.3	24	91.5	
7512	3	5	7.21	25	213	22.4	19.4	40.4	7.32	.86	.88	13.8	223	.45	4	.354	.71	.3.02	-.26	.73	1.1	.23	.23	.23	.23	.23	.23	.23
* 7514	3	5	7.22	21	-10	215	20.9	18.2	14.5	37.9	2.80	.69	4.7	250	.46	.2	.297	.100	.1.83	.05	.75	1.5	.32-.3	.34	96.0			
* 7520	3	5	7.27	-1	202	18.1	14.5	37.9	2.80	.69	4.8	2.28	46	3	.274	.115	.3.33	.08	.85	1.5	.82-.3	.57	92.0					
* 7522	3	5	7.28	69	241	21.0	17.8	37.1	2.34	.57	1.01	3.7	183	.46	28	.229	.101	.1.22	-.07	.81	0	.14-.2	.43	85.4				
* 7524	3	5	7.28	55	276	36.1	34.2	40.8	9.61	.90	1.02	5.5	190	.46	55	.236	.79	.2.09	1.24	.85	1.8	.95-.3	11.0	.7				
* 7527	3	5	7.29	13	249	27.6	25.1	33.2	1.35	.62	.52	2.2	286	.46	32	.333	.74	.14.78	-.24	.85	1.3	.14-.3	15	89.7				
16359	3	5	7.29	38	120	13.4	8.1	36.9	2.24	.56	1.00	3.5	166	.46	4	.212	.153	.1.84	-.11	.50	1.2	.50-.3	.12	81.8				
7529	3	5	7.30	35	195	17.8	14.1	39.5	4.47	.78	.97	8.0	203	.46	13	.250	.126	.7.15	.56	.93	1.8	.33-.3	.25	83.5				
* 7534	3	5	7.32	-13	241	35.0	33.2	37.9	2.06	.90	.28	5.3	302	.46	12	.349	.74	.4.86	.73	.71	1.1	.94-.4	29	92.7				
7535	3	5	7.34	40	239	29.8	28.0	30.9	1.06	.84	.99	2.16	46	.43	.262	.97	.7.06	-.78	.1.4	.11-.4	.9	.85.8						
7537	3	5	7.34	57	298	38.6	36.8	40.8	9.96	.90	1.00	18.9	168	.46	61	.215	.75	.1.93	1.28	.70	14	.106.4						
7541	3	5	7.34	32	253	8.2	2.3	29.1	.98	.04	.93	1.0	321	.46	4	.212	.153	.1.84	-.11	.50	1.2	.50-.3	.12	81.8				
7543	3	5	7.34	-1	250	41.8	40.3	40.2	6.33	.96	.26	12.4	302	.46	44	.348	.68	.10.55	.1.49	.83	1.9	.36-.4	.21	95.5				
7545	3	5	7.35	25	311	61.6	60.4	43.0	1.27	1.11	1.00	1.0	310	.46	13	.250	.126	.7.15	.56	.93	1.8	.33-.3	.25	83.5				
7550	3	5	7.36	-1	261	48.6	47.2	40.3	6.76	.97	.19	13.3	310	.46	74	.357	.58	.9.91	1.67	.82	1.8	.16-.4	.14	94.5				
7552	3	5	8.17	38	212	16.5	12.1	36.0	1.93	.50	.96	2.9	211	.47	14	.258	.113	.8.69	-.23	.91	1.4	.67-.3	17	82.9				
7554	3	5	8.26	13	212	17.8	14.0	36.7	2.15	.59	.88	3.4	230	.47	10	.277	.110	.8.80	-.08	.95	1.8	.40-.3	.31	94.6				
* 7557	3	5	8.27	3	227	14.8	9.8	31.5	1.16	.30	.81	1.5	262	.47	6	.310	.92	.6.60	-.66	.89	1.6	.62-.3	.13	81.6				
* 7560	3	5	8.27	27	252	37.7	35.9	41.4	21.55	.97	.72	4.2	246	.47	50	.293	.78	.10.30	.2.10	.85	1.2	.13-.3	.30	106.0				
* 7562	3	5	8.28	-3	225	26.4	23.9	38.8	3.59	.83	.62	6.6	262	.47	10	.309	.93	.6.47	.55	.82	1.6	.37-.3	.53	100.0				
* 7563	3	5	8.28	21	-10	208	20.5	17.4	38.3	3.03	.74	.79	5.3	240	.47	1	.288	.106	.57	.30	.75	1.4	.40-.2	.41	86.2			
7565	3	5	8.30	66	209	18.2	14.6	37.6	2.59	.61	1.01	4.2	185	.47	21	.232	.113	.7.16	-.03	.86	1.4	.26-.3	.18	82.5				
7567	3	5	8.31	-7	243	18.3	14.5	29.3	1.99	.45	.64	1.4	347	.47	8	.347	.75	.7.51	-.58	.80	1.0	.44-.3	.32	85.4				
7569	3	5	8.33	46	268	35.4	33.6	39.6	4.81	.80	.96	8.7	209	.47	55	.256	.78	.5.02	.64	.89	1.3	.12-.3	.27	92.4				
7571	3	5	8.33	33	233	13.6	8.0	31.3	1.14	.19	.93	1.4	241	.47	11	.288	.96	.7.14	-.78	.99	2.1	.65-.3	.31	82.5				
7573	3	5	8.34	19	241	11.5	9.2	29.3	.99	.07	.92	1.1	289	.47	4	.337	.84	.8.88	-.94	.98	1.9	.42-.3	11	79.3				
12060	4	5	8.36	40	250	30.7	27.9	38.7	3.44	.74	.88	6.0	226	.47	42	.273	.85	.10.00	.37	.9.1	.62	.4	.27	.99.2				
7575	3	5	8.37	-17	246	37.6	36.0	37.0	2.28	.93	.17	4.4	317	.47	11	.270	.91	.7.70	.67	.88	1.8	.64-.4	.24	99.3				
7587	3	5	8.39	41	232	16.4	12.5	33.6	1.41	.33	.94	1.9	223	.47	18	.270	.98	.10.64	-.55	.94	1.3	.97-.3	.19	84.6				
12062	4	5	8.42	64	257	25.2	22.8	38.1	2.91	.65	1.01	4.8	187	.47	37	.234	.93	.1.80	.14	.86	1.4	.25-.3	.19	88.8				
12064	4	5	8.45	41	338	41.1	39.4	35.2	1.71	.65	.60	2.8	89	.47	72	.136	.59	.8.55	-.10	.71	.68	-.4	.22	.96.2				
7583	3	5	9.27	-6	230	30.0	27.9	40.0	5.84	.91	.53	11.1	270	.48	11	.318	.89	.5.85	1.09	.78	.9	.11-.3	.24	96.9				
7585	3	5	9.28	10	242	14.0	8.5	29.4	1.99	.23	.76	1.2	288	.48	9	.336	.81	.7.66	-.80	.90	.6	.61-.3	.12	79.9				
7587	3	5	9.30	5	228	12.5	5.9	30.4	1.07	.17	.88	1.3	262	.48	4	.311	.93	.3.11	-.82	.94	2.0	.36-.3	.13	80.4				
7589	3	5	9.32	27	259	33.4	31.5	36.2	1.99	.65	.70	3.4	257	.48	50	.306	.73	.11.40	-.03	.93	.1	.11-.3	.17	94.1				
* 7592	3	5	9.34	25	140	13.2	7.8	37.2	2.40	.58	1.01	3.8	176	.48	2	.225	.71	.1.18	-.04	.41	13	.91.7						
7593	3	5	9.34	21	-17	213	19.9	16.8	36.6	2.14	.65	.76	3.5	68	.228	2	.297	.101	.2.01	-.00	.60	1.4	.32-.3	.30	83.9			
7596	3	5	9.35	20	234	16.6	12.5	32.4	1.54	.226	.35	1.7	254	.48	14	.302	.92	.12.95	-.59	.97	2.1	.28-.3	.21	82.6				
7598	3	5	9.36	43	288	46.1	41.9	33.9	23.44	.44	.01	.00	-	194	.48	45	.242	.65	.4.5	.79	1.3	.36	105.0					
7600	3	5	9.36	-1	220	16.4	12.4	33.9	1.46	.45	.81	2.1	249	.48	75	.295	.71	.6.14	-.42	.79	1.5	.50-.3	.27	66.9				
* 7607	3	5	9.37	69	312	31.5	29.4	39.8	5.21	.82	.97	9.4	155	.48	47	203	.85	.5.91	.71	.68	.2	.19-.3	.27	92.9				

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Fruit No.	Fr. No.	Day	Sh.	True rad.	V_{∞}	V_h	a	α	q	q'	ω	β	1	λ	G.M.	K	C_2	N_{∞}	n_{∞}	H _b	A			
V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0	V_0			
10008 3 5 9.38	24 23.1	35.1	34.4	49.5	2.5	2.54	.97	.71	14.2	245	47	294	.80	11.19	1.17	.95	1.18	.98	25	101.2	2			
10100 3 5 9.38	-24	23.1	35.0	34.4	49.5	2.5	2.53	.97	1.03	1.32	228	6	204	.71	12.12	1.17	.95	1.18	.98	25	101.2	2		
76122 3 5 9.38	33	26.9	27.0	30.8	1.0	1.10	.94	.73	1.05	276	49	324	.69	19.99	.97	.95	1.17	.98	27	90.8	2			
76115 3 5 9.39	15	23.4	24.9	22.5	37.1	2.36	.70	.70	4.0	255	48	303	.90	13.89	.93	.95	1.17	.98	28	99.7	2			
76118 3 5 9.41	82	31.4	22.5	19.5	37.5	2.55	.62	.98	4.1	195	48	204	.98	8.01	.93	.95	1.17	.98	41	94.5	2			
76202 3 5 9.42	65	256	13.8	8.0	29.9	1.03	.16	.87	1.02	87	48	13	136	.85	7.70	-.85	.66	1.0	21-2	22	81.7	3		
112668 4 5 10.39	43	290	47.0	46.3	43.0	1.1	.66	1.12	1.00	-	191	77	261	.65	1.49	1.62	.91	1.5	41-5	5	101.6	1		
11044 4 5 10.42	0	338	69.4	68.2	42.6	1.05	.69	-	-	112	49	164	.23	6.67	-	.36	1.0	14-4	18	117.9	3			
11047 4 5 10.42	25	100	44.0	44.0	42.5	1.07	.64	-	218	49	97	.21	2.64	1.26	.96	1.2	78-5	13	109.5	3				
11038 4 5 10.45	-3	345	67.3	66.1	62.0	1.00	.52	-	92	49	174	.27	.96	-	.37	1.7	41-4	24	107.8	2				
112076 4 5 11.40	-11	230	28.1	26.1	38.9	3.64	.85	.54	6.07	271	50	7	321	.89	4.27	.66	1.03	25-3	52	93.9	2			
112080 4 5 11.40	73	263	14.5	9.4	31.8	1.19	.16	1.01	1.4	167	50	17	217	.96	1.99	-.79	.87	1.9	53-3	12	81.4	1		
11035 4 5 11.44	10	336	67.0	65.9	42.5	1.05	.64	-	115	50	143	.29	1.35	-	.58	1.4	14-4	18	110.4	2				
112084 4 5 11.44	22	104	45.4	44.0	42.5	1.03	.64	-	254	50	68	.67	8.41	1.07	.96	2.04	1.74	18	104.5	2				
76222 3 5 12.18	-14	228	26.4	23.8	38.1	2.95	.80	.58	5.3	267	51	3	319	.91	2.02	.43	.54	2.04	14-3	42	93.3	2		
112076 4 5 12.20	-61	177	13.1	7.3	31.5	1.17	.18	.96	1.4	48	231	11	279	.100	5.74	-.78	.98	2.7	10	103	10			
76226 3 5 12.20	-33	263	9.4	10.4	29.1	.98	.36	.93	1.0	343	51	2	354	.75	1.98	-.85	.85	1.6	16-2	24	86.7	5		
76323 3 5 12.25	21	216	32.0	32.7	32.7	1.04	.04	1.04	1.0	71	231	2	302	.100	2.10	-.96	.71	1.1	24-3	24	80.0	1		
76395 3 5 12.25	-11	237	29.7	27.4	38.0	2.88	.84	.47	5.3	281	51	10	332	.84	5.20	.51	.68	1.4	36-3	42	100.4	2		
76337 3 5 12.25	-23	238	31.3	29.2	37.4	2.49	.85	.37	4.6	112	231	4	363	.79	2.07	.49	.51	1.7	24-2	67	98.2	2		
76244 3 5 12.20	-8	269	24.8	22.1	31.1	1.13	.18	.96	1.4	39	235	51	13	354	.73	8.59	-.27	.67	1.2	39-3	24	90.7	8	
76262 3 5 12.20	21	226	17.3	7.3	37.5	2.42	.65	.84	4.0	235	51	18	286	.101	12.59	-.06	.97	1.2	26-3	34	95.1	2		
76443 3 5 12.31	37	260	13.4	7.3	36.9	.96	.12	.85	1.0	301	51	13	352	.78	5.15	-.92	1.0	46-3	9	81.2	1			
76473 3 5 12.33	39	171	14.0	9.0	30.0	3.02	.84	.47	5.3	237	146	1	237	.97	1.60	-.04	.71	1.4	45-3	16	81.2	2		
76511 3 5 12.34	53	240	14.8	10.0	32.3	1.25	.21	.99	3.05	209	51	17	261	.97	5.60	-.02	.96	1.12	63-2	16	79.0	2		
76555 3 5 12.36	7	222	15.9	11.7	34.0	1.48	.43	.85	2.1	242	51	8	293	.102	8.53	-.44	.85	1.6	26-3	12	83.5	5		
112089 4 5 12.38	-22	248	35.3	33.6	36.6	2.14	.90	.21	4.1	132	231	1	313	.71	.28	.61	.59	1.8	27-4	9	87.7	5		
112092 4 5 12.39	23	276	52.6	51.6	44.5	4.00	1.19	.74	2.39	231	84	60	60	5.39	1.97	.93	1.3	20-4	13	112.5	2			
76559 3 5 12.43	-20	255	40.9	39.6	37.8	2.70	.96	.10	5.3	327	51	14	290	.100	1.16	.93	1.02	51	25-4	29	124.1	2		
112094 4 5 12.43	2	342	71.0	69.9	45.0	2.70	.96	.10	112	51	163	25	275	.75	.39	.43	.33	1.5	25-4	29	124.1	2		
120996 4 5 12.43	3	341	65.9	64.7	60.0	5.00	.90	.60	11.0	98	51	159	.149	2.12	1.03	.42	.7	11-4	16	108.3	2			
76643 3 5 12.43	17	180	14.6	9.7	37.8	2.72	.64	.99	4.4	197	52	4	249	.145	2.16	.09	.98	1.0	21-3	10	89.1	1		
76664 3 5 12.43	-3	206	14.4	9.4	37.8	2.70	.68	.87	4.5	229	52	3	281	.115	2.97	-.15	.91	1.1	80-3	54	89.8	2		
76619 3 5 13.18	51	306	14.5	9.1	37.2	.87	.16	.73	1.0	204	52	18	66	.67	1.04	-.92	.74	1.3	36-3	13	80.8	3		
76667 3 5 13.19	3	184	13.4	7.7	35.6	1.82	.46	.98	2.0	256	1	139	.66	.94	.92	.92	.92	1.4	36-3	13	80.8	3		
121018 4 5 13.42	12	310	63.0	61.8	58.9	3.69	.73	.99	6.4	197	52	129	.249	29	.50	.37	.80	.9	38-5	7	106.2	2		
76775 3 5 18.38	-7	294	54.9	53.6	33.6	1.43	.83	.24	2.6	313	57	138	.10	3.65	-.19	.67	.3	18-4	13	101.5	2			
76882 3 5 18.41	29	260	18.8	15.0	32.4	1.26	.41	.75	2.9	277	57	234	.78	14.90	-.72	.65	1.6	57-3	15	81.7	2			
76843 3 5 18.41	57	295	42.1	41.4	37.8	3.71	1.07	.99	4.4	205	57	68	215	.71	1.00	-.07	.82	1.8	50-4	38	97.8	2		
76866 3 5 18.42	52	297	43.5	42.1	42.4	4.00	1.05	1.01	-	180	57	69	237	2	307	101	2.02	-.69	1.6	68-3	14	107.5	2	
76761 3 5 18.38	-4	216	22.1	13.2	31.7	1.18	.26	.88	1.5	70	237	54	282	.73	6.82	-.19	.98	.7	26-4	7	70-3	21	84.3	10
76773 3 5 18.38	-1	246	17.2	13.5	30.8	1.10	.40	.66	1.5	282	57	10	340	.83	10.83	-.59	.72	.7	70-3	21	84.3	10		
121018 4 5 13.42	37	64	11.4	3.6	30.3	1.06	.92	.24	2.6	313	57	10	34	3.65	1.19	.67	.42	1.7	57-3	13	81.7	2		
40084 2 5 19.21	-27	231	15.0	31.1	30.3	1.07	.29	.76	1.4	224	57	234	.92	3.55	-.19	.60	1.6	26-3	13	86.1	2			
40086 2 5 19.25	-27	231	15.0	31.1	30.3	1.07	.29	.76	1.4	224	57	234	.92	3.55	-.19	.60	1.6	26-3	13	86.1	2			
76923 2 5 19.35	24	217	18.3	14.9	38.3	3.10	.70	.93	5.3	274	14	216	.53	2.02	-.24	.86	1.8	22-3	20	86.0	3			
76964 3 5 19.39	45	217	18.3	14.9	38.3	3.10	.70	.93	5.3	274	14	216	.53	2.02	-.24	.86	1.8	22-3	20	86.0	3			
76964 3 5 19.40	-19	250	12.4	12.4	34.0	3.82	.74	.93	5.6	274	14	216	.53	2.02	-.24	.86	1.8	22-3	20	86.0	3			

ORBITAL ELEMENTS OF PHOTOGRAPHIC METEORS

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	V_0	V_H	α	δ	q	q'	ω	$\delta\theta$	i	κ	λ	C.W.	K	CZ _R	H _P	π_{∞}	n	H _B	A	
* 3344	2	5 21.022	73	206	19.2	15.7	38.1	2.98	.66	1.01	5.0	174	60	23	234	112	1.90	.91	2.3	24.3	33	93.5			
No.		6	6	6	6	6	6	6	6	6	6	16.56	.95	.88	32.2	121	283	136	1.78	.97	2.3	24.3	33	93.5	
* 3340	2	5 21.311	-15	214	19.5	16.3	37.0	2.32	.65	.82	3.8	222	60	121	283	105	9.16	.04	.40	-.7	53.2	95	86.5		
* 3342	2	5 21.311	-35	214	19.5	16.3	37.0	2.32	.65	.82	3.8	222	60	10	299	105	9.16	.04	.40	-.7	53.2	95	86.5		
* 3344	2	5 21.313	15	283	53.5	52.2	42.4	20.76	1.03	.56	264	60	92	324	54	6.13	.81	-.6	87.4	29	112.9				
* 3345	2	5 21.313	28	204	11.3	38.6	3.39	.73	.92	5.9	219	60	19	279	109	11.88	.34	.95	1.05	95.4	10	88.6	0		
* 3332	2	5 21.335	9	240	24.6	22.1	37.0	2.71	.74	.71	4.7	252	60	20	313	93	12.76	.25	.95	1.3	62.4	24	100.6		
* 3323	2	5 21.443	-25	256	35.9	36.3	37.6	2.62	.92	.22	5.0	129	240	1	84	44	.53	-.83	.47	.6	22.2	24	80.7		
* 7700	3	5 21.443	33	207	22.8	20.4	44.3	4.15	1.23	.97	-	203	60	18	263	125	7.65	.42	.98	.1	16.2	23	88.2		
12115	4	5 22.017	21	200	16.6	12.5	39.0	3.84	.75	.98	6.7	204	240	1	240	133	5.40	.42	.92	1.0	4.1	14	89.1		
12117	4	5 22.020	1	225	16.8	12.5	35.1	1.71	.50	.86	2.6	237	61	6	298	107	6.56	.29	.85	-.1	10.2	18	83.9	3	
3317	2	5 22.223	61	193	15.7	11.2	36.7	2.19	.54	1.01	3.4	179	61	15	240	122	4.45	-.14	.92	1.0	4.1	14	89.1		
3319	2	5 22.223	23	274	18.5	14.5	27.2	.88	.33	.59	1.2	314	61	24	15	67	13.41	7.67	1.2	.78	28.3	18	88.5	2	
3313	2	5 22.225	17	240	14.0	8.4	31.4	1.16	.24	.89	1.4	250	61	9	311	96	7.74	-.02	.94	1.01	32.3	8	83.2		
* 3312	2	5 22.226	63	181	16.5	12.5	37.8	2.77	.64	1.01	4.5	174	61	16	235	124	2.21	-.09	.81	2.1	91.3	56	91.7		
* 3307	2	5 22.227	65	218	19.2	15.8	38.0	2.89	.65	1.01	4.8	183	61	23	244	111	.18	.13	.87	1.2	10.2	50	93.7		
* 3308	2	5 22.227	-20	182	16.2	12.2	39.3	4.25	.77	.98	7.5	24	241	5	265	137	3.93	.52	1.6	4.6	24	92.5			
* 3303	2	5 22.228	-9	220	17.3	13.4	36.3	2.04	.58	.66	3.2	235	61	2	296	110	2.36	-.11	.72	1.2	49.9	40	85.7		
* 3304	2	5 22.228	5	243	24.0	21.2	36.3	2.05	.67	.67	3.4	261	61	18	322	90	12.14	.02	.88	1.8	20.5	43	91.4	2	
3300	2	5 22.311	24	223	15.7	11.3	35.3	1.75	.46	.94	2.6	219	61	12	280	112	9.31	-.32	.96	-.1.1	24.2	14	83.1	3	
* 4094	2	5 22.335	23	274	39.4	37.7	37.8	2.72	.77	.64	4.8	262	61	61	323	67	9.87	.31	.96	1.05	16.4	11	98.9		
* 3296	2	5 23.339	26	314	55.6	54.3	37.7	6.3	.63	.00	4.4	196	62	107	258	42	.73	.08	.92	1.05	26.4	15	109.7		
* 3292	2	5 23.41	-7	260	32.2	30.5	35.4	1.79	.83	.31	3.3	302	62	22	4	73	9.78	.28	.73	1.01	32	101.3	32		
* 3282	2	5 23.42	32	268	29.7	27.7	35.0	1.68	.54	.77	2.6	251	62	45	313	75	11.90	-.25	.97	1.07	94.3	25	89.2	-4	
* 3288	2	5 24.39	-41	227	21.0	17.9	35.9	1.93	.62	.74	3.1	243	61	12	316	96	10.65	-.09	.38	1.5	78.3	73	86.4		
* 4088	2	5 24.35	51	295	39.9	38.2	39.5	4.59	.78	1.01	8.2	189	63	66	252	70	1.40	.57	.77	.9	41.4	19	95.4		
* 3286	2	5 25.23	-35	274	31.4	30.3	37.7	6.3	.63	.00	3.7	149	244	38	333	60	9.47	.64	.84	1.05	15.7	57	99.4		
12124	4	5 25.23	-24	221	19.6	16.3	37.4	2.51	.68	.81	4.2	60	243	4	304	106	3.72	.12	.63	1.01	15.7	57	99.4		
3280	2	5 25.24	-13	240	29.5	27.2	41.0	13.43	.96	.58	26.3	263	64	7	327	93	3.66	1.79	.68	.7	26.5	65	95.7		
3282	2	5 25.24	-2	201	12.7	6.4	34.1	1.51	.35	.98	2.0	208	64	1	272	133	.74	-.50	.88	.7	19.2	23	77.0		
12126	4	5 25.26	-37	248	27.5	25.1	35.6	1.82	.74	.47	3.2	205	243	14	349	81	8.50	.37	-.1	41.4	19	95.4			
12138	4	5 27.27	-22	236	24.3	21.6	38.3	3.11	.79	.66	5.6	78	245	2	324	96	1.24	.42	.63	1.2	29	92.0	1		
12140	4	5 27.27	53	274	30.6	28.0	38.0	2.91	.66	.99	4.8	199	65	47	265	82	4.00	.15	.82	1.3	30.4	8	90.7		
12142	4	5 27.27	25	225	18.6	15.1	37.2	3.42	.79	.69	5.0	215	65	15	281	114	10.64	.21	.99	1.1	43.3	22	93.0		
12146	4	5 27.27	-35	211	13.6	8.2	34.2	1.53	.62	.01	2.0	190	65	24	204	103	12.96	.29	.45	1.5	71.3	18	94.4		
12148	4	5 27.27	-35	272	16.5	12.1	26.4	.84	.43	.64	1.2	139	245	6	24	64	5.56	-.67	.47	1.0	76.3	22	85.5		
12150	4	5 27.30	-8	210	15.5	11.2	36.9	2.29	.59	.93	3.7	218	65	1	283	124	1.23	-.05	.73	2.2	49.3	36	83.6		
12152	4	5 27.30	45	229	14.4	9.4	33.7	1.44	.31	.99	1.9	203	65	14	269	109	5.59	-.36	.97	.2	21.2	23	80.9		
12156	4	5 27.34	-41	238	18.7	15.2	33.2	1.37	.48	.71	2.0	286	245	10	331	90	10.34	-.41	.37	.9	47.3	24	87.3	1	
12161	4	5 28.16	39	240	20.9	17.6	37.2	2.45	.61	.95	3.9	215	66	24	281	102	10.59	.01	.17	-.5	73.3	17	84.4	-3	
12165	4	5 28.19	-17	228	18.7	14.9	36.4	2.09	.61	.81	3.4	242	66	0	308	106	.20	-.06	.67	.0	59.3	15	85.9	2	
12169	4	5 28.20	30	232	13.5	7.6	32.5	1.28	.24	.97	1.6	220	66	10	286	108	5.66	-.68	.42	.9	68.3	12	78.1	2	
12171	4	5 28.23	4	242	22.3	19.3	36.6	2.26	.67	.74	3.8	251	66	14	317	96	11.00	.06	.84	.8	69.4	12	85.3		
12175	4	5 28.25	28	140	13.6	8.5	37.3	2.48	.60	1.00	4.0	165	66	3	232	155	1.39	-.01	.52	2.5	50.3	26	82.9	1	
12177	4	5 28.26	-21	254	33.0	31.0	39.2	4.20	.91	.37	8.0	289	66	3	355	81	1.22	.95	.57	.2	22.3	32	93.5		
12186	4	5 28.27	73	327	13.6	7.8	29.5	1.01	.09	.91	1.1	81	66	14	147	83	5.22	-.92	.68	1.2	35.3	9	81.6		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	ϱ_0	ϱ_g	ϱ_h	a	e	q	q'	m	β	i	π	λ	$C.M.$	K	CZ	H	H_{∞}	n	H_B	A		
12220	4	5	28.27	94	199	16.3	12.2	37.7	2.670	.93	1.01	4.4	186	66	15	250	125	.00	.07	.88	1.6	31-3	15	82.3	-1		
12222	4	5	28.29	26	280	44.3	42.0	41.0	13.49	.95	1.01	26.3	247	66	69	314	66	7.67	1.0	.04	1.1	15.4	11	107.9	-1		
12224	4	5	28.30	9	235	17.5	17.5	17.7	1.73	.51	.85	2.6	238	66	11	305	103	.27	.93	1.4	28.3	12	87.1	-			
12226	4	5	28.31	60	79	15.4	10.6	33.6	1.43	.38	.89	2.0	205	66	12	189	104	11.25	.50	.28	1.9	10.2	27	85.1	-		
12227	4	5	28.36	46	278	37.3	35.6	40.6	6.79	.89	.96	16.6	209	66	57	275	77	4.82	1.18	.96	1.2	34.4	17	96.4	-2		
12227	4	5	28.37	-23	267	36.2	34.6	36.5	2.12	.91	.18	4.1	316	66	1	22	69	.38	.68	.59	1.4	27.4	14	93.5	-		
12229	4	5	28.38	-29	288	51.9	56.9	50.1	1.17	1.72	.66	4.01	224	66	87	290	62	.41	.29	.12	1.4	9	109.2	-			
12232	4	5	28.39	-30	338	73.0	72.6	46.2	2.31	1.42	.98	-	20	247	149	267	20	.41	.29	.12	1.4	9	106.8	-			
12234	4	5	28.40	76	217	17.5	13.0	35.7	1.87	.46	1.01	2.7	168	67	21	234	106	4.05	.15	.88	.9	14.4	21	106.8	-		
12236	4	5	28.40	58	260	25.8	23.4	38.0	2.93	.66	1.00	4.9	194	67	38	260	91	4.05	.15	.88	.9	14.4	7	99.1	-		
12238	4	5	28.40	28	348	56.4	55.0	36.9	2.30	.72	.65	3.9	98	67	117	165	39	3.29	.15	.57	.3	36.4	24	108.3	-		
12240	4	5	28.41	-1	251	59.6	58.8	64.2	2.37	2.15	.43	-	261	67	67	39	328	87	5.41	-.07	.69	1.1	23-3	74	107.6	-	
12242	4	5	28.43	35	251	24.2	21.8	37.4	2.51	.65	.88	4.1	228	67	31	294	93	13.03	-.07	.51	1.2	20	20	85.5	-		
12246	4	5	29.17	54	66	16.9	13.1	33.6	1.43	.44	.81	2.0	109	67	13	176	97	12.29	-.04	.28	1.5	14.2	16	85.1	-		
10569	4	5	29.19	32	252	20.9	17.5	34.6	1.60	.46	.87	2.3	237	67	25	304	91	13.36	-.37	.81	.5	42.3	21	86.5	-		
12288	4	5	29.29	-25	241	24.2	21.6	37.2	2.41	.74	.62	4.2	85	67	3	332	92	2.51	.21	.59	.4	11-2	48	99.0	-		
12294	4	5	29.31	-7	238	21.0	18.0	36.8	2.23	.67	.74	3.7	251	67	7	319	99	6.58	.05	.80	1.4	32-3	33	89.0	-		
12308	4	5	29.32	67	38.7	38.7	41.4	26.97	.97	.97	2.0	151	67	58	208	76	6.24	2.17	.53	.1	15-3	35	95.4	-			
12318	4	5	29.37	45	259	29.3	27.2	39.7	5.13	.82	.94	9.3	213	67	41	281	89	8.31	.71	.96	2.0	4.6-4	21	92.6	-		
4996	2	5	29.41	53	334	12.7	5.9	27.1	.88	.17	.72	1.0	20	68	11	88	62	2.70	-.91	.86	.8	15-2	23	75.6	0		
12322	4	5	29.41	-29	265	35.7	34.2	37.1	2.40	.91	.22	4.6	131	247	10	18	71	3.99	.71	.45	1.3	62.4	26	99.5	-		
12224	4	5	31.28	35	227	20.3	17.2	39.7	2.40	.91	.22	4.6	131	247	10	18	71	3.99	.71	.45	1.3	62.4	26	99.5	-		
12326	4	5	31.28	86	214	16.7	12.6	34.1	1.51	.35	.97	2.0	152	69	20	221	101	8.15	-.51	.69	.4	53-3	12	84.1	-		
12328	4	5	31.28	-13	260	31.0	28.8	37.1	2.40	.84	.99	4.4	291	69	12	360	79	6.17	.43	.69	1.6	4.9-16	16	92.2	-		
12333	4	5	31.31	-53	193	40.5	39.2	57.3	-.58	.54	.89	-	34	249	31	284	112	6.10	-.00	1.0	19-4	9	90.1	-			
* 3277	2	5	31.33	41	310	50.7	49.3	41.7	75.12	.99	1.01	149.2	190	70	86	260	58	2.00	3.05	7.71	-.23	.41	.5	66-3	55	94.9	-
12335	4	5	31.34	-36	245	25.0	22.8	37.1	2.39	.75	.60	4.2	88	249	11	337	90	7.71	-.23	.41	.5	66-3	55	94.9	-		
12339	4	5	31.35	33	302	52.7	51.4	42.2	2.58	1.03	.92	-	215	69	90	285	95	3.00	-.00	.88	-.9	12.3	28	107.9	-		
12341	4	5	31.35	-21	238	23.1	20.5	38.2	3.04	.77	.69	5.4	259	0	324	98	2.26	.37	.88	.8	70-3	53	93.2	-			
12347	4	5	31.36	-18	275	44.4	43.0	74.3	7.15	.99	.05	14.2	328	69	20	37	65	4.80	2.09	.66	-.07	37.3	29	123.8	-		
12343	4	5	31.37	47	157	13.0	7.4	35.4	1.79	.44	1.01	2.6	168	69	7	237	141	2.47	-.34	.45	1.6	22-2	37	61.3	-		
12249	4	5	31.37	-28	252	25.5	25.5	37.2	2.45	.80	.49	4.4	100	249	5	349	85	3.24	.34	.50	1.1	32-3	59	98.4	-		
12253	4	5	31.37	-14	244	13.0	7.2	30.8	1.11	.24	.85	1.4	262	69	2	332	95	1.73	-.75	.75	1.4	31-3	16	81.0	-		
4200	2	5	31.39	19	308	57.3	59.4	46.8	4.58	.83	.79	8.4	239	70	110	309	42	2.92	.68	.86	.13-4	13	106.9	-			
3272	2	5	31.45	24	321	57.0	55.9	37.1	2.38	.59	.99	3.8	201	70	114	271	37	.81	-.00	.96	1.5	44-3	21	84.6	-		
12355	4	6	1.16	44	227	17.2	13.1	36.5	2.12	.53	.99	3.3	201	70	18	271	113	6.98	-.16	.93	1.3	10-2	49	85.4	-		
12358	4	6	1.18	-7	239	27.9	25.4	42.3	2.49	1.03	.69	-	248	70	10	318	101	5.57	-.67	1.6	76-4	17	89.9	-			
12260	4	6	1.18	-36	223	23.6	20.8	40.8	10.54	.92	.80	20.3	250	11	206	283	113	10.66	-.03	.87	1.6	27-3	18	78.4	-		
* 4103	2	6	1.39	43	236	18.9	14.4	37.4	2.32	.58	.98	3.7	206	71	22	277	107	9.50	-.06	.86	2.3	22-3	27	90.9	-		
12382	4	6	1.40	26	237	15.3	10.9	34.2	1.52	.39	.94	2.1	224	70	13	294	107	10.64	-.46	.82	1.3	52-3	14	83.4	-		
12384	4	6	2.18	-7	249	16.6	12.5	40.1	6.52	.85	1.00	12.0	192	71	9	263	144	3.37	.73	.9	37-3	51	99.3	-			
12270	4	6	1.25	52	286	39.9	38.2	42.3	20.62	1.05	.99	-	196	70	61	266	76	2.95	-.03	.73	1.5	31-3	30	103.0	-		
12778	4	6	1.34	29	229	17.9	14.4	37.4	2.52	.62	.95	4.1	213	70	16	283	71	4.73	1.43	.42	4	65-2	129	91.3	-		
* 103	2	6	1.39	43	236	18.9	15.6	37.0	2.32	.58	.98	3.7	206	71	22	277	107	9.50	1.10	.82	1.3	52-3	14	83.4	-		
12382	4	6	1.40	26	237	15.3	10.9	34.2	1.52	.39	.94	2.1	224	70	13	294	107	10.64	-.46	.82	1.3	52-3	14	83.4	-		
12384	4	6	2.22	-67	134	36.5	35.1	50.4	-	1.12	1.89	1.00	-	11	211	42	263	103	2.82	-.01	.90	1.4	11-3	24	97.2	-	
7702	3	6	2.23	-18	255	24.4	21.6	36.2	2.04	.63	.95	3.3	251	71	26	322	89	14.39	-.04	.87	1.1	26-3	32	96.6	-		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Ir.	No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	ϵ	q	q'	ω	i	λ	Ω	α_{∞}	μ_{∞}	n	H_B	A		
12498	4	6	2.24	35	236	19.8	16.4	37.7	2.74	.65	.95	4.5	212	71	21	283	108	10.51	.11	.99	1.4	53-3	47	
12499	4	6	2.24	35	236	20.4	36.3	2.74	.65	.95	4.5	212	71	20	326	92	13.49	-.02	.99	1.4	53-3	47		
12500	4	6	2.25	10	236	24.8	22.2	40.6	8.83	.92	.73	16.9	246	71	6	317	103	4.12	1.31	.75	1.5	13-3	21	
12503	4	6	2.25	-11	237	24.8	22.2	40.6	8.83	.92	.73	16.9	246	71	6	317	103	4.12	1.31	.75	1.5	13-3	21	
12505	4	6	2.27	28	246	20.4	17.2	36.2	2.02	.56	.89	3.2	230	71	22	301	99	13.55	-.14	.99	1.0	93-3	14	
12507	4	6	2.29	78	318	40.5	38.6	47.3	1.83	1.53	.96	-	156	71	54	227	86	4.65	-.59	.6	91-4	27	109-7	
12409	4	6	2.31	28	321	58.7	57.4	40.1	6.50	.87	1.00	12.0	196	71	111	267	41	10.99	.25	.95	1.4	48-6	10	
12412	4	6	2.33	-1	257	27.6	25.3	37.0	2.34	.77	.54	4.1	274	71	44	278	85	6.24	.21	.95	1.0	93-3	3	
12414	4	6	2.33	50	269	29.1	26.9	38.0	3.05	.68	.97	5.1	207	71	25	14	73	8.13	1.52	-.08	4.2	46	98-9	
10594	4	6	2.35	-10	268	38.9	37.4	40.1	6.51	.96	.25	12.8	303	71	19	330	88	15.03	-.16	.93	1.7	46-3	37	
12422	4	6	2.39	22	259	17.7	14.0	32.0	1.22	.34	.81	1.6	259	71	1	266	148	1.21	.73	1.7	1.7	32	82-9	
12424	4	6	2.40	64	182	16.9	13.0	29.1	2.82	.64	1.01	4.6	170	71	17	241	122	4.17	.11	.52	.7	74-3	23	
16771	4	6	2.42	18	285	28.9	26.8	30.0	7.71	1.10	.80	-	127	71	163	198	20	14.83	-.47	.96	1.7	10-3	32	
10597	4	6	2.43	8	395	70.8	69.7	43.2	-	1.73	1.48	.90	2.6	131	72	33	203	87	11.73	-.31	.56	1.2	17-2	20
12428	4	6	3.16	79	4	23.5	20.7	35.1	1.21	.17	1.01	1.4	13	252	1	266	148	1.21	.73	1.7	1.7	20	117-6	
7707	3	6	3.18	-18	183	10.8	3.0	31.9	1.21	.17	1.01	1.4	13	252	1	266	148	1.21	.73	1.7	1.7	20	100-9	
12432	4	6	3.18	-3	236	28.2	25.7	37.8	2.76	.80	.55	5.0	271	72	18	343	86	9.94	.39	.59	.5	14-3	15	
12434	4	6	3.22	-7	227	21.5	18.4	40.6	6.70	.90	.85	16.6	230	72	5	302	114	4.20	1.23	.61	.7	28-3	19	
12436	4	6	3.22	-16	243	23.8	21.0	38.3	3.16	.78	.68	5.6	255	72	4	327	98	2.83	.41	.67	.9	23-3	23	
7713	3	6	3.26	-20	171	13.3	8.0	36.0	2.16	.53	1.01	3.3	9	252	5	262	151	1.48	-.15	.46	1.2	71-2	166	
7715	3	6	3.27	56	299	37.1	35.3	38.6	5.49	.71	1.01	6.0	183	72	61	255	73	.68	.31	.70	1.0	28-4	12	
12442	4	6	3.29	84	181	18.9	15.4	36.0	1.98	.51	.98	3.0	154	72	23	226	103	8.96	-.22	.65	1.1	30-3	18	
12444	4	6	3.31	49	312	47.2	45.8	41.5	32.93	.97	1.01	6.4	180	72	70	252	63	1.00	2.32	.71	.4	60-4	26	
12446	4	6	3.31	34	256	31.6	29.6	40.3	9.48	.92	.45	10.5	279	72	6	352	85	4.11	1.11	.69	.6	22-3	39	
12448	4	6	3.32	-15	256	31.6	29.6	39.8	9.48	.92	.45	10.5	279	72	3	266	87	3.68	-.20	.91	1.8	82-4	19	
12452	4	6	3.37	58	270	25.4	22.9	36.3	2.06	.51	1.00	3.1	194	72	39	266	87	3.68	-.20	.91	1.8	82-4	19	
12454	4	6	3.38	27	290	50.2	49.0	43.6	5.64	1.13	.76	-	238	72	80	311	62	5.84	-.28	.99	-.5	46-4	16	
12456	4	6	3.39	13	337	69.7	68.6	42.5	1.83	1.07	1.01	1.01	175	72	145	248	21	.18	-.3	.21	.63	2.5	13-7	
7721	3	6	4.17	-20	234	17.6	13.5	35.5	1.82	.55	.83	2.8	62	73	5	315	106	.21	.21	.63	.25	13-7	16	
7719	3	6	4.18	-25	222	18.4	14.6	38.0	2.90	.70	.87	4.9	253	3	302	115	3.06	.21	.62	.25	18-3	23		
* 7726	3	6	4.20	-25	262	30.7	28.4	37.0	2.34	.84	.38	4.3	112	253	3	80	157	.43	.36	1.2	20-3	43		
7727	3	6	4.22	-25	255	27.0	24.5	37.0	2.35	.78	.51	4.2	253	2	351	86	1.58	.28	.48	1.2	22-3	37		
7729	3	6	4.23	-1	240	21.4	18.3	38.1	3.04	.74	.79	5.3	241	73	10	314	104	2.29	.31	.64	1.4	94-6	25	
7731	3	6	4.24	51	271	39.8	38.1	45.9	2.49	1.39	.98	-	274	85	5	315	106	2.11	.64	.84	1.1	123-6		
* 7734	3	6	4.25	-15	208	15.1	10.6	37.2	2.46	.61	.96	4.0	31	253	1	284	132	.72	.01	.72	1.9	65-3	43	
12462	4	6	4.25	49	243	25.6	23.1	41.0	1.93	.93	.93	5.5	253	201	73	32	274	102	6.63	1.53	.96	-.07	22-3	8
7735	3	6	4.26	34	213	12.5	6.0	31.3	1.39	.28	1.01	1.8	197	73	7	270	127	2.16	-.61	.93	3.0	14-2	12	
12468	4	6	4.27	-1	255	16.3	12.0	31.5	1.17	.37	.74	1.6	270	73	9	343	89	9.31	.60	.86	0	56-3	10	
7737	3	6	4.30	63	250	14.8	9.8	32.2	1.24	.18	1.01	1.5	186	73	16	259	98	.47	-.74	.95	1.8	39-3	18	
12470	4	6	4.32	35	213	16.6	12.7	38.2	3.07	.68	1.00	5.2	198	73	14	271	126	6.29	.20	.85	1.5	38-3	22	
12474	4	6	4.34	-17	267	41.4	39.7	43.1	-	6.06	1.03	2.3	-	302	73	12	15	75	3.69	-.66	.6	69-4	24	
12478	4	6	4.34	-10	248	25.3	22.9	38.6	3.67	.82	.65	6.7	259	73	6	332	95	6.09	.58	.73	1.6	11-3	23	
12480	4	6	4.35	65	302	35.1	33.2	39.6	4.88	.79	1.01	8.7	242	73	55	242	78	2.26	.63	.80	0	11-3	17	
12484	4	6	4.35	-29	269	36.1	36.6	39.8	5.52	.96	.23	10.8	226	73	11	259	98	3.99	1.42	.48	1.0	64-4	25	
12486	4	6	4.36	-4	234	18.3	14.9	37.1	2.37	.64	.85	3.9	235	73	7	308	109	6.71	.04	.68	.7	50-3	21	
10384	4	6	4.39	-10	251	26.3	24.1	38.4	3.29	.82	.60	6.0	265	73	10	338	91	6.64	.52	.62	.7	31-3	35	
* 7744	3	6	5.18	-17	237	19.7	16.2	37.1	2.37	.67	.80	3.9	243	74	1	317	105	1.07	.07	.62	1.4	74-3	62	

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Period	Yr.	No.	Day	Sh.	True red.	V_{∞}	V_G	V_H	a	e	q	q'	ω	Ω	i	n	λ	Ω^2	R_B	n	R_B	A			
Meteors	3	6	5.18	50	167	15.8	11.6	38.5	3.39	.70	1.01	5.8	145	254	11	243	136	3.61	.29	2.9	21.3	22			
*	7755	3	6	5.21	-19	222	16.8	12.7	37.0	.37	.62	.90	3.8	145	254	1	299	118	1.22	.00	.70	1.7	54.3		
12299	4	6	5.22	12	278	42.3	40.6	40.5	0.45	.95	.45	16.4	278	74	58	352	69	10.81	1.69	.63	-.4	14.3	28		
12501	4	6	5.24	63	243	18.6	14.9	35.4	1.79	.43	1.01	2.0	105	74	24	259	101	1.73	-.35	.67	-.7	28.3	84.3		
*	7754	3	6	5.26	-11	249	22.0	18.9	36.3	2.06	.67	.69	3.04	259	74	7	333	95	6.08	.01	.76	.1	13.2	47	
*	7755	3	6	5.26	33	262	17.3	13.2	31.6	1.19	.26	.88	1.5	250	74	21	324	88	12.46	-.69	.96	2.0	82.4	8	
*	7758	3	6	5.29	3	310	61.8	60.5	40.8	10.67	.95	.51	20.8	272	74	131	346	36	3.04	1.64	-.66	-.3	69.4	34	
7760	3	6	6.20	-3	184	12.3	9.9	56.8	58.5	58.5	43.0	-	6.61	1.11	.91	-	217	45	1.07	-.67	1.0	-.7	107.9	89.0	
7762	3	6	5.31	43	265	14.1	8.7	30.5	1.06	.12	.94	1.2	254	74	15	328	87	6.60	-.87	.98	1.7	85.3	0.0		
12508	4	6	5.31	-26	240	21.4	18.5	37.4	2.53	.71	.73	4.3	254	71	3	325	100	2.96	.17	.56	1.0	31.3	20		
7765	3	6	5.32	30	288	22.9	19.9	27.8	.91	.34	.60	1.2	307	74	37	22	66	13.13	-.73	.92	1.3	11.3	14		
7769	3	6	6.20	-3	25	317	58.0	56.0	40.3	7.23	.87	.92	13.6	218	75	109	293	43	1.92	1.05	.59	1.3	81.5	99.5	
7771	3	6	6.30	25	162	17.5	14.0	42.7	-	1.06	1.01	1.2	173	75	6	248	160	1.99	-.03	.95	1.3	42.3	39		
7775	3	6	6.32	26	162	18.0	15.0	42.7	-	1.06	1.01	1.2	231	75	22	307	99	14.09	-.03	.95	1.3	42.3	39		
7777	3	6	6.34	24	249	20.9	18.0	36.8	224	.61	.87	3.6	231	75	23	307	99	1.05	-.03	.95	1.3	42.3	39		
12513	4	6	7.33	46	227	17.4	13.7	37.1	2.42	.59	1.00	3.8	196	76	19	272	115	6.15	-.03	.88	2.5	21.3	19		
12515	4	6	7.36	69	218	19.1	15.8	37.4	2.54	.60	1.01	4.1	173	76	24	249	108	3.21	-.01	.71	2.7	22.3	28		
12517	4	6	7.37	-6	250	23.5	21.0	38.0	2.90	.76	.69	5.1	255	76	10	331	97	8.11	.33	.71	1	43.3	23		
12559	4	6	7.38	-20	325	63.0	63.0	42.7	1.04	1.08	.96	2.08	76	125	34	284	34	1.07	-.07	.86	1.3	109.7	86.5		
7780	3	6	8.26	69	339	32.6	30.6	36.1	2.00	.55	.91	3.1	134	77	53	211	74	7.07	-.17	.80	1.4	35.4	13		
7782	3	6	8.26	-31	266	30.1	28.0	37.0	2.36	.83	.40	4.3	109	257	8	7	80	4.35	.40	.45	1.3	14.3	35		
7784	3	6	8.28	21	293	46.0	44.4	39.0	3.96	.85	.60	7.3	264	77	77	341	60	7.81	.69	.79	.8	15.4	11		
*	7787	3	6	8.29	41	306	45.6	44.1	38.9	3.78	.75	.96	6.6	208	77	79	285	60	4.74	.41	1.0	.6	33	108.0	
7790	3	6	8.29	37	257	25.1	22.6	38.2	3.05	.70	.91	5.2	221	77	32	298	94	11.33	.24	.79	1.7	69.9	15		
7796	3	6	8.30	50	181	14.6	9.9	36.9	2.29	.56	1.01	3.6	173	77	11	250	134	1.08	-.09	.69	1.2	45.3	14		
7802	3	6	8.33	-35	255	27.3	25.0	38.3	3.14	.82	.56	5.7	90	257	10	347	89	6.68	.51	.43	2.0	77.4	26		
7804	3	6	8.33	-23	277	37.8	36.2	38.2	3.08	.94	.18	6.0	314	77	1	31	70	3.32	.100	.59	.6	10.3	33		
12528	4	6	8.33	-17	281	42.3	40.8	39.5	4.07	.98	.11	9.4	323	77	17	40	66	4.74	.41	1.0	.6	61.4	33		
12530	4	6	8.33	20	344	70.4	69.9	69.9	3.62	1.27	.99	-	164	77	139	241	26	4.44	-.07	.39	-.7	33.4	23		
12532	4	6	8.34	39	252	17.8	14.1	34.3	1.55	.39	.95	2.1	219	77	22	296	98	11.03	-.46	.96	.1	76.3	13		
7806	3	6	8.35	1	283	43.2	41.8	39.8	5.44	.95	.26	10.6	302	77	55	19	65	11.18	1.34	.66	1.5	22.4	21		
12534	4	6	8.37	19	246	19.3	16.1	36.4	2.11	.58	.88	3.3	275	77	18	308	103	13.60	-.10	.86	.5	87.0	87.0		
12536	4	6	8.37	-19	258	27.1	24.9	37.8	2.76	.81	.53	5.0	275	77	3	352	88	2.22	.42	.60	-.05	83.3	44		
7808	3	6	8.38	-27	266	31.9	30.1	38.3	3.16	.88	.37	5.9	111	257	5	8	80	226	.70	.50	.9	12.2	28		
7813	3	6	9.19	63	285	33.8	31.8	40.5	6.29	.88	1.02	15.6	181	78	51	259	83	1.41	1.10	.85	1.5	102.7	86.8		
7815	3	6	9.20	85	21	18.4	15.6	36.1	1.99	.54	.93	3.1	138	78	27	216	96	12.15	-.18	.57	.6	26.3	15		
*	7820	3	6	9.24	233	18.9	15.5	37.8	2.81	.65	1.00	4.6	199	78	21	277	112	6.60	.11	.86	.5	21.2	12		
7821	3	6	9.25	54	252	14.3	9.0	31.9	3.21	.17	1.00	1.4	202	78	16	280	98	3.60	-.76	.94	1.2	66.3	19		
7823	3	6	9.25	-3	251	25.7	23.2	39.6	5.05	.86	.69	9.4	252	78	13	330	97	8.69	.84	.85	1.0	15.3	22		
12546	4	6	9.37	-4	243	19.3	16.1	37.0	2.34	.65	.81	3.9	240	78	8	318	105	6.06	.05	.67	-.9	11.2	15		
12548	4	6	9.37	56	268	28.0	25.9	38.7	3.61	.72	1.00	6.2	196	78	41	274	89	4.04	.35	.91	2.0	55.4	18		
*	7835	3	6	9.34	27	269	28.0	25.8	36.6	2.18	.65	.76	3.6	249	78	37	327	83	13.74	-.01	.96	1.8	37.4	31	
*	7838	3	6	9.35	35	224	16.2	12.1	35.8	1.92	.49	.98	2.9	207	78	16	285	113	8.95	-.25	.68	.5	85.4	89.7	
12541	4	6	9.35	-10	269	30.6	28.7	36.9	2.29	.83	.39	4.2	291	78	15	79	78	.39	.75	.8	20	93.6	20		
12546	4	6	9.37	-4	243	19.3	16.1	37.0	2.34	.65	.81	3.9	240	78	8	318	105	6.06	.05	.67	-.9	11.2	15		
7829	3	6	9.33	56	268	28.0	25.9	38.7	3.61	.72	1.00	6.2	196	78	41	274	89	4.04	.35	.91	2.0	55.4	18		
*	7841	3	6	9.29	-9	343	70.5	69.4	40.4	7.75	.87	.97	14.5	258	78	7	323	178	283	.03	1.06	.43	-.2	37.4	31
12552	4	6	9.39	-39	324	51.7	50.4	38.2	3.12	.68	1.01	5.2	186	78	49	264	186	.26	.21	.89	.3	21.4	12		
12554	4	6	9.40	-16	288	26.8	24.6	29.5	1.01	.75	.26	1.8	319	78	8	37	66	5.20	.15	.82	.1	19.3	34		
7844	3	6	9.43	-25	288	43.0	41.7	37.9	2.87	.98	.05	5.7	287	78	11	53	62	2.83	1.45	.53	1.5	10.3	43		
7846	3	6	9.43	40	10	31.4	29.1	24.2	.76	.69	.24	1.3	259	78	57	107	49	13.19	-.38	.65	1.4	12.3	35		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True rad.	V_{∞}	V_H	V_g	a	ϵ	q	q'	ω	i	Ω	α	λ	C.W.	K	CZ_R	H_p	H_{∞}	n	H_B	A	
12557	4	6 10-36	-23	271	32.0	30.1	37.4	2.53	.87	.33	4.7	.296	.79	1	15	.78	.25	.55	.59	.9	14-3	33	99.6		
12559	4	6 10-36	-8	277	26.6	24.2	31.7	1.19	.70	.56	2.0	.305	.79	16	24	.72	.10-16	.57	.59	1.3	15-3	29	88.0		
12561	4	6 10-39	-1	284	46.6	45.4	42.9	9.43	1.03	.27	.297	.79	.59	16	66	.66	.10-40	-.6	.86	-.6	61-4	13	100.9		
12568	4	6 11-37	0	327	65.8	64.7	39.5	4.76	.86	.68	8.8	.254	.80	156	334	23	1.06	.79	.43	.3	67-5	8	95.4		
12570	4	6 11-38	50	257	28.0	26.0	40.9	12.27	.92	.98	23.6	.202	.80	38	282	95	6.38	1.47	.88	2.3	32-4	15	88.5		
12572	4	6 11-40	50	279	38.8	37.3	43.9	4.87	1.20	.97	-.202	.80	.56	282	82	4.27	-.60	.93	-.3	51-3	40	108.0			
12576	4	6 11-41	-15	269	30.1	27.4	25.3	36.5	2.15	.62	.81	3.5	.242	.80	10	.9	.50	.43	.60	.2	12-2	63	104.3		
12580	4	6 11-42	-6	265	11.6	4.2	29.2	1.00	.13	.86	1.1	.287	.80	3	.6	.85	1.31	-.89	.83	.7	1.4	51-4	12	88.4	
12583	4	6 11-42	-6	254	64.5	63.6	73.7	-.24	5.00	.96	-.201	.82	.57	283	98	2.33	-.97	.5	22-4	.35	101.0				
7854	3	6 13-27	46	300	32.7	30.6	27.0	-.87	.76	.21	1.5	.327	.82	51	.49	.54	14.24	-.19	.77	1.0	85-4	23	96.5		
7855	3	6 13-31	7	259	62.2	19.9	36.8	2.25	.56	.94	3.6	.210	.82	30	.299	.95	10.88	-.07	.77	1.2	19-3	23	90.6		
7859	3	6 13-31	40	259	14.6	10.0	37.9	2.90	.66	.99	4.8	.201	.82	0	.283	145	.22	.15	.68	1.3	40-3	13	84.9		
7862	3	6 13-33	-9	206	48.4	47.0	320	4.54	.78	1.01	8.1	.189	.82	85	.271	.87	.56	-.6	.67	.4	19	104.5			
7866	3	6 13-35	45	320	15.9	11.6	31.7	1.19	.36	.77	1.6	.86	.262	9	.348	91	10.00	-.60	.37	.2	12-2	21	84.2		
7868	3	6 13-35	-47	258	15.9	11.6	31.7	1.19	.36	.77	1.6	.86	.262	9	.348	91	10.00	-.60	.37	.2	12-2	21	84.2		
* 7871	3	6 13-36	-31	270	62.0	61.8	40.6	9.68	.93	.70	17.9	.250	.82	131	.332	33	2.24	1.38	.76	-.4	57-4	26	111.1		
* 7873	3	6 13-36	11	322	63.0	61.8	40.6	9.68	.93	.70	17.9	.250	.82	128	.219	32	1.38	.76	.60	2.1	80-5	16	112.3		
* 7874	3	6 13-38	28	353	62.8	61.5	39.7	5.32	.83	.89	9.7	.137	.82	23	.84	.59	1.00	-.86	.93	.9	39-3	14	83.4	4	
* 7877	3	6 13-39	49	323	16.0	11.5	25.3	8.80	.27	.59	1.0	.2	.82	19	.297	111	11.64	-.32	.65	1.0	11-2	67	91.5		
* 7882	3	6 13-42	27	240	19.6	16.5	38.5	3.37	.72	.94	5.8	.215	.82	19	.297	111	11.64	-.32	.65	1.0	11-2	67	91.5		
* 7883	3	6 13-43	16	322	3.0	4.8	63.6	38.1	2.98	.76	.73	5.2	.110	.82	154	.192	22	1.01	.33	.63	.2	16-4	18	108.7	
4104	2	6 14-18	50	241	25.2	22.6	41.8	4.54	.41	1.00	1.00	911.8	.195	.83	30	.278	106	12.74	4.62	.92	1.6	20-2	35	98.5	
4106	2	6 14-18	51	227	18.5	14.8	34.3	2.51	.61	.99	4.0	.203	.83	9	.286	132	.554	.01	.90	2.3	22-3	17	79.2		
4108	2	6 14-18	38	225	12.8	37.6	63.0	4.60	.40	.94	2.24	.65	.93	16	.279	114	7.62	-.44	.95	1.6	20-3	10	84.3	1	
* 4111	2	6 14-20	-31	226	16.8	12.6	37.2	2.46	.63	.91	4.0	.263	.83	14	.306	120	.422	.03	.58	-.8	90-2	81	85.7		
4112	2	6 14-21	58	228	17.9	14.1	36.7	2.24	.55	1.02	3.5	.184	.83	21	.267	111	1.12	-.12	.92	1.8	17-3	16	84-8	2	
4114	2	6 14-27	17	220	15.2	10.7	37.3	2.51	.61	.99	4.0	.203	.83	9	.286	132	.554	.01	.90	2.3	22-3	17	79.2		
7891	3	6 16-21	11	242	14.7	9.7	34.3	2.51	.61	.99	4.8	.189	.83	21	.272	114	7.62	-.44	.95	1.6	20-3	10	84.3		
7895	3	6 16-31	-29	266	16.8	12.6	37.8	2.83	.81	.93	5.0	.261	.83	16	.279	122	.589	.06	.99	.9	2.1-2	29	86.4	1	
7897	3	6 16-31	78	87	20.2	16.9	34.5	1.60	.45	.88	2.3	.124	.85	25	.208	93	14.13	-.37	.28	.28	1.3-3	35	96.9		
* 7899	3	6 16-31	-26	269	29.5	38.5	3.33	.86	.46	.62	100	.265	.83	5	.85	1.69	.65	.56	1.0	82-4	18	90-2			
* 7902	3	6 16-35	-5	318	58.9	39.9	57.8	.98	.25	11.3	303	.85	147	28	.38	2.03	1.41	.61	.49	2.8	110.8				
* 7906	3	6 16-36	67	250	22.0	19.4	37.3	2.49	.59	.02	4.0	.178	.85	31	.262	98	1.18	.01	.78	.65	77-3	48	93-7		
7914	3	6 20-32	23	331	61.6	60.3	40.5	8.52	.90	.89	16.2	.222	.89	121	.311	36	1.19	.66	.66	.3	27-5	18	111.9		
* 3346	2	6 17-37	75	241	21.2	18.2	36.5	2.16	.53	1.00	3.6	.165	.86	29	.251	98	4.67	-.15	.70	-.8	15-2	27	87.5	-6	
* 4125	2	6 19-30	29	241	18.3	14.8	37.8	2.84	.66	.97	4.7	.209	.88	18	.297	114	10.18	.14	.93	1.3	65-3	35	84.0		
4128	2	6 19-32	-14	270	25.0	22.5	36.3	2.08	.73	.56	3.6	.274	.88	8	1	.88	5.81	.12	.72	.5	11-3	11	85.4	-3	
4131	2	6 19-42	2	305	34.0	32.4	27.6	.90	.64	1.7	.251	.88	50	.59	.53	1.26	.01	.86	.4	67-4	15	94-0			
4133	2	6 19-43	36	312	49.6	48.4	40.3	7.25	.88	.88	13.6	.224	.86	312	.379	1.05	.79	.03	.94	.6	19-4	15	106.3		
7914	3	6 20-32	23	331	61.6	60.3	40.5	8.52	.90	.89	16.2	.222	.89	121	.311	36	1.19	.66	.66	.3	27-5	18	111.9		
7920	3	6 20-35	53	259	20.6	17.5	35.7	1.89	.47	1.00	2.8	.200	.89	29	.288	96	6.00	-.28	.69	1.1	18-3	14	85.0	1	
* 7922	3	6 20-36	16	283	22.3	19.4	31.1	1.14	.47	.60	1.7	.286	.89	26	.15	.76	16.80	-.50	.96	.8	87-7	1			
7924	3	6 20-37	-9	259	20.1	17.0	36.3	2.07	.64	.75	3.4	.251	.89	7	.339	100	7.17	-.03	.67	.1	31-3	32	93.1		
* 7926	3	6 20-37	-21	0	64.1	62.9	37.2	2.46	.63	.91	4.0	.137	.89	145	.226	22	.75	.03	.94	.0	20-4	18	108.1		
* 7929	3	6 20-40	-5	340	69.4	68.3	41.7	19.00	1.00	.73	.381.3	.244	.89	174	.333	19	.60	.400	.64	1.0	11-3	31	112.9		
* 7930	3	6 20-42	60	289	12.3	5.6	28.9	.97	.05	.93	1.0	.343	.89	11	.72	.80	.60	-.97	.92	1.3	88-3	18	112.9		
* 7934	3	6 20-43	-12	336	62.6	61.6	37.3	2.53	.83	.44	4.6	.105	.269	176	13	26	.24	.42	.68	.2	16-4	20	108.2		
* 4136	2	6 21-42	35	319	53.4	52.3	41.1	17.31	.95	.91	33.7	.218	.90	308	52	.275	1.81	.99	1.2	13-3	23	108.5			
* 4138	2	6 21-42	19	6	68.7	67.6	38.7	18.01	.95	.89	35.1	.137	.90	227	20	.85	1.85	.68	.68	0	35-6	24	113.4		
* 4141	2	6 22-18	61	179	16.9	12.9	37.3	2.50	.60	.99	4.0	.160	.21	251	91	.211	7.33	.00	.03	19-2	43	83.7			
* 4143	2	6 22-19	-9	277	21.5	19.0	38.0	2.94	.84	.67	5.4	.247	.89	14	.74	.76	.65	.55	1.4	18-3	48	99.5			

TABLE 7.—Orbital and physical parameters of 2,539 double-estimation meteors (continued)

Trail No.	Mr.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	θ	q'	ω	Ω	i	λ	$\alpha_{\text{C.W.}}$	$\delta_{\text{C.W.}}$	H_p	H_{B}	A
No. 1	6	22.20	-2	24.3	17.6	13.6	36.8	2.29	.62	.87	3.7	51	271	5	322	113	.00	.53	.51-3
* 4147 2	6	22.20	-1	26.5	22.7	19.7	36.7	2.23	.70	.67	3.8	261	91	4	351	95	.01	.64	.92-2
* 4148 2	6	22.35	8	25.5	21.9	19.2	39.0	4.03	.79	.83	7.2	234	91	16	325	105	.05	.54	.92-1
* 4151 2	6	22.38	13	4.	70.9	69.8	41.6	78.89	.77	.87	1.15	46	163	246	12	.30	1.11	.49	.65-4
12585 4	6	23.20	-19	24.3	11.8	4.1	31.3	1.16	.17	.97	1.04	229	91	0	320	117	.09	.79	.18-2
12589 4	6	23.21	53	25.5	26.6	24.1	40.9	12.03	.92	1.00	23.1	195	91	35	286	99	.95	1.04	.11-3
12597 4	6	23.22	-1	26.6	26.8	20.3	52.9	.87	.87	.67	9.9	254	91	16	305	95	.99	.89	.50-3
12599 4	6	23.24	-17	22.8	18.1	14.5	40.2	7.03	.87	.94	13.1	214	91	0	305	130	.26	.99	.13-2
12603 4	6	23.24	0	24.2	18.2	14.6	38.5	3.41	.73	.91	5.9	222	91	8	313	119	.717	.87	.1.1
* 4153 2	6	23.29	-17	25.6	20.5	17.4	37.7	2.77	.72	.78	4.8	244	92	3	336	105	.23	.69	.1
4154 2	6	23.30	2	197	11.5	4.2	33.3	1.40	*28	1.02	1.8	187	92	1	278	165	.11	.61	.9
4156 2	6	23.34	-4	26.1	40.5	39.2	53.0	-	5.57	1.76	.63	6.4	246	92	20	338	100	.597	.104
4167 2	6	23.20	-10	25.7	21.8	18.7	38.7	3.99	.81	.88	7.8	272	93	7	335	105	.681	.446	
12609 4	6	24.20	-27	254	21.9	18.8	39.0	3.99	.81	.88	7.2	272	93	12	340	106	.81	.57	
4158 2	6	24.21	36	289	13.4	7.3	28.4	.95	.14	.82	1.01	301	93	12	544	44	.90	.86	
4161 2	6	24.25	-35	275	24.1	21.3	35.8	1.91	.69	.58	3.2	92	273	9	89	655	.03	.42	.8
12618 4	6	24.26	-24	287	33.6	31.6	37.9	2.89	.90	.30	5.5	119	272	2	31	77	.81	.72	.18-3
12620 4	6	24.27	-9	294	44.8	43.2	42.3	18.14	1.01	.16	-	313	92	35	45	68	.814	.63	.74-4
4169 2	6	24.30	-10	26.7	24.7	22.2	38.5	3.34	.80	.66	6.0	258	93	9	350	96	.66	.75	.13-2
4171 2	6	24.31	37	274	18.8	15.3	32.5	1.29	.31	.89	1.7	241	93	25	334	88	.1298	.66	
4173 2	6	24.34	-15	311	42.4	40.9	33.2	1.38	.99	.02	2.7	348	93	24	81	53	.570	.133	.63-4
4175 2	6	24.34	-20	268	24.1	21.6	37.8	2.79	.77	.64	5.0	262	93	2	354	95	.1.94	.34	
4177 2	6	24.42	32	341	63.8	62.8	43.2	-	1.14	1.00	-	1.94	287	93	119	37	.58	.97	.1.3-2
12624 4	6	25.19	32	264	16.1	13.2	32.7	1.32	.50	.50	1.7	238	93	16	331	97	.1149	.60	
12692 4	6	25.20	14	270	21.9	18.7	35.4	1.80	.58	.76	2.8	252	93	21	345	92	.1440	.18	
12694 4	6	25.21	-5	283	17.0	12.6	29.8	1.04	.40	.63	1.4	291	93	8	24	80	.850	.62	
* 12696 4	6	25.21	15	264	24.0	21.2	38.5	3.43	.77	.61	2.39	93	22	332	98	.1310	.41	.91	
4181 2	6	25.22	-11	278	30.4	28.2	39.0	3.92	.88	.48	7.4	277	94	13	11	665	.666	.78	
12700 4	6	25.22	-2	250	19.1	15.6	38.1	3.01	.71	.88	5.0	228	93	10	321	112	.92	.89	
12702 4	6	25.22	-25	240	18.2	14.5	38.6	3.50	.75	.89	6.1	45	273	1	318	120	.1.36	.38	.64
12704 4	6	25.24	71	259	26.8	24.4	39.3	4.41	.77	1.01	7.8	173	93	38	266	94	.1.91	.53	.20-3
12709 4	6	25.25	72	237	21.7	18.7	2.46	2.46	.59	1.01	3.9	168	93	30	261	93	.3.77	.0.7	
12711 4	6	25.25	46	237	18.6	15.1	37.9	2.88	.65	1.01	4.7	193	93	21	286	113	.506	.13	.11-2
12713 4	6	25.26	-3	276	24.5	21.9	35.6	1.86	.68	.59	3.01	272	93	15	5	87	.11.00	.01	.81
4184 2	6	26.39	13	17	66.2	64.9	37.9	2.85	.74	.75	4.9	113	95	170	207	17	.35	.27	.41
4186 2	6	28.26	-25	289	31.6	29.5	37.6	2.70	.87	.36	5.0	113	276	3	29	80	.1.72	.57	.50
4188 2	6	28.27	-13	255	13.5	10.4	36.5	2.14	.63	.54	2.05	256	97	4	331	111	.4.18	.0.7	.1.0-3
3348 2	6	28.31	-38	330	15.8	11.1	24.2	1.77	.44	.43	1.01	153	277	12	70	53	.8.96	.71	.49-3
4190 2	6	28.32	12	261	14.6	9.7	33.0	1.36	.34	.90	1.08	236	97	10	333	104	.9.58	.56	
12715 4	6	29.19	-16	183	12.3	41.3	25.91	.96	1.02	50.8	2	277	4	278	166	.2.11	.47	.3.2	
12720 4	6	29.28	-15	280	27.5	25.2	37.7	2.75	.81	.52	5.0	276	97	7	12	87	.4.57	.42	.20-3
12722 4	6	29.29	36	301	34.1	32.0	34.6	1.63	.54	.75	2.05	256	97	56	353	68	.9.70	.26	.82-6
12726 4	6	29.30	2	309	37.2	35.3	31.2	1.05	.87	.16	2.02	326	97	50	63	57	.12.98	.20	.100-3
12728 4	6	29.30	16	273	53.1	52.0	60.8	-	2.37	.97	-	237	97	46	334	93	.6.41	.75	
12732 4	6	29.33	55	316	15.3	10.5	26.8	.87	.16	.71	1.0	351	97	21	88	66	.2.28	.91	.1.1-4
12734 4	6	29.34	-10	275	27.4	25.3	39.3	4.53	.87	.59	8.5	264	97	11	92	6.92	.81	.1.4	
10570 4	6	29.35	56	19	68.8	67.7	56.0	-	.64	2.27	.81	-	136	97	102	233	54	.2.91	.1.4
16787 4	6	29.35	14	309	28.8	26.3	27.1	.88	.66	.30	1.5	321	97	42	58	58	.15.61	.37	.9.9
4192 2	6	29.38	58	69	32.8	30.7	35.6	1.87	.74	.49	3.3	77	98	41	174	73	.15.87	.10	.12-3
4194 2	6	29.39	33	60	60.8	59.5	40.3	7.39	.94	.43	14.04	79	98	133	176	37	.3.27	.42	.1.1-4

ORBITAL ELEMENTS OF PHOTOGRAPHIC METEORS

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Ir. No.	Day	Sh.	True rad.	V_0	V_R	V_0	V_R	α	δ	ϵ	η	η'	ω	Ω	i	λ	$\alpha_{\text{J.W.}}$	K	GZ_R	M_{D}	M_{L}	n	H_B	A	
12738	4	6	29440	0	253	18.6	15.3	38.1	3.05	.71	.88	5.2	.227	.97	10	325	114	9.08	.26	.53	.5	13-2	42	90.7		
4196	2	6	29443	42	343	58.9	57.9	42.4	5.55	1.07	1.02	4.3	.282	.43	106	282	752	69	3.52	.27	.60	1.5	13-4	15	109.2	
* 4199	2	6	29443	3	-17	299	32.1	30.3	34.0	1.50	.85	.02	2.8	.314	.98	190	288	102	5.02	-.5	.92	1.5	11-3	41	98.9	
10567	4	6	30.26	54	252	27.0	24.7	42.1	-	32.23	1.03	1.01	-	2.63	.80	244	114	232	118	2.32	0.4	.53	-.3	12-1	141	86.1
10576	4	6	30.35	-16	249	16.7	12.9	37.2	2.45	.64	.02	4.0	.226	.98	2	324	118	2.32	0.4	.53	-.3	12-1	141	86.1		
12744	4	7	1.20	-12	249	20.6	17.4	40.8	10.95	.92	.88	21.0	.225	.99	5	323	120	3.98	1.42	.63	.4	15-3	13	88.0		
12864	4	7	3.17	-2	280	25.5	22.8	37.42	2.47	.75	.62	4.3	.265	.101	16	5	.90	10.43	.23	.63	.4	15-3	13	88.0		
12870	4	7	3.24	-2	270	29.2	27.0	43.4	-	6.022	1.11	.66	-	2.51	.101	4	351	101	2.43	-.64	.6	33-3	42	92.7		
12872	4	7	3.26	-28	265	21.6	18.7	38.7	3.61	.79	.77	6.5	.64	.281	2	344	106	2.08	.48	.59	1.2	13-3	11	90.7		
12874	4	7	3.26	23	261	18.3	14.6	36.0	1.99	.54	.92	3.1	.224	.101	18	324	105	12.55	-.18	.99	1.5	33-3	12	82.7		
12878	4	7	3.29	-40	259	19.5	16.2	37.8	2.83	.71	.83	4.8	.253	.101	63	354	71	9.24	-.21	.39	.6	84-3	34	88.8		
12886	4	7	3.34	25	299	43.8	42.4	43.1	-	7.91	1.08	.64	-	220	101	44	321	84	8.88	.24	.99	.4	29-6	11	89.2	
12890	4	7	3.36	44	285	29.9	27.9	38.1	3.05	.70	.92	5.2	.223	.101	125	354	41	2.42	-.91	.40	.82	1.0	109.9			
12893	4	7	3.39	10	329	73.0	72.3	53.7	1.72	.66	.92	13.9	.212	.101	37	313	95	9.44	1.04	.79	.6	15-3	18	85.5		
12895	4	7	3.40	42	270	27.5	25.5	40.3	7.42	.87	.95	13.9	.212	.101	37	313	95	9.44	1.04	.79	.6	15-3	18	85.5		
12897	4	7	3.42	47	263	27.5	25.5	41.6	53.11	.98	.98	105.2	.202	.101	36	303	99	8.93	2.76	.69	1.7	10-3	22	100.2		
* 7941	3	7	6.27	61	290	31.3	29.3	38.3	3.18	.68	1.01	5.4	.193	.104	49	296	82	2.44	.23	.87	1.0	11-3	25	101.5		
* 7944	3	7	6.31	-11	272	22.2	22.2	19.3	38.2	3.09	.76	.74	5.4	.249	.104	7	352	102	6.24	.36	.74	1.2	12-2	73	99.2	
* 7946	3	7	6.32	25	258	18.4	15.1	37.3	2.49	.62	.95	4.0	.215	.104	18	319	110	12.04	.03	.89	.7	18-1	154	88.1		
* 7947	3	7	6.36	-22	292	30.9	29.0	38.8	3.69	.89	.62	7.0	.110	.279	0	29	83	.00	.79	.60	.1	52-3	57	100.0		
12900	4	7	7.35	-32	286	26.0	23.7	38.0	2.97	.81	.58	5.4	.08	.285	7	13	91	5.31	.44	.45	1.2	33-3	54	92.7		
7965	3	7	10.33	6	278	21.7	18.8	36.9	2.31	.67	.77	3.9	.247	.108	16	355	98	12.97	.07	.87	2.3	97-2	22	78.3		
12904	4	7	10.34	47	263	55.4	53.1	40.3	7.60	.87	.99	14.2	.201	.108	33	308	100	6.75	1.04	.85	.6	12-3	12	86.6		
7972	3	7	10.40	5	291	19.0	15.9	32.0	1.23	.47	.66	1.8	.277	.108	15	24	85	14.25	-.47	.80	.2	75-3	25	85.4		
12908	4	7	10.40	15	6	71.5	70.5	42.4	-	15.31	1.07	.99	-	198	108	160	305	13	.19	-.75	.1	64-5	9	112.5		
8003	3	7	15.24	63	16	18.3	14.5	24.1	.76	.37	.68	1.0	.17	.112	28	129	55	7.81	-.78	.49	1.0	34-3	17	88.7		
* 8005	3	7	15.26	62	334	26.7	24.8	28.5	.95	.07	.88	1.0	.354	.112	50	106	313	99	5.50	-.61	.93	1.1	13-2	21	82.9	
* 8012	3	7	15.26	1	295	30.0	27.9	38.9	3.90	.86	.54	7.3	.271	.112	22	24	86	11.09	.97	.72	-.06	11-2	31	88.0		
8028	3	7	15.33	12	331	28.7	26.3	33.2	1.39	.33	.92	1.8	.337	.113	39	90	49	16.35	-.21	.85	2.3	66-6	19	96.0		
* 8030	3	7	15.33	0	323	40.8	39.2	34.7	1.65	.94	.10	3.2	.329	.113	48	91	114.40	-.70	.81	1.5	11-4	9	96.3			
8032	3	7	15.38	42	349	61.6	60.5	44.01	-	4.33	.79	.97	8.2	.206	.112	60	319	74	4.34	.58	.87	1.1	35-3	15	103.8	
8035	3	7	15.38	-1	320	34.6	33.0	1.35	.88	.15	2.6	.325	.113	32	77	62	10.82	-.38	.84	1.0	34-3	17	88.7			
8063	3	7	16.36	-12	296	26.9	24.7	37.5	2.63	.80	.52	4.7	.275	.114	8	29	88	4.87	-.00	.97	1.0	132.3	10	132.3		
8067	3	7	16.42	17	339	76.0	75.3	56.9	-	1.55	2.00	.64	-	243	113	131	356	42	2.28	.38	.97	1.0	22-2	20	94.7	
* 8050	3	7	16.43	-7	319	42.3	40.9	39.0	1.74	.79	.16	1.02	.222	.114	27	78	65	7.16	1.47	.78	1.05	22-2	20	94.7		
* 8054	3	7	16.43	39	8	63.7	62.7	41.4	26.20	.97	.86	51.5	.193	.113	96	247	51	3.29	2.20	.45	1.05	24-3	37	111.5		
* 8059	3	7	16.34	12	18	73.9	72.7	43.6	-	5.54	1.18	1.01	-	189	113	173	302	5	.04	-.44	-.6	4.94	39	114.4		
8061	3	7	16.35	51	7	59.7	58.5	42.4	-	17.72	1.06	1.00	-	166	113	108	279	43	.99	-.73	-.4	15-5	16	110.5		
8063	3	7	16.36	-12	40	296	26.9	37.5	2.63	.80	.52	4.7	.275	.114	8	29	88	5.23	.38	.69	1.07	82	21	93.8		
8067	3	7	16.42	64	12	50.2	48.9	40.3	4.00	.97	.11	7.9	.325	.114	27	78	65	7.16	1.47	.78	1.05	22-2	20	94.7		
* 8079	3	7	16.43	40	59.0	57.8	35.8	1.91	.56	.85	3.0	.222	.114	30	128	114	14.2	145	1.42	.97	1.07	82	1.05	107.4		
* 8083	3	7	16.43	5	357	65.9	65.0	40.2	7.05	.92	.57	13.5	.265	.114	167	114	167	19	2.36	.10	.60-6	4.94	22	113.5		

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True red.	V_{∞}	v_H	v_G	a	e	q	q'	ω	Ω	i	π	λ	α	δ	μ_H	μ_B	A						
3085	3	7	17+37	-17	305	29.9	27.9	2.47	.86	.39	.45	.290	.114	3	45	.81	1.71	.46	.66	.6	10-3	93-2					
3356	2	7	19+39	-11	316	27.4	22.5	.72	.79	.15	.15	.339	.117	34	95	.48	1.17	-.20	.93	1.1	16-3	95-2					
* 3355	2	7	19+41	3	-17	316	34.2	.32	.6	.249	.90	.47	.127	.297	1	63	.74	.40	.60	.60	.6	16-4	89-5				
* 3099	3	7	20+37	51	281	31.3	29.5	41.9	-8.92	1.01	.97	-.204	.117	44	321	.91	6.37	-.82	-.9	1.1	11-2	94-5					
8092	3	7	20+43	-21	320	35.0	33.4	37.0	2.38	.91	.22	4.5	.130	.297	9	67	.72	3.63	.69	.54	.5	92-4	22				
* 3360	2	7	21+36	5	-17	334	44.3	42.9	.37	.8	.280	.98	.05	.55	.158	.299	33	96	.60	7.55	1.52	.63	-.8	11-3	14		
8098	3	7	21+36	-16	320	40.0	38.5	38.2	30.13	.96	.13	.61	.322	.119	15	80	.67	4.68	1.10	.76	-.3	11-3	22				
3361	2	7	21+37	-9	322	32.0	29.9	.27	.8	.32	.5	.129	.81	.24	2.3	.135	.298	6	73	.66	.00	1.45	-.82	-.4	18-3	34	
* 8106	3	7	21+39	-19	323	40.9	39.0	42.7	40.9	12.15	.92	1.02	23.3	177	.118	73	.295	66	.00	1.45	-.82	-.4	18-3	34	106-1		
* 8108	3	7	21+40	67	334	44.1	42.7	40.9	40.0	44.1	42.7	40.9	12.15	.92	1.02	23.3	177	.118	73	.295	66	.00	1.45	-.82	-.4	18-3	34
* 8110	3	7	21+42	-15	308	30.3	29.5	37.8	2.78	.86	.39	.52	.289	.118	5	47	.82	2.66	.56	.57	1.0	22-3	43				
* 8113	3	7	23+42	3	-13	310	31.0	30.2	37.4	2.56	.86	.36	.48	.294	.118	5	52	.79	2.90	.53	.59	1.4	19-3	47			
* 3365	2	7	24+22	22	302	27.2	27.2	28.4	26.1	36.8	.71	.66	.308	.261	.121	261	.164	.280	11	.18	2.02	.76	-.2	92-4	27		
3367	2	7	24+22	59	274	27.2	27.2	28.4	26.1	36.8	.71	.66	.308	.261	.121	233	.164	.280	11	.18	2.02	.76	-.2	92-4	27		
* 3373	2	7	24+27	68	266	15.8	11.4	31.5	1.18	.14	1.02	.13	.175	.121	21	.296	.90	.06	-.00	.84	1.3	34-3	14				
* 3377	2	7	24+35	37	310	65.3	64.1	41.5	36.06	.97	.99	.67	.197	.121	130	.318	.30	.63	2.36	.76	-.8	.56	24	112-6			
* 3379	2	7	24+37	1	-11	300	24.8	22.4	30.3	25.3	.77	.59	.45	.268	.121	8	.29	.59	.67	.68	1.0	31-3	32	96-3			
8120	3	7	24+43	45	354	56.2	55.2	40.7	60.11	.85	.94	11.3	.213	.121	105	.335	.45	1.88	.87	.97	.6	12-2	111-9				
3380	2	7	25+23	10	248	15.3	10.8	37.8	2.80	.65	.99	4.6	.200	.122	9	.322	135	.544	.11	.93	.9	64-3	18	81-3			
* 3382	2	7	25+25	1	-12	300	26.9	26.4	36.8	2.27	.78	.50	.40	.279	.122	6	41	.86	3.94	.26	.71	.9	16-2	23			
* 3385	2	7	25+27	1	-8	301	26.8	24.4	38.6	3.03	.83	.58	.63	.267	.122	10	.29	.91	6.50	.57	.78	1.3	13-2	25			
* 3386	2	7	25+27	1	-9	303	24.7	22.0	36.5	2.13	.73	.57	.37	.272	.122	8	34	.89	5.80	.14	.76	1.0	21-3	28			
* 3387	2	7	25+28	1	-10	303	25.9	23.4	37.5	2.59	.78	.56	.46	.271	.122	7	33	.90	5.29	.33	.75	1.0	13-3	25			
* 3389	2	7	25+28	34	285	22.8	20.0	37.0	2.37	.62	.89	.38	.227	.122	28	.349	.95	13.26	.01	.99	.9	29-3	26				
* 3393	2	7	25+42	21	310	36.0	34.5	40.0	6.21	.91	.55	11.9	.268	.122	44	.31	.77	12.87	1.13	.82	.6	13-3	28				
* 3399	2	7	25+44	5	-17	336	43.0	41.1	37.9	2.85	.98	.06	.56	.154	.302	7	.96	.62	6.90	1.41	.61	.6	27	97-3			
* 3402	2	7	26+22	57	9	59.2	58.0	43.9	47.8	1.21	1.01	-.1	.173	.123	103	.296	48	.35	-.35	-.42	-.05	.90-4	42	114-2			
* 3405	2	7	26+22	1	-11	305	26.1	23.4	37.2	2.45	.78	.55	.43	.273	.123	8	.36	.89	5.27	.29	.67	1.7	58	97-1			
* 3416	2	7	26+26	3	-15	318	36.3	34.4	40.1	6.39	.96	.28	12.5	.299	.123	2	.62	.77	.59	1.46	.59	-.9	17-3	16			
* 3407	2	7	26+26	3	-17	321	35.0	33.9	38.5	3.34	.92	.27	.64	.123	.303	2	.66	.76	.79	.91	.55	-.9	19-3	16			
* 3408	2	7	26+28	1	-13	301	22.8	20.9	36.4	2.11	.70	.64	.36	.265	.123	5	.28	.93	4.32	.08	.74	1.8	19-3	30			
* 3410	2	7	26+28	1	-9	303	26.5	24.1	38.1	3.04	.81	.57	.53	.269	.123	9	.32	.91	6.24	.47	.77	.7	17-3	20			
* 3411	2	7	26+28	1	-13	305	24.0	21.8	36.3	2.04	.73	.57	.36	.273	.123	5	.36	.89	4.18	.11	.73	1.5	16-2	22			
* 3416	2	7	26+26	1	-11	303	25.3	23.0	37.4	2.54	.77	.57	.45	.270	.123	7	.33	.90	5.43	.30	.70	1.0	32-3	33			
* 3417	2	7	27+22	-1	298	25.5	22.9	38.5	3.35	.81	.65	.60	.259	.124	14	.23	.94	9.64	.49	.61	-.5	28-3	14				
* 3419	2	7	27+23	-7	324	40.4	38.7	40.2	6.75	.97	.17	13.3	.313	.124	16	.77	.71	5.03	1.71	.56	1.4	45-5	30				
* 3421	2	7	27+27	5	-14	339	44.4	42.8	37.7	2.70	.99	.04	.54	.159	.304	28	.103	.60	6.36	1.56	.47	0	46-5	25			
* 3424	2	7	27+28	5	-17	337	43.2	41.5	38.1	3.00	.89	.99	.07	.59	.152	.304	26	.97	.62	6.49	1.41	.49	1.4	102-0	1		
* 3429	2	7	27+22	33	-8	321	30.4	35.7	1.89	.86	.07	.27	3.5	.306	.124	10	.70	.74	4.67	.39	.77	1.0	22-3	13			
* 3431	2	7	28+31	5	-17	340	45.4	44.1	40.8	10.44	.95	.50	20.4	.273	.124	71	.37	.64	9.49	1.63	.99	.3	39-4	19			
* 3434	2	7	28+32	5	-15	338	43.4	41.8	41.8	2.53	.72	.43	.253	.124	0	.17	.101	.20	.19	.51	1.64	32	86-4				
* 3443	2	7	28+38	2	53	67.4	66.1	40.6	9.01	.91	.84	17.2	.310	.206	149	.256	23	.93	1.27	.24	.6	43-5	17				
* 3445	2	7	28+39	17	311	33.0	31.3	39.0	3.93	.86	.04	.73	.270	.126	37	.36	.80	13.60	.72	.88	1.0	16	109-3				
* 3446	2	7	29+38	5	-18	340	43.6	42.2	38.4	3.27	.98	.07	.65	.306	.124	62	.97	.62	8.43	1.46	.66	.7	21-4	12			
* 3447	2	7	29+41	5	-18	340	43.6	42.2	38.4	3.27	.98	.07	.65	.306	.124	62	.97	.62	8.43	1.46	.66	.7	21-4	12			

ORBITAL ELEMENTS OF PHOTOGRAPHIC METEORS

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Day	Sh.	True rad.	V_0	V_H	α	δ	q'	ω	Ω	i	κ	C.W.	K	CZ_R	M_{PG}	m_{eo}	n	H_B	A					
3474 2	7	29.44	46	18	60.4	59.3	39.2	4.23	.76	1.02	7.4	181	126	119	307	35	.05	1.45	.90	-2.1	11-3				
3476 2	7	29.44	-17	335	40.0	39.1	30.6	4.23	.97	.01	7.9	144	306	118	90	67	.025	1.45	.62	-	15-3				
3480 2	7	29.44	53	25	63.9	62.8	44.6	3.62	1.27	.99	-	162	126	115	288	40	.88	-	.86	108-0	10-6				
3482 2	7	29.44	53	30	60.3	59.1	41.1	15.33	.94	.95	29.7	150	126	114	276	40	1.42	1.68	.84	15	110-1				
3484 2	7	29.44	-2	308	22.5	19.9	34.4	1.58	.63	.58	2.6	276	126	12	42	87	10.09	-.15	.59	.9	36-3	30	86-4		
* 3487 2	7	29.44	5	-17	341	51.8	40.4	36.6	2.18	.97	.07	4.3	154	306	29	100	61	7.48	1.14	.66	1.79	23	97-7		
3491 2	7	29.45	71	51.8	51.5	50.2	40.9	11.69	.97	.41	23.0	77	126	109	204	46	5.42	.62	.60	1.15	10	111-8			
8124 3	8	3.18	52	270	17.7	13.8	34.5	1.59	.37	1.00	2.2	198	131	23	328	100	5.28	-	.46	.95	1.64	48-3	82-4		
* 8127 3	8	3.20	15	308	26.8	23.6	36.9	2.31	.73	.64	4.0	264	131	25	34	87	13.91	3.15	.82	-.1	33-4	18	109-9		
* 3493 2	8	3.47	7	62	40	56.8	55.6	41.7	80.75	.99	.91	160.6	143	131	102	274	47	2.59	3.15	.83	1.8	14-3	18	109-6	
8136 3	8	4.18	-56	216	64.3	63.6	87.9	-.15	7.78	1.01	-	8	311	28	320	139	.72	-	.18	.2	52-4	.49	116-2		
8138 3	8	4.19	-9	286	14.5	9.3	34.3	1.55	.41	.91	2.2	231	132	4	214	132	29	115	4.08	-.43	.80	1.0	72-3	20	83-6
* 8143 3	8	4.22	39	283	23.6	20.9	38.7	3.58	.74	.94	6.2	279	132	27	345	99	10.68	-.37	.99	-.4	11-3	43	98-6		
* 8146 3	8	4.22	-9	316	28.2	25.7	37.7	2.71	.82	.48	4.9	279	132	7	51	86	4.07	4.47	.54	1.73	78-4	16	99-8		
* 8147 3	8	4.22	1	-9	316	27.5	25.0	37.3	2.48	.80	.50	4.5	279	132	7	50	86	4.31	.35	.66	1.07	91-4	19	101-5	
* 8148 3	8	4.26	1	-9	310	25.0	22.4	37.5	2.60	.77	.60	4.6	267	132	7	39	92	5.12	.30	.76	1.1	30-3	40	99-1	
* 8149 3	8	4.26	1	-9	310	24.9	22.2	37.5	2.59	.77	.60	4.6	267	132	7	38	92	5.28	.29	.76	1.1	29-3	40	98-5	
* 8152 3	8	4.30	7	56	33	61.6	60.4	42.8	10.14	1.10	.97	-	157	132	113	289	41	1.16	2.02	.49	1.03	10-3	31	112-9	
* 8153 3	8	4.30	7	57	38	60.1	58.9	41.3	22.37	.96	.94	43.8	149	132	112	280	41	1.57	2.02	.49	1.03	18-3	32	111-9	
* 3497 2	8	4.46	75	262	28.1	26.0	37.8	2.75	.64	1.01	4.5	167	132	43	299	86	3.28	-.09	.49	.5	20-3	24	92-3		
8227 3	8	5.15	43	282	23.9	21.1	38.7	3.56	.73	.96	6.2	210	132	31	342	99	9.33	.36	.95	1.3	18-3	25	92-8		
8157 3	8	5.20	65	297	20.9	17.7	31.9	1.22	.18	1.00	1.4	207	132	33	340	81	3.85	-.76	.85	1.4	50-3	23	88-6		
8159 3	8	5.23	27	337	18.2	14.3	25.4	1.54	.80	.45	1.02	325	132	20	97	60	16.34	-.67	.80	1.7	14-2	19	84-8		
8161 3	8	5.23	8	332	52.7	51.3	48.2	1.55	1.12	.19	-	303	133	61	75	67	8.73	-.71	.77	1.4-4	34	84-9	9		
8163 3	8	5.24	66	266	24.7	22.2	37.4	2.54	.60	1.01	4.1	180	133	37	313	92	.98	.01	.82	.7	24-3	23	89-0		
* 8165 3	8	5.25	54	32	63.4	62.2	43.4	6.35	1.16	.99	-	163	133	116	296	39	.81	-.39	.58	.80	1.1	46-4	35	108-8	
* 8168 3	8	5.25	26	-1	340	42.9	37.8	37.8	.44	.62	.98	.07	5.4	220	133	24	333	133	6.03	1.36	.62	1.0-1	22-3	38	99-7
* 8169 3	8	5.29	4	286	18.7	15.3	37.9	2.83	.69	.87	4.8	229	133	14	108	51	10.57	.70	.95	.5	53-1	13	82-6		
* 8176 3	8	5.31	61	17	56.3	41.3	19.99	.95	1.01	39.0	174	133	99	307	49	.00	1.09	.69	.9	81-5	9	109-0			
8178 3	8	5.32	-5	12	339	43.4	41.9	40.8	10.19	.99	.91	20.3	145	133	13	107	67	2.75	2.32	.68	.2	67-4	24	100-9	
* 8180 3	8	5.33	-5	333	33.1	30.3	36.1	1.99	.90	.20	3.8	314	133	11	87	70	4.27	.58	.80	.5	11-3	26	97-6		
8182 3	8	5.33	-9	279	16.0	11.9	37.2	2.44	.62	.92	4.0	220	133	55	353	123	4.86	-.02	.63	1.0-1	22-3	38	82-0		
* 8184 3	8	5.33	25	346	16.2	11.0	23.6	1.75	.46	.41	1.01	335	133	14	108	51	10.57	.70	.95	.5	53-1	13	82-6		
* 8187 3	8	5.34	5	-15	343	41.6	40.0	38.0	2.95	.97	.10	5.8	147	133	24	99	64	1.24	.65	.65	.3	88-3	30	102-5	
* 8189 3	8	5.34	3	3	296	21.6	18.8	38.3	3.13	.75	.78	5.5	242	133	13	113	113	.34	.78	.22	.44	44	94-1		
* 8192 3	8	5.35	-17	344	25.4	22.9	28.5	2.95	.72	.26	1.6	140	133	10	93	65	6.76	-.23	.68	1.0-	27-3	26	90-6		
8193 3	8	5.35	6	296	21.5	18.7	38.0	2.94	.73	.79	5.1	142	133	14	102	11.97	.28	.78	1.1-2	13-2	20	85-9			
* 8199 3	8	5.36	31	331	21.8	18.9	27.3	3.89	.47	.47	1.3	313	133	30	85	65	17.13	-.61	.99	-.2	62-3	21	88-3		
8202 3	8	5.37	-20	312	25.1	22.8	38.6	3.39	.82	.61	6.0	83	133	2	36	94	1.17	.54	.56	1.0-6	26-3	46	92-7		
8208 3	8	5.41	7	37	56.9	55.7	39.0	3.90	.76	.94	4.9	147	133	109	280	42	1.61	.45	.79	.1	15-4	11	104-3		
* 8210 3	8	5.42	1	342	39.0	37.6	34.0	1.50	.95	.08	2.9	334	133	26	107	60	7.68	.77	.82	-.4	15-3	27	97-0		
* 8215 3	8	5.43	63	327	41.3	39.1	36.0	19.53	.95	.91	38.1	142	133	70	274	68	5.11	1.91	.60	1.0-3	62-4	36	100-8		
* 8224 3	8	5.44	7	57	41.3	39.4	41.3	23.08	.96	.96	45.2	153	133	25	99	65	7.00	2.04	.87	-.2	30-4	18	109-3		
* 8225 3	8	6.16	1	-7	308	24.6	21.7	38.2	3.08	.79	.65	5.5	260	133	8	33	95	5.86	-.42	.58	1.0-7	10-2	16	97-9	
8229 3	8	6.16	-33	290	18.1	16.2	37.9	2.88	.70	.87	4.9	149	133	4	117	4.11	.21	.49	.5	74-5	22	89-1			
* 8233 3	8	6.17	-26	272	15.8	11.4	37.9	2.86	.67	.95	4.8	313	133	1	347	132	.84	.16	.65	1	12-2	20	83-3		
* 8235 3	8	6.17	-12	327	34.1	32.0	36.8	3.65	.92	.31	7.0	297	133	1	70	178	.62	.91	.36	1.21-3	45	99-8			
* 8238 3	8	6.21	5	-15	344	41.2	39.4	37.8	2.87	.96	.11	5.4	313	133	25	99	65	7.00	1.14	.28	103-7	58	102-0		
* 8240 3	8	6.22	37	287	28.7	26.5	40.0	5.84	.85	.85	10.8	249	133	36	2	11.91	.97	.86	.98	96-3	46	102-2			
* 8244 3	8	6.24	25	259	16.5	12.5	38.0	2.95	.66	1.00	4.9	198	133	14	331	126	6.07	.16	.88	1.8	14-2	71	89-2		

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Tr. No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	η	μ	ρ_L	i	π	λ	C.M.	K	GZ_R	H_p	H_a	n	H_b	A		
8245	3	8	6.26	57	24	63.8	62.7	45.7	-	2.63	1.38	1.01	-	0.9	174	133	112	307	43	1.34	.9	57.5	9	114.1	17		
8247	3	8	6.26	57	32	42.3	40.7	39.4	-	4.61	.94	.29	-	0.9	298	133	55	72	66	114.9	1.15	.85	.7	34.7	17	97.6	17
8249	3	8	6.27	69	186	18.0	40.6	40.4	32.9	1.34	.31	.92	-	1.8	127	133	23	260	91	12.34	.55	.47	.9	41.3	18	99.1	18
* 8254	3	8	6.30	5	-15	342	41.7	40.1	38.9	3.81	.97	.11	7.5	144	314	19	98	66	5.38	1.42	.60	1.6	31.4	26	102.4	26	
8257	3	8	6.31	47	342	41.8	46.4	46.4	39.6	4.83	.84	.79	-	240	134	83	13	58	5.32	.74	.92	1.6	92.5	12	95.7	12	
8261	3	8	6.33	22	239	12.8	7.1	35.0	1.01	1.69	1.06	1.01	-	2.6	185	134	8	319	138	1.06	-.40	.56	1.4	12.2	26	79.7	26
* 8266	3	8	7.39	-14	321	22.8	20.1	36.4	1.57	.66	.54	2.6	-	280	135	1	331	138	3.90	-.19	.33	.5	27.2	24	86.5	24	
* 8294	3	8	7.40	11	254	13.7	8.7	36.3	2.06	.52	1.00	3.01	-	1.96	135	8	331	138	3.90	-.19	.33	.5	35.2	39	93.4	39	
* 8304	3	8	8.19	-13	315	22.0	18.8	36.3	2.06	.68	.93	2.6	-	262	135	3	315	138	3.90	-.19	.33	.5	27.2	22	83.6	22	
* 8307	3	8	8.19	3	-15	336	30.0	34.0	38.5	3.32	.93	.24	6.4	-	315	8	81	74	2.93	.94	.34	.8	22.3	62	101.3	62	
8312	3	8	8.24	-3	275	13.5	8.0	36.8	1.65	.42	.96	2.3	-	215	135	5	350	127	4.07	-.40	.87	2.4	30.3	15	76.5	15	
8314	3	8	8.26	-19	306	20.1	16.8	36.7	2.01	.66	.75	3.07	-	250	135	0	26	102	.20	.04	.66	1.5	18.3	17	88.5	17	
8316	3	8	8.27	7	59	60.3	59.2	42.8	-10.34	1.10	.99	2.3	-	164	135	109	300	43	.20	.04	.66	1.5	18.4	18	108.9	18	
8318	3	8	8.27	5	-10	347	61.3	39.6	36.7	2.20	.97	.07	4.3	-	153	315	14	109	62	3.92	1.13	.67	.3	38.4	16	95.2	16
8320	3	8	8.29	11	56.6	55.3	4.3	19.37	.95	1.00	37.7	193	135	102	329	47	.60	1.86	.10	1.0	1.14	13	111.8	13			
8322	3	8	8.32	-16	348	48.4	47.0	43.0	-	9.15	1.01	.07	-.7	-	148	315	45	103	64	8.44	-.60	.5	.62	4	95	116.7	4
8324	3	8	8.32	7	54	45	60.9	59.7	40.5	8.08	.89	.93	15.2	-	145	135	118	281	37	1.48	1.12	.53	.2	20.4	18	112.3	18
8326	3	8	8.34	0	342	31.7	29.6	30.5	1.08	.86	.16	2.0	-	327	135	14	102	62	6.17	.14	.64	.4	4	4	75.9	4	
8328	3	8	8.36	-17	350	51.7	50.4	45.3	-	2.95	1.03	-.07	-	-	146	315	59	102	63	8.58	-.14	.64	.1.4	80.5	12	99.8	12
8330	3	8	8.36	7	56	44	59.4	58.2	39.9	5.78	.84	.93	10.6	-	145	135	114	281	39	1.58	.82	.64	.8	10.4	13	108.9	13
8332	3	8	8.36	7	309	23.3	20.8	37.0	2.73	.76	.66	4.8	-	259	135	8	34	96	6.41	-.30	.71	1.7	21.3	35	96.7	35	
8334	3	8	8.36	1	-7	347	22.5	19.6	25.3	.80	.69	.25	1.4	-	328	136	6	104	58	4.35	-.36	.86	1.7	99.4	16	83.6	16
8341	3	8	8.39	7	57	41.2	39.7	37.3	2.46	.96	.09	4.8	-	149	316	27	104	63	7.41	1.11	.70	.7	54.4	29	101.3	29	
* 8344	3	8	8.39	5	-15	348	41.2	39.7	37.3	2.46	.96	.09	4.8	-	149	316	27	104	63	7.41	1.11	.70	.7	54.4	29	101.3	29
* 8346	3	8	8.40	7	57	52	56.5	55.2	38.0	3.02	.73	.83	5.2	-	125	136	111	260	41	2.54	-.28	.69	1.2	67.5	9	104.5	9
8348	3	8	8.41	7	61	43	56.3	55.1	40.1	6.16	.85	.93	11.4	-	146	136	105	281	45	1.99	-.88	.75	.6	13.4	13	110.9	13
8350	3	8	8.41	40	41	68.7	67.7	42.3	-23.84	1.04	1.00	1.00	-	165	136	142	301	23	.31	-.81	.61	1.62	4.9	14	114.9	14	
8363	3	8	9.20	30	255	17.6	13.9	39.9	3.88	.74	.71	.01	6.8	-	192	136	17	328	125	3.98	-.42	.62	.3	16.3	21	90.4	21
8361	3	8	9.21	11	281	19.2	15.8	39.3	4.32	.79	.92	7.7	-	218	136	13	354	118	10.28	.56	.94	1.8	26.3	23	96.2	23	
* 8368	3	8	9.22	-3	320	27.9	25.5	37.4	2.53	.80	.50	4.6	-	279	136	12	55	86	7.29	-.37	.72	.5	31.3	43	100.9	43	
8369	3	8	9.23	39	259	17.5	13.8	37.4	2.51	.60	1.00	4.0	-	193	136	19	329	115	4.39	-.00	.90	1.7	28.3	21	91.3	21	
8371	3	8	9.25	0	344	42.5	40.8	37.1	2.40	.97	.07	4.7	-	334	136	25	110	61	6.29	1.24	.60	.3	58.4	21	103.1	21	
8374	3	8	9.39	7	57	43	61.8	60.7	42.4	-17.13	1.06	.96	4.7	-	153	136	142	301	23	1.28	-.74	.6	29.4	21	109.2	21	
8379	3	8	9.40	42	49	65.3	64.1	39.6	4.95	.81	.92	9.0	-	142	136	139	279	25	.89	.69	.73	.3	13.4	17	110.5	17	
8383	3	8	9.41	7	60	47	58.2	57.1	40.8	11.02	.92	.92	21.1	-	143	137	108	280	43	1.99	1.40	.75	.8	99.5	12	112.0	12
* 8389	3	8	9.46	33	24	68.1	67.2	42.4	-18.91	1.05	.92	2.5	-	215	137	142	352	25	8.82	-.82	.99	.1	11.4	15	110.0	15	
* 8394	3	8	10.23	-7	262	14.1	14.0	31.0	2.36	.59	.98	3.07	-	206	137	4	343	138	1.29	-.04	.79	1.0	26.2	61	80.7	61	
* 8401	3	8	10.25	7	59	44	59.9	58.7	41.6	51.49	.98	.95	102.0	-	151	137	111	288	42	1.75	2.74	.36	.77	37.3	55	115.7	55
* 8417	3	8	10.33	3	338	29.1	26.9	31.5	1.07	.79	.25	2.1	-	316	137	14	93	68	7.78	-.01	.66	-.1	31.3	18	88.2	18	
8418	3	8	10.36	7	59	41	60.6	59.5	42.6	-13.08	1.07	.97	-	-	157	137	111	294	42	1.29	-.67	.67	-.3	27.4	18	110.2	18
* 8413	3	8	10.31	65	274	26.2	24.0	37.9	2.87	.65	1.01	4.7	-	185	137	39	322	90	1.04	1.13	.75	1.6	92.4	50	102.8	50	
* 8415	3	8	10.31	-19	262	14.1	9.0	31.0	2.48	.60	.98	.90	-	203	137	1	340	145	.92	-.00	.48	1.5	52	60.7	60	111.1	60
* 8416	3	8	10.33	3	336	28.0	25.8	31.6	1.18	.76	.29	2.0	-	311	137	15	89	70	8.86	-.07	.79	1.1	59.3	22	88.0	22	
* 8417	3	8	10.33	3	338	29.1	26.9	31.5	1.07	.79	.25	2.1	-	316	137	14	93	68	7.78	-.01	.66	-.1	31.3	18	88.2	18	
8418	3	8	10.40	7	58	46	61.2	60.1	42.6	-13.91	1.07	.94	-	-	150	137	113	287	41	1.50	-.74	.74	-.7	81-5	11	111.6	11

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Ir.	No.	Day	Sh.	True node	V_0	V_H	α	δ	V	θ	q	q'	ω	$\delta\ell$	i	π	λ	C_{He}	K	C_{He}^*	H_{pg}	m_{eq}	n	H_B	A	
8433	3	6	10+41	6	6	39	326	18.0	14+4	28.4	59.4	.31	.65	1+2	302	137	24	79	72	15.85	.75	.91	.5	95-3	17	93-8	
8435	3	6	10+41	7	58	43	61.5	60+4	42.7	12.0	.08	.96	-	154	113	292	41	1.22	-	.79	.0	.80	.5	11-4	16	28-4	
8437	3	6	10+43	7	60	42	59.5	58+4	41.9	99.47	1.01	.96	-	155	137	109	292	43	.65	-	.80	.5	11-4	15	109-8		
* 8441	3	8	10+43	7	0	343	40.0	38.6	37.0	23.34	.98	.10	.46	327	137	21	104	64	6.29	1.02	.76	1+4	25-4	16	96-0		
* 8658	3	8	10+44	7	57	47	60.4	59.3	41.4	25.75	.96	.94	50.6	147	137	114	285	40	1.66	2.14	.82	-.9	65-4	25	113-7		
8661	3	8	10+44	7	0	61.3	60.4	48.3	-	1.52	1.64	.97	-	201	138	100	339	52	1.57	-	.86	-1+7	.68-4	14	111-9		
* 8666	3	8	10+46	1	-7	310	22.7	20.5	31.6	2.67	.75	.67	4+7	258	138	7	35	97	6.49	.27	.38	1+2	.60-3	.59	98-3		
* 8666	3	8	10+46	7	57	46	61.0	59.3	41.7	105.68	.99	.94	210+0	219	115	287	40	1.40	3.37	.86	0	18-4	15	109-6			
* 8446	3	8	11+43	29	281	20.8	18.0	39.2	4.18	.77	.94	7.4	213	138	22	351	109	11.79	.52	.42	1+2	.13-2	.91	96-1			
* 8447	3	8	11+43	36	65	75	58	49	57.9	56.8	39.4	4.55	.80	.93	8+2	145	139	111	284	41	1.35	2.05	.60	.04	1+4	14	109-6
* 8679	3	8	11+47	7	57	46	60+8	59.7	41.4	23.35	.99	.95	270+2	151	138	114	290	41	1.42	3.59	.87	-2+5	.42-3	44	119-7		
* 8652	3	8	12+34	7	58	47	60.2	59.0	41.4	45.7	.95	.95	45+7	150	139	113	290	41	1.71	.60	.75	.07	.65	10	107-1		
8466	3	8	12+40	36	65	75	301	317.9	36.0	41.3	1.98	1.01	37.4	180	140	59	320	77	.00	1.85	.73	1+3	.29	14	91-8		
8466	3	8	13+18	75	301	317.9	36.0	41.3	1.98	1.01	37.4	125	139	115	285	24	.95	-	.62	.07	.71	.22	120-4				
* 8469	3	8	13+24	7	59	50	60.5	59.4	41.5	28.25	.97	.94	55.6	148	140	114	288	40	1.60	2.22	.33	-2+6	.96-3	80	117-5		
8470	3	8	13+24	44	20	63.3	62.1	62.1	41.07	79.17	.99	.93	157.4	214	140	122	354	35	1.15	3.13	.51	.07	1+3-4	19	112-3		
8472	3	8	13+25	34	341	46.8	45.3	46.8	40.4	7.15	.94	.50	15.0	272	140	75	53	61	8.71	1.36	.4	.59-4	28	108-4			
* 8476	3	8	13+26	49	276	22.1	19.4	38.3	31.17	.69	.99	5.4	199	140	29	339	102	7.09	.23	.86	-.1	.84-3	52	97-9			
* 8477	3	8	13+31	59	39	66.2	67.1	49.1	-	1.35	1.74	1.00	-	168	140	116	308	41	.61	-.58	1+0	45-5	10	113-8			
8707	3	8	13+32	7	-5	347	44.3	42.8	40.1	6.19	.99	.06	12.3	332	140	1	112	64	.20	2.08	.75	-.3	.99-4	26	108-8		
8715	3	8	13+32	-5	-5	340	37.0	35.4	36.5	2.13	.92	.18	4+1	316	140	24	97	68	8.16	.68	.89	-.1	.17-3	.31	102-5		
8481	3	8	13+35	-4	-9	352	42.0	40.5	39.3	2.16	.97	.07	4+9	154	320	20	114	62	5.33	1.26	.75	-.1	.29	4	97-7		
8483	3	8	13+35	5	-9	352	42.0	40.5	39.3	2.16	.97	.07	4+9	154	320	1	16	112	1.03	-.53	.59	1+2	.67-3	17	83-5		
8486	3	8	13+36	-24	301	13.6	8.3	33.4	1.40	.36	.90	1.9	55	320	1	16	112	1.03	-.53	.59	1+2	.67-3	17	83-5			
8488	3	8	13+36	7	35	43	67.2	66.0	39.0	3.82	7.4	1.01	6.6	179	140	150	319	17	.09	.40	.67	.3	4+4-5	6	109-3		
8492	3	8	13+36	7	59	48	61.4	60.4	42.5	15.11	1.06	.95	-	152	140	113	293	41	1+40	1.57	-	.73	.0	20-4	17	109-3	
8494	3	8	13+39	7	58	48	60.9	59.8	41.9	93.61	1.01	.95	-	151	140	113	292	40	1.57	1.52	-.02	.42-1	.66-2	.84-2	88-2		
8499	3	8	13+41	48	42	61.9	63.9	41.5	31.04	.97	1.00	61.1	168	140	128	308	31	.96	2.28	.83	.2	12-4	14	108-0			
8501	3	8	13+41	7	59	44	61.7	60.6	42.9	-	10.02	1.10	.98	-	159	140	113	299	41	1+00	-	.79	.5	.68-5	9	110-8	
8503	3	8	13+41	38	8	60.7	59.7	41.6	4.40	94.40	1.01	.70	-	247	140	118	288	41	3.26	1.00	.57	.44	1+6	34-3	56	84-8	
8505	3	8	13+41	-19	316	2.01	21.7	36.8	3.65	.82	.66	6.6	78	320	2	38	98	1+0	1.50	1.57	.44	1+6	34-3	56	84-8		
* 8505	3	8	13+42	74	128	12.7	6.2	27.9	.91	.15	.78	1.0	36	140	10	176	70	3.97	-.91	.65	.7	13-2	17	81-1			
* 8510	3	8	13+43	27	280	17.7	14.3	37.3	2.50	.62	.96	4.0	212	140	11	352	113	11.55	-.02	.42-1	.66-2	.84-2	88-2				
* 8512	3	8	13+43	7	59	50	59.7	58.6	41.2	16.35	.94	.94	32+2	148	140	112	288	41	1+53	1.75	.79	.0	1+6-4	16	111-1		
8514	3	8	13+43	57	49	70.7	69.9	51.4	51.4	.99	.97	.97	-	158	140	116	299	41	1+08	1.7	.80	.0	1+6-4	16	111-1		
8516	3	8	13+44	7	57	49	61.6	60.6	42.1	45.48	1.02	.95	-	151	140	115	292	39	1.30	-.1	.82	.0	1+6-4	16	111-1		
8518	3	8	13+44	7	59	53	60.2	59.1	41.5	30.53	.97	.92	60+3	144	140	113	284	41	1.76	2.30	.80	.3	1+3-4	13	107-8		
8520	3	8	13+45	35	52	68.9	67.9	40.9	11.54	.92	.96	22+1	152	140	152	293	18	1.45	1.43	.86	1+2	.33-5	9	109-5			
8522	3	8	13+45	63	344	46.4	45.3	41.0	12.51	.92	.97	24+0	205	140	78	345	62	2.89	1.49	.80	1+6	86-5	8	102-6			
8526	3	8	13+45	23	12	46	71.4	70.4	41.3	20.21	.95	1.00	39+6	13	320	172	334	6	.07	1.91	.85	.7	47-5	10	111-2		
* 8526	3	8	13+46	7	57	47	60.5	59.3	41.2	17.74	.95	.96	34+5	153	140	114	293	40	1.30	1.80	1.00	.16	.63-4	40	113-0		
* 8531	3	8	13+46	31	342	49.0	48.0	42.6	13.41	1.03	.46	-	274	140	78	55	61	8.77	-.07	.86	-.1	.79-4	22	98-8			
8530	3	8	13+46	68	65	43.2	41.7	36.4	1.27	.43	.72	1.8	93	140	84	233	51	5.10	-.49	.73	1.5	15-4	12	94-7			
8532	3	8	13+46	7	57	47	63.0	61.9	43.4	6.62	1.15	.97	-	156	140	116	296	39	1.15	-.03	.86	.9	47-5	8	108-8		
8533	3	8	13+46	23	23	68.0	67.1	42.2	-	27.74	1.03	.71	-	155	140	155	26	25	1.03	-	.99-6	14	111-9				
8536	3	8	13+46	7	59	52	61.3	60.4	41.6	40.9	10.09	.93	-	148	140	112	289	42	1.59	1.00	.83	-.1	22-6	16	110-6		
8540	3	8	14+07	18	298	2.3	20.4	4.6	4.78	.83	.84	8+7	-	232	141	20	13	104	12.04	.70	.91	1.6	19-3	31	97-3		
* 8719	3	8	14+19	7	57	51	60.1	58.9	40.8	10.19	.91	.94	19+4	147	141	114	289	40	1.52	1.33	.20	25	99-4	25	99-4		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	a	e	q	q'	ω	Ω	i	λ	α_{H}	δ_{H}	χ_{CZ}	χ_{R}	χ_{D}	χ_{E}	n	H_B	A		
No. 542	3	8	14.28	6	358	55.1	53.0	40.7	.918	.98	.17	18.2	313	141	113	94	48	6.67	1.99	.76	-.3	63-4	30	110.6		
No. 8725	3	8	14.29	6	56	65.3	64.0	1.00	1.96	.96	.203	103	141	113	94	51	344	1.60	1.14	1.85	-.47	2.6	63	127.3		
* 8726	3	8	14.29	7	57	48	61.0	59.9	41.3	18.60	.95	.36-2	153	141	116	294	39	1.14	1.14	1.85	-.47	3.6	20-2	59	118.2	
* 8546	3	8	14.30	-29	304	18.7	15.3	37.9	2.79	.70	.83	4.8	55	321	4	16	112	3.81	2.0	.55	-.8	26-2	114	90.0		
* 8553	3	8	14.36	7	56	60.6	59.5	40.6	8.67	.89	.96	16.4	153	141	116	294	38	1.18	1.17	.67	-.2	27-4	17	109.0		
8558	3	8	14.37	9	351	25.7	23.3	25.9	.82	.76	.20	1.4	330	141	17	111	57	9.82	-.23	1.6	15-3	34	88-6			
8560	3	8	14.37	-15	307	17.3	13.0	35.7	1.87	.57	.81	2.9	244	141	2	25	106	2.17	-.17	.58	1.0	32-3	14	85-0		
8565	3	8	14.41	35	64	68.0	66.6	40.8	10.65	.93	.79	20.5	123	141	154	264	21	1.06	1.06	.66	-.5	98-5	14	111.9		
8567	3	8	14.41	7	56	48	61.7	60.0	45.4	4.91	.98	.96	86.9	154	141	117	295	38	1.13	1.13	.67	-.2	106-7	10	111.3	
* 8572	3	8	14.43	1	24	64.2	63.2	40.8	10.72	.96	.43	21.0	101	321	160	62	31	1.34	1.72	.83	-.4	31-4	20	112.8		
* 8575	3	8	14.44	-34	33	55.7	54.5	44.4	-4.03	1.19	.73	-.76	-	58	321	94	20	54	6.47	-.40	.5	4.8-4	38	116.2		
8581	3	8	14.45	44	3	57	68.8	67.8	40.8	10.58	.92	.82	20.3	53	321	164	14	18	1.16	1.16	.50	-.2	27-4	26	109-1	
8736	3	8	14.45	5	37	68.8	67.8	40.8	10.58	.92	.82	20.3	115	232	141	115	39	2.34	.93	.97	-.3	13-4	13	109.8		
* 8583	3	8	14.47	44	14	59.1	58.2	40.1	6.15	.86	.83	11.5	232	141	115	13	39	1.15	1.15	.50	-.2	34-4	21	110.5		
* 3567	2	8	15.32	-13	325	26.8	24.5	38.3	3.11	.83	.54	5.7	272	142	0	54	90	.28	.52	.72	.3	51-3	45	100-1		
* 3568	2	8	15.33	62	289	24.8	21.8	37.6	2.61	.62	1.00	4.2	41	339	88	4.23	.04	.78	.0	87-5	66	105-6				
* 3571	2	8	15.38	5	350	36.8	35.1	33.1	1.36	.93	.10	2.6	331	142	22	113	61	7.42	.54	.89	-.1	75-3	37	100-3		
* 3574	2	8	15.38	3	350	36.0	34.3	30.7	1.30	.92	.10	2.5	331	142	17	113	61	6.04	.50	.87	-.1	75-3	35	99.7		
8597	3	8	15.38	7	59	58	59.0	57.8	40.6	8.72	.90	.89	16.6	138	142	111	281	41	2.07	1.21	.65	-.2	34-4	21	110.5	
8697	3	8	15.42	52	52	63.1	62.0	41.0	12.86	.93	.95	24.8	150	142	126	292	34	1.09	1.53	.81	-.4	20-6	13	112.4		
8599	3	8	15.44	7	57	53	50.3	58.2	39.6	4.97	.81	.93	9.0	145	142	115	287	39	1.56	.68	.68	-.2	65-5	9	106.3	
3578	2	8	16.29	53	34	61.0	60.0	40.7	9.25	.89	1.01	17.5	186	143	110	329	37	1.20	.59	.3	87-5	10	97.2			
* 3586	2	8	16.33	-6	10	34.6	32.0	25.4	2.02	.80	.94	.05	1.6	165	323	35	128	48	10.39	.42	.67	.6	93-3	23	95.1	
3595	2	8	17.32	65	169	32.9	31.1	40.2	6.63	.88	.80	12.5	123	144	44	267	83	11.17	1.02	.17	-.1	39-3	50	85.4		
8606	3	8	17.32	-7	337	28.1	25.0	35.1	1.70	.78	.37	3.0	296	144	3	80	79	1.63	.14	.79	.1	94-3	26	90-7		
* 3597	2	8	17.33	-4	331	29.7	26.0	38.0	2.89	.85	.43	5.3	285	144	7	69	84	4.25	.56	.82	.3	20-3	25	101-4		
* 8609	3	8	17.33	49	31	61.9	60.7	40.1	6.13	.84	.98	11.3	201	144	122	345	35	.80	.85	.73	-.1	88-3	23	107.8		
3601	2	8	17.35	-58	63	61.2	60.0	41.9	-14.2	1.01	.89	.24	26.7	303	145	139	144	40	1.98	.54	.54	-.1	17-4	14	110.2	
3607	2	8	17.35	0	349	39.9	38.4	37.2	2.43	.92	.10	4.7	327	144	14	111	65	4.31	1.05	.84	-.1	23-4	13	97.4		
8610	3	8	17.35	-2	37	57.9	56.6	32.7	1.30	.61	.51	2.1	108	324	145	17	117	63	4.72	1.21	.86	-.2	74-4	29	100-9	
* 8616	3	8	17.36	-25	61	69.4	68.3	39.7	5.06	.82	.93	9.2	144	144	117	288	10	1.15	.70	.52	-.7	17-4	12	102.2		
* 8619	3	8	17.45	65	273	31.0	29.1	41.3	2.09	.95	1.01	40.8	183	145	45	329	90	25.45	1.93	.71	.74	-.1	11-3	28	103.7	
* 3604	2	8	18.26	3	338	34.6	33.0	38.6	3.38	.92	.97	0.8	347	145	5	132	51	1.63	.65	.65	-.3	98-0	19	98.0		
* 3605	2	8	18.28	3	345	36.4	34.5	27.6	.90	.97	.03	1.8	400	325	9	106	68	3.31	.75	.74	.94	92-4	25	95-2		
3619	2	8	18.41	3	-8	351	36.9	35.0	36.4	2.08	.93	.15	4.0	199	145	103	344	45	1.04	.48	.69	-.1	18-4	11	104.6	
3623	2	8	18.45	58	23	55.2	54.1	39.2	4.12	.76	.98	.24	7.4	136	327	5	103	70	1.65	1.25	.74	1.7	19-4	16	86.9	
* 3629	2	8	18.46	31	-3	344	34.2	32.6	36.7	2.49	.97	.08	4.9	332	145	5	96	72	2.33	.61	.61	1.1-3	34	100-6		
* 3633	2	8	20.21	-5	338	272	23.9	21.0	2.98	.65	1.01	4.8	147	34	335	96	344	13	.87	.13	.87	4.2-3	51	99.1		
* 3644	2	8	21.24	42	18	60.2	58.9	40.5	8.65	.91	.74	15.6	261	147	0	48	96	.08	.27	.69	.1	22-2	86	92.3		
* 3656	2	8	21.24	50	292	26.3	24.9	39.6	4.87	.80	.96	.24	148	148	118	32	356	95	8.35	.65	.86	-.1	13-2	22	90-7	
* 3652	2	8	21.29	-3	322	26.7	24.4	40.1	6.31	.90	.62	12.0	259	148	8	47	96	5.50	1.09	.81	-.3	53-3	53	100-8		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sp.	True rad.	V_{∞}	V_0	V_H	α	θ	q	q'	ω	δb	i	π	λ	C.W.	K	CZ_R	H_p	H_{∞}	n	H_B	A		
*	3657	2	8	21.440	6	67	69	55.8	54.6	41.2	16.82	.95	.91	32.7	142	148	100	290	48	2.44	.66	.1	43.4	16	107.4		
*	3658	2	8	21.441	3	-9	38.9	31.4	37.3	6.47	.95	.13	4.8	17	11.1	67	328	17	1.11	.96	.1	68.4	15	95.9			
*	3660	2	8	21.444	41	53	67.1	66.1	40.2	6.42	.84	.01	11.8	17.3	14.8	14.3	321	22	.16	.88	.90	.6	17.4	13	110.1		
*	3663	2	8	21.447	-1	347	30.3	28.5	33.7	1.43	.82	.25	2.6	312	148	7	100	71	3.67	.17	.64	.5	43.3	54	101.2		
*	3664	2	8	22.220	-1	318	24.4	21.6	39.3	4.30	.84	.69	7.9	252	149	9	100	100	7.02	.69	.80	.1	1.7	13.3	98.0		
*	3667	2	8	22.220	12	354	15.0	9.8	26.5	.84	.38	.52	1.2	319	149	5	108	63	5.31	-.73	.66	.6	65.3	13	84.2		
*	3784	2	8	22.224	3	-11	354	37.5	35.6	37.5	2.58	.93	.18	5.0	135	329	14	104	70	4.83	-.86	.54	.6	62.3	23	96.7	
*	3786	2	8	22.228	-17	333	21.2	18.1	35.0	1.68	.62	.63	2.67	89	329	4	58	92	3.68	-.14	.66	.3	11.2	39	89.2		
*	3787	2	8	22.229	67	274	25.2	22.8	36.9	2.28	.56	1.01	3.3	184	38	333	89	-.10	.98	-.10	.73	1.4	26	93.5			
*	3795	2	8	22.338	-12	359	36.6	34.9	35.3	1.75	.91	.16	3.3	141	329	24	110	66	8.36	.57	.73	.2	88.4	22	99.9		
*	3798	2	8	22.440	0	299	16.0	12.1	36.6	2.13	.58	.90	3.4	226	149	7	15	117	7.90	-.10	.50	-.6	24	22	83.6		
*	8626	3	8	22.441	10	343	29.6	27.7	33.7	1.43	.78	.32	2.6	305	149	20	94	72	10.71	-.07	.84	1.4	12.3	31	101.1		
*	8630	3	8	22.442	63	58	62.0	60.9	44.4	4.12	1.24	.97	1.58	149	110	307	43	1.22	.76	.6	94.5	12	110.3				
*	8632	3	8	22.443	-6	21.6	18.6	21.0	1.68	.72	.19	1.2	160	329	129	45	9.30	-.37	.62	.6	91.5	15	103.2				
*	8634	3	8	22.444	5	33	66.4	65.4	41.7	90.83	.99	.52	181.1	88	329	164	.57	28	.91	3.50	.88	-.6	21.4	15	96.3		
*	4203	2	8	25.117	13	300	21.2	18.0	39.9	5.54	.84	.80	10.2	225	152	15	117	110.89	.81	.93	2.6	12.3	25	93.6			
*	4205	2	8	25.118	-3	319	24.8	22.1	40.3	6.65	.89	.70	12.6	249	152	8	41	102	5.90	1.08	.93	-.1	62.3	31	95.0		
*	4207	2	8	25.118	10	255	15.5	11.2	38.7	1.41	.71	1.01	5.8	188	152	11	339	139	2.95	.29	.87	-.0	35.2	24	81.2		
*	4211	2	8	25.23	-22	356	39.5	37.3	41.6	16.89	.99	.32	73.5	112	332	31	84	76	9.46	2.93	.34	1.6	75.3	56	110.6		
*	4213	2	8	25.23	45	268	23.2	20.7	41.1	14.46	.93	1.00	27.9	190	152	28	342	109	5.19	1.61	.66	.3	50.3	30	86.1		
*	4216	2	8	25.227	59	44	60.5	59.3	41.7	2.35	.96	.10	4.6	328	152	20	120	64	5.87	1.04	.90	-.6	11.3	18	99.2		
*	4219	2	8	25.336	6	356	40.3	38.8	37.1	1.41	1.29	1.01	24.8	173	152	15	325	74	1.07	.50	.58	.6	28.4	10	104.0		
*	3800	2	8	25.337	62	299	39.6	36.0	31.1	1.92	.97	.07	3.07	217	152	13	9	118	11.12	.24	.64	1.4	12	72	85.9		
*	3802	2	8	25.339	15	293	17.7	14.3	38.3	1.3	1.3	.70	.93	5.2	217	152	13	9	118	11.12	.24	.64	1.4	12	72	85.9	
*	3804	2	8	25.339	15	54	71.1	70.0	41.2	15.50	.94	.96	30.0	26	332	173	358	9	.11	1.69	.71	.3	75.5	13	108.6		
*	3810	2	8	25.441	40	56	70.2	69.2	42.7	12.73	1.08	1.01	—	179	152	112	334	41	.00	2.80	.54	.2	38.4	30	109.6		
*	3813	2	8	25.444	61	259	23.1	20.4	37.9	2.76	.63	1.01	4.5	179	152	20	331	20	.16	—	.84	.6	58.5	12	110.8		
*	3816	2	8	26.224	14	334	29.5	27.2	37.6	2.60	.81	.07	4.0	278	152	23	323	23	1.69	.09	.91	.1	1.6	72	98.1		
*	3819	2	8	26.226	-60	306	14.0	12.2	36.6	1.62	.60	.86	2.3	233	152	7	32	333	9	121	6.89	-.42	.29	.6	42.3	28	95.1
*	3827	2	8	28.443	-5	3	39.8	36.5	37.4	2.48	.96	.11	4.9	146	335	18	121	65	5.43	1.05	.75	-.1	26.3	24	98.3		
*	3829	2	8	28.444	49	49	64.3	63.3	40.7	8.87	.89	.99	16.8	195	155	129	350	30	.49	1.18	.91	.4	34.5	5	109.0		
*	3831	2	8	29.337	29	47	71.3	70.1	43.1	6.46	1.10	.72	4.5	222	156	160	18	350	18	.50	1.3	1.3	.2	11.6	6	116.6	
*	3833	2	8	29.337	-16	315	18.5	15.2	38.2	3.03	.72	.84	5.2	233	156	0	29	114	.44	.27	.52	.6	12.2	46	85.2		
*	3837	2	8	29.338	0	311	16.9	13.2	36.6	2.14	.60	.86	3.4	233	156	7	29	112	7.47	-.07	.59	.1	10.2	19	86.6		
*	3841	2	8	29.442	31	46	71.3	70.3	43.5	6.44	1.14	.87	—	222	156	18	19	11	.00	1.70	.78	.4	55.5	9	110.8		
*	3848	2	8	30.335	1	42	62.8	61.6	39.5	4.60	.90	.48	8.7	96	337	146	73	32	2.05	.92	.62	.6	60.5	9	99.6		
*	3850	2	8	30.335	9	347	16.8	12.7	29.9	1.76	.98	.62	1.4	299	157	7	95	76	7.63	2.1	1.2	10	82.7	2	111.1		
*	3847	2	8	30.346	63	52	59.0	57.9	41.7	4.36	.67	.98	1.01	86.3	179	157	108	336	43	.47	2.57	.73	-.2	19.4	11	96.2	
*	3852	2	8	30.347	1	4	39.1	31.6	36.0	1.92	.95	.09	3.7	150	337	1	127	64	.35	.91	.67	1.0	27.4	15	91.9		
*	3854	2	8	30.441	32	64	70.9	69.9	41.2	16.11	.94	1.01	31.2	179	157	162	335	11	.00	1.70	.78	.4	55.5	9	110.8		
*	3856	2	8	30.442	16	67	72.6	71.5	42.3	30.13	1.03	1.01	—	357	337	171	334	5	.07	—	.72	.3	46.5	8	98.6		
*	3861	2	8	30.446	61	17	52.2	51.1	40.3	6.88	.87	.91	12.8	218	157	93	15	52	2.86	.99	.65	-.2	46.5	32	111.1		
*	3864	2	8	30.448	-3	55	70.9	46.7	2.60	21.10	1.42	.88	—	38	337	142	15	27	1.00	.47	.80	.9	46.5	17	107.5		
*	3862	2	8	31.441	7	58	30	59.5	58.4	41.6	39.34	.98	.96	77.7	206	158	110	3	42	1.56	2.50	.87	.7	56.5	8	104.5	
*	3864	2	8	31.441	1	17	33.7	32.0	37.2	2.38	.89	.42	4.5	126	338	3	104	74	1.46	.63	.74	-.1	12.2	44	91.2		
*	3870	2	8	31.444	42	82	68.9	67.8	42.4	20.14	1.04	.85	—	134	158	147	292	23	.96	—	.77	-.8	23.4	15	100.9		
*	3872	2	8	31.446	19	72	68.8	67.8	38.5	3.24	.70	.99	5.5	341	338	174	319	5	.06	—	.75	.06	26	1.74	15	113.0	
*	3877	2	8	31.447	5	2	25.9	28.8	28.8	.96	.75	.24	1.07	158	158	5	119	65	3.02	—	.87	1.02	34.3	51	100.0		
*	3878	2	8	31.441	58	307	19.4	16.2	32.8	1.30	.28	.94	1.07	227	158	28	10.29	87	.64	—	.68	1.0	19.3	12	89.1		
*	3881	2	8	31.442	76	338	38.9	37.4	38.3	3.09	.68	1.00	5.2	195	159	65	21.13	21	.21	.66	1.3	57.4	32	99.5			

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	V_∞	V_0	V_H	α	δ	q	q'	m	ρ	A	λ	$G.M.$	K	GZ_R	H_{PG}	H_B	n	H_B	A		
3863	2	9	1.47	50	116	58.3	57.0	42.6	-16.39	1.03	.45	.52	.85	.59	.109	.244	.47	.498	.5	.18	.55	.5	.18-4	109.8		
*	3866	2	9	1.48	2	50	354	27.3	32.9	1.64	.01	.52	.50	.302	.159	.201	.76	.104	.18	.04	.04	.5	.5-3	.71	101.5	
*	4226	2	9	10.12	14	302	16.5	37.5	2.51	.62	.94	.41	.213	.167	.11	.21	.123	.819	.04	.93	.1	.04	.04	.04	.04	
*	4226	2	9	10.15	-1	317	18.8	15.0	39.1	.78	.77	.87	.67	.226	.167	.6	.33	.119	.544	.06	.81	.5	.19-2	.61	90.8	
4290	2	9	10.18	29	0	43.3	41.6	41.2	14.05	.98	.31	.27.8	.294	.167	.53	.102	.68	.10.92	.2.11	.71	.8	.28-4	.17	93.0		
4292	2	9	11.16	-2	335	21.9	18.7	38.4	3.07	.76	.73	.54	.249	.168	.4	.57	.103	.3.47	.36	.71	.4	.16-2	.47	98.7		
4294	2	9	11.18	-6	324	16.6	14.9	36.5	2.05	.58	.87	.32	.232	.168	.3	.40	.115	.3.09	.11	.81	.1	.13-2	.23	81.1		
4298	2	9	11.21	-4	335	18.6	14.9	36.5	1.97	.61	.78	.32	.247	.168	.3	.45	.104	.2.81	.10	.80	.1	.13-3	.12	87.0		
4300	2	9	11.23	-7	329	14.2	8.9	33.0	1.32	.35	.86	.18	.244	.168	.5	.52	.105	.5.65	.57	.94	.1	.04	.16	77.6		
4302	2	9	11.26	28	354	41.5	40.0	43.0	-10.02	1.04	.39	-	.282	.168	.45	.90	.75	.10.94	-.96	.1.2	.2-4	.15	.92-2			
4304	2	9	12.11	36	295	18.6	14.9	37.7	2.60	.63	.97	.42	.206	.169	.20	.16	.112	.9.39	.06	.99	.1	.03	.19	89.4		
4307	2	9	13.16	30	310	19.5	16.1	37.9	2.70	.66	.91	.45	.220	.170	.19	.30	.105	.12.44	.012	.99	.1	.06	.15-3	81.7		
*	4311	2	9	13.27	-31	346	20.1	16.8	37.7	2.59	.69	.80	.44	.244	.168	.5	.52	.105	.10.42	.1.15	.52	.1	.15-2	.27	86.7	
*	4318	2	9	13.32	27	335	30.4	28.6	42.1	-12.64	1.01	.68	.44	.208	.170	.8	.18	.132	.6.60	.09	.61	.1	.19-2	.69	83.4	
*	4328	2	9	14.21	49	287	30.0	28.1	45.5	-	2.85	1.35	.99	-.195	.101	.36	.7	.104	.4.78	-.87	.02	.18-3	.20	104.0		
*	4330	2	9	14.24	51	341	25.8	23.2	39.1	3.80	.83	.63	.50	.259	.171	.14	.71	.95	.9.41	.62	.90	.0	.55-3	.45	94.0	
*	4331	2	9	14.24	10	317	15.7	11.3	36.1	1.94	.93	.91	.30	.225	.171	.6	.36	.117	.1.48	.2.68	-.2.5	.39-3	.37	115.9		
*	4335	2	9	14.29	26	317	19.6	16.4	37.7	2.62	.67	.68	.43	.227	.171	.17	.39	.107	.13.44	.012	.90	.0	.20-2	.67	104.4	
*	4337	2	9	14.31	51	348	41.3	39.8	42.6	-16.63	1.04	.71	-.245	.171	.59	.57	.74	.9.15	-.17	.94	-.1.6	.48-3	.36	109.4		
*	4340	2	9	14.31	-15	351	22.7	19.9	37.3	2.37	.72	.65	.41	.180	.351	.6	.72	.96	.5.36	.17	.72	.0	.20-2	.67	100.0	
*	4341	2	9	14.33	83	294	38.6	37.1	40.0	5.53	.82	.1.01	.10.1	.182	.171	.62	.354	.73	.00	.74	.57	.07	.91	.29	101.9	
*	4343	2	9	14.33	-11	280	54.4	53.7	62.0	-	.18	.648	.98	.194	.171	.8	.5	.159	.051	.00	.00	.0	.15-4	.14	92.7	
*	4351	2	9	14.37	-15	3	24.9	22.5	36.1	1.93	.72	.54	.3.3	.96	.351	.12	.87	.87	.9.07	.07	.66	.0	.53-3	.44	92.4	
*	4352	2	9	14.38	-1	78	72.5	71.4	46.6	-	2.49	1.40	.99	-.13	.351	.141	.5	.24	.34	-.06	-.48	-.02	.26-4	.31	123.7	
*	4355	2	9	14.39	21	79	78.3	49.1	50.3	3.11	.68	.00	.5.2	.188	.173	.9	.1	.145	.2.36	.21	.62	.6.6	.2.6	.32	.37	81.2
*	4357	2	9	16.14	11	274	14.9	14.9	14.9	5.53	.82	.00	.10.1	.279	.173	.73	.92	.61	.9.27	.81	.61	.1	.11-2	.41	112.1	
*	4360	2	9	16.15	45	12	45.4	43.8	39.2	3.97	.88	.46	.7.5	.279	.173	.73	.146	.54	.2.96	.68	.97	.2.0	.80-2	.20	80.0	
*	4363	2	9	16.23	10	2	32.1	30.0	37.8	2.65	.87	.34	.5.0	.295	.173	.11	.108	.79	.5.30	.58	.77	.1.1	.57-4	.17	86.5	
*	4369	2	9	16.33	-5	352	26.7	24.6	38.3	2.96	.82	.54	.5.4	.272	.173	.7	.85	.90	.4.99	.47	.88	.1	.28-3	.47	101.0	
*	4370	2	9	16.34	-1	374	35.8	42.9	-12.11	1.03	.32	-.111	.353	.3	.104	.81	.1.27	.81	.1.07	.0.27	.1.33	.25	100.9			
*	4372	2	9	16.34	-9	328	14.5	9.8	35.3	1.71	.48	.90	.2.5	.229	.173	.1	.42	.118	.1.34	.32	.68	.2.6	.36-3	.37	81.2	
*	4374	2	9	16.36	49	23	12.2	5.2	26.9	.85	.22	.67	1.0	.333	.173	.7	.146	.54	.2.96	.68	.97	.2.0	.11-2	.41	78.6	
*	4378	2	9	17.20	18	6	13.8	8.0	28.3	.92	.29	.65	1.0	.304	.174	.4	.119	.72	.4.19	-.376	.80	.2.0	.32-3	.15	82.5	
*	4380	2	9	17.23	81	294	36.7	35.1	40.50	.78	1.00	.80	.186	.174	.59	.1	.75	.1.17	.5.6	.31	.57	.0	.59-4	.23	101.6	
*	4382	2	9	17.24	45	71	64.6	63.4	38.5	3.16	.70	.94	.5.4	.214	.174	.139	.28	.25	.0.75	.56	.31	.0.6	.2.8-5	.7	103.8	
*	4385	2	9	17.27	1	369	16.1	11.7	32.8	1.28	.42	.74	1.0	.263	.174	.2	.77	.95	.2.60	-.50	.88	.4	.46-3	.11	78.2	
*	4388	2	9	17.28	-7	311	16.0	11.9	38.7	3.33	.72	.94	.5.7	.212	.174	.4	.27	.133	.3.32	.31	.70	.1	.17-2	.65	83.5	
*	4391	2	9	17.30	1	5	31.8	29.8	38.5	3.12	.89	.36	.5.9	.112	.354	.2	.106	.81	.0.92	.71	.85	.0.1	.17-3	.24	90.4	
*	4394	2	9	17.32	1	33	31.8	31.9	37.5	2.47	.89	.26	.4.7	.124	.354	.5	.119	.75	.2.01	.64	.86	.0	.11-3	.30	97.5	
*	4398	2	9	17.32	-12	28	15.6	10.8	27.1	.86	.38	.54	1.2	.135	.354	.9	.129	.66	.9.10	-.72	.73	.0	.8-3	.20	85.2	
4400	2	9	17.37	17	68	78.3	77.3	49.8	-	1.24	1.69	.86	-.40	.354	.173	.5	.17	.19	-.06	-.78	.0	.2-5	.7	106.6		
4402	2	9	17.40	28	80	77.8	76.8	47.5	1.81	1.55	.99	-.191	.174	.172	.5	.7	.164	.0.6	.78	.0	.59-5	.16	122.2			
4404	2	9	17.40	-25	6	11.5	3.7	29.9	1.02	.13	.69	1.1	.92	.354	.3	.86	.90	.1.44	-.88	.77	.1	.77-3	.15	79.9		
*	4406	2	9	17.40	20	11	37.1	35.6	36.7	2.13	.91	.19	4.1	.315	.174	.28	.129	.68	.9.55	.66	.94	.2	.11-4	.11	96.2	
*	4408	2	9	17.44	40	60	70.6	69.7	45.2	-	3.17	1.26	.81	-.01	-.01	-.01	-.01	.43	.43	.43	-.97	.2.1	.2	121.3		
*	4410	2	9	17.46	10	69	70.0	69.5	42.5	-	20.85	1.04	.81	-.40	-.40	-.40	-.40	.51	.51	.51	-.67	.91	.91	120.1		
*	4412	2	9	17.47	41	156	23.5	20.5	26.5	-	10.84	.58	.25	1.3	.40	.175	.26	.214	.61	.14.64	-.51	.51	.50	90.5		
*	4414	2	9	17.48	41	62	61.3	53.0	-	10.26	1.03	-.25	1.3	-.25	-.25	-.25	-.25	.126	.126	.126	-.95	.95	.95	108.6		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True red.	V	V_0	V_H	a	•	q	q'	ω	δ_θ	1	κ	λ	C.N.	K	GZ_R	N_{PG}	n_{∞}	n	H_B	A			
4416	2	9	17448	-12	88	63.5	62.4	42.1	-101.02	1.01	1.00	-	354	355	120	348	.36	.00	-	.54	1.2	.97	.16	106.7			
4418	2	9	18440	14	9	35.0	32.9	37.6	20.53	.90	.92	4.8	307	175	116	122	73	6.60	.70	.88	1.7	.48	.0	29	103.2		
4420	2	9	18445	50	116	68.6	67.5	46.5	-7	20.12	1.37	-	129	175	128	305	36	1.87	.66	.8	.50	.5	10	109.1			
4422	2	9	18446	33	103	66.7	65.6	38.6	3.20	.76	.77	5.6	117	175	160	293	18	.65	.37	.78	.8	.54	.0	105.5			
4424	2	9	18446	-1	326	64.2	63.7	81.7	-	1.18	4.85	.70	-	231	175	113	47	118	1.61	-.39	1.0	.71	.5	14	106.0		
*	4229	2	9	19420	73	213	34.1	32.4	38.8	3.39	.72	.96	5.8	152	176	54	328	77	5.15	.31	.46	1.0	.17	.3	47	103.6	
4426	2	9	19420	53	0	36.1	37.9	2.70	9	30.8	1.09	.77	.63	4.8	262	176	58	78	70	10.66	.31	.61	.6	.66	.4	20	93.3
4428	2	9	19420	81	202	35.0	33.3	36.4	2.01	.51	.98	3.0	157	176	59	334	70	3.14	-.20	.49	1.0	.15	.3	45	103.0		
4430	2	9	19421	-3	303	13.2	7.4	35.6	1.79	.46	.97	2.6	205	176	5	21	140	-.32	.86	.24	.59	.5	.28	.1	81.3		
4432	2	9	19423	-8	339	20.4	17.1	38.6	3.47	.77	.79	6.1	239	176	0	56	109	.10	.43	.86	.1.6	.50	.3	.52	.93.2		
4434	2	9	19428	13	16	38.8	37.0	37.8	2.67	.95	.14	5.2	320	176	13	136	68	4.36	.98	.87	1.7	.36	.3	29	108.1		
4436	2	9	19429	-22	19	18.6	14.9	30.8	1.09	.44	.61	1.6	107	356	15	103	80	13.97	-.56	.57	1.5	.18	.3	14	87.5		
4439	2	9	19430	17	23	35.6	33.7	31.9	1.19	.92	.10	2.3	159	176	17	148	60	6.13	.43	.63	1.3	.26	.4	.13	93.2		
4442	2	9	19432	1	19	37.8	36.1	38.1	2.85	.94	.16	5.5	135	356	14	131	70	4.96	.95	.84	1.2	.48	.3	24	103.8		
4444	2	9	19432	27	354	28.3	26.1	36.7	2.12	.76	.52	3.7	276	176	25	93	82	13.36	.16	.99	1.5	.11	.3	.32	.88.2		
4446	2	9	19434	53	38	19.9	16.5	22.1	.69	.54	.32	1.1	341	176	28	157	47	12.55	-.63	.89	-.1	4.1	.3	13	86.1		
4448	2	9	19434	15	75	70.3	69.2	41.1	11.69	.92	.89	22.5	41	356	166	37	14	32	1.47	.53	.7	.85	.5	.16	113.1		
4453	2	9	19437	42	93	67.6	65.5	39.6	4.57	.79	.98	3.5	159	176	148	336	19	.35	.58	.57	.1	1.6	.4	108.9			
*	4454	2	9	19437	45	90	69.0	67.9	41.6	1.00	.60	45.2	170	176	145	347	21	.27	2.01	.62	0.0	20	.6	16	111.6		
*	4455	2	9	19437	1	17	28.0	25.8	32.6	1.26	.77	.29	2.2	129	356	7	126	72	4.19	-.01	.87	2.0	.82	.4	28	100.3	
4457	2	9	19439	-7	20	38.9	37.5	40.1	5.77	.96	.23	11.3	125	396	27	121	72	6.71	1.45	.78	.9	.33	.4	16	92.7		
4460	2	9	19441	44	91	69.8	68.8	42.3	38.08	1.03	.93	-	168	176	146	344	21	.28	-.75	.5	.32	.6	101.8				
*	4464	2	9	19443	7	346	21.8	19.3	37.2	2.31	.71	.68	3.9	258	176	8	74	97	7.18	-.13	.55	-.9	.85	.137	99.9		
4467	2	9	19446	6	79	71.0	70.0	43.1	1.0	.96	-.7	24	356	151	20	19	41	.35	.84	.5	.66	.5	14	111.6			
4469	2	9	20425	21	353	27.6	25.3	37.8	2.61	.79	.54	4.7	272	177	19	90	87	11.17	.35	.97	1.1	.91	.4	18	94.6		
*	4472	2	9	20426	57	276	23.5	20.9	39.0	3.58	.72	1.00	6.2	187	177	32	4	99	2.03	.36	.67	-.8	6.1	.5	55	101.6	
4473	2	9	20427	28	105	26.4	23.7	9.4	.53	.94	.03	1.0	3	177	177	17	180	16	2.71	.24	-.0	-.2	4.1	.3	24	89.7	
4476	2	9	20428	3	8	30.5	28.3	37.2	2.33	.85	.36	4.3	113	357	0	111	80	.22	.44	.85	.4	1.4	.3	23	93.5		
4478	2	9	20428	1	8	26.8	24.3	35.3	1.70	.75	.62	3.0	111	357	3	108	81	1.69	.08	.84	.9	.27	.3	36	98.4		
4482	2	9	20429	-5	352	23.0	20.3	38.1	2.86	.77	.66	5.1	77	357	1	75	98	.97	.34	.82	1.1	.66	.5	50	101.1		
4484	2	9	20430	-7	11	28.7	26.0	38.1	2.80	.86	.40	5.2	108	357	12	106	81	6.29	.57	.87	5	.18	.3	31	104.1		
4486	2	9	20430	30	44	58.0	56.7	38.8	3.37	.96	.22	6.5	309	177	140	126	40	3.69	1.01	.80	.3	.16	.3	14	106.4		
4492	2	9	20435	-11	337	18.5	15.1	38.2	2.92	.72	.63	5.0	54	357	0	113	51	.44	.24	.63	1.3	.84	.3	49	92.2		
4494	2	9	20435	32	49	61.7	60.6	42.4	1.70	.75	.32	3.1	293	177	139	110	33	.29	.84	.9	.5	.76	.1	108.8			
4496	2	9	20435	47	59	69.9	67.9	47.9	1.68	1.49	.82	-	226	177	133	43	33	.50	-.83	.6	.40	.5	.9	112.4			
4498	2	9	20435	2	16	27.5	25.2	32.8	1.28	.76	.31	2.3	127	357	6	124	73	3.46	-.03	.87	1.4	.79	.1	18	96.7		
4501	2	9	20438	4	17	36.4	34.8	37.8	2.62	.93	.19	5.0	133	357	6	130	71	2.35	.84	.87	1.8	.23	.4	16	100.9		
* 4513	2	9	20439	51	259	19.3	16.0	37.3	2.36	.58	1.00	3.7	174	177	24	352	106	2.90	-.06	.19	-.3	.22	.2	51	90.3		
4516	2	9	20441	5	3	67.3	66.2	40.7	7.85	.92	.00	15.1	261	177	3	103	84	.58	.74	2.01	1.0	.74	.15	99.8			
4518	2	9	20445	41	61	67.7	66.8	43.2	2.12	.82	.02	5.4	57	357	-	239	177	142	56	.29	1.43	.86	.37	.5	7	110.4	
4520	2	9	20446	0	10	31.0	29.3	37.6	2.54	.86	.35	4.7	114	357	5	112	79	2.82	.54	.58	.02	.33	.3	31	102.5		
4524	2	9	25417	45	327	18.4	16.8	34.5	1.53	.43	.08	2.2	235	182	21	57	96	1.430	-.42	.97	1.1	.31	.1	18	88.7		
4526	2	9	25417	-24	304	13.1	7.2	36.2	2.94	.49	.08	2.9	19	2	1	21	152	.48	.24	.72	-.8	.25	.1	11	79.8		
4522	2	9	25418	67	38	51.2	49.9	41.1	11.42	.93	.03	22.0	230	182	88	52	55	4.05	1.48	.56	1.0	.22	.2	109.7			
4528	2	9	25419	67	50	21.0	18.1	38.7	3.30	.70	1.00	5.6	175	182	27	358	106	1.47	.27	.60	-.7	.67	.3	14	87.9		
4531	2	9	25428	7	359	27.4	25.1	39.3	4.00	.86	.55	7.5	269	182	6	91	91	4.05	.74	.91	.2	.24	.3	23	89.6		

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	ω	Ω	i	λ	α	δ	λ	α_{M}	δ_{M}	C_{Z}	H_{pg}	m_{∞}	n	H_{B}	A		
*	4534	2	9	25.29	-21	28.5	31.7	29.9	39.6	4.43	.78	.99	7.9	195	48	17	.83	3.38	.55	.64	-1.8	21.2	61	104.7	16	81.3	7		
*	4535	2	9	25.29	-21	28.5	31.4	29.4	36.4	1.51	.34	1.00	2.0	189	182	0	11	.73	.52	.64	-1.7	20.2	51.3	16	81.3	7			
*	4537	2	9	25.30	-25	5	19.5	16.1	35.9	1.84	.59	.76	2.9	2.9	70	2	12	.72	.99	11.76	.15	.62	0	51.3	17	90.9	1		
*	4539	2	9	25.32	-15	11	21.9	25.6	39.0	1.58	.59	.55	6.6	.89	2	5	95	90	4.83	.07	.79	1.2	28.3	37	98.1	1			
*	4542	2	9	25.34	-5	7	23.8	21.2	36.3	1.98	.71	.57	3.4	92	2	6	15	91	.89	9.13	.63	.71	-3.3	48.2	28	91.0	1		
4544	2	9	25.36	5	357	24.2	21.7	38.0	2.76	.78	.61	4.9	264	182	4	66	94	3.61	.34	.81	1.02	2.3	35	98.8	32	100.1	1		
4546	2	9	25.36	4	22	31.0	29.1	34.2	1.49	.83	.25	2.7	131	2	7	133	71	3.63	.21	.89	1.02	1.8	32	100.1	15	106.6	1		
4548	2	9	25.36	6	95	60.9	59.6	32.6	1.26	.22	.98	1.5	332	162	1	146	181	2.24	.24	.63	1.01	.85	13	106.6	15	113.4	1		
4550	2	9	25.39	50	15	46.8	45.7	42.7	15.27	1.03	.53	—	266	182	2	129	71	89	9.06	—	.85	1.23	1.9	97.5	1				
4552	2	9	25.40	-12	86	56.2	52.8	33.6	1.39	.93	1.8	4.5	2	114	4.7	36	1.17	.56	.50	1.1	13.4	15	116.1	1					
4554	2	9	25.41	42	102	68.4	67.3	40.7	8.04	.88	.97	15.1	157	182	147	339	20	4.4	1.10	.71	*.4	75.5	12	111.4	12				
4555	2	9	25.41	13	27	29.8	27.8	30.4	1.05	.83	.18	1.9	324	182	3	146	64	1.77	.05	.91	2.0	.56	28	97.1	15	97.1	1		
4556	2	9	25.44	42	62	67.3	66.4	44.3	—	1.15	.67	—	2.47	182	139	70	32	1.88	—	.98	—	.3	16.4	15	113.4	1			
4558	2	9	25.46	9	18	29.7	27.9	36.4	1.52	.81	.28	2.8	307	182	2	129	73	.85	.17	.68	1.8	21.3	33	101.3	22				
4560	2	9	25.46	-2	113	58.8	57.6	36.0	1.88	.68	.60	3.2	271	2	129	73	2.54	—	.01	.58	—	18.4	12	109.7	2				
4565	2	9	25.48	-2	113	58.8	57.6	36.0	1.88	.68	.60	3.2	271	2	129	73	2.54	—	.01	.58	—	18.4	12	109.7	2				
4567	2	9	25.48	38	110	53.3	52.0	26.2	3.82	.49	.42	1.2	39	182	144	221	20	1.48	—	.62	.85	1.6	85.5	15	99.0	1			
4571	2	9	26.22	11	356	23.4	20.6	38.6	3.17	.78	.69	5.7	254	183	9	77	99	2.98	—	.93	1.2	39	100.2	15	100.2	1			
*	4574	2	9	26.23	2	7	25	26.6	26.1	31.6	1.15	.78	2.1	1.35	3	5	138	69	2.98	—	.03	1.7	1.9	15.3	49	103.3	1		
*	4575	2	9	26.23	2	3	22.5	19.5	35.7	1.79	.67	.59	3.0	271	183	1	94	91	.54	—	.05	.81	1.8	21.3	33	97.0	1		
4577	2	9	26.24	24	354	17.9	14.0	32.8	1.28	.45	.70	1.8	268	183	11	91	90	11.75	—	.47	.98	1.3	12.3	8	61.0	2			
4582	2	9	26.26	5	62	64.4	63.0	40.3	6.04	.93	.40	11.7	284	183	3	96	90	1.91	.42	.87	2.0	47.4	14	100.1	1				
4586	2	9	26.34	36	19	22.4	19.7	36.8	2.14	.57	.91	3.4	221	183	30	44	94	12.14	—	.10	.64	2.0	49.3	15	116.4	1			
*	4588	2	9	26.37	53	319	22.4	19.7	36.8	2.14	.57	.91	3.4	221	183	30	44	94	12.14	—	.10	.64	2.0	49.3	15	116.4	1		
4597	2	9	26.38	12	86	60.8	59.5	32.6	1.25	.51	.68	2.5	66	69	17	94	18	.78	—	.48	.68	1.6	12.4	14	115.4	1			
4599	2	9	26.39	-2	86	74.2	73.1	48.5	1.51	1.64	.97	—	18	3	136	21	27	.50	—	.54	.1	11.4	18	116.5	1				
4605	2	9	26.41	-1	13	28.2	26.4	38.1	2.21	.81	.54	5.0	273	183	3	96	90	1.91	.42	.87	2.0	47.4	14	100.1	1				
4603	2	9	26.42	3	97	70.7	69.6	43.0	9.70	1.81	.99	4.0	11.7	284	183	172	107	30	.55	1.25	.87	1.4	48.5	11	109.5	1			
4607	2	9	26.43	36	18	37.2	35.9	42.1	1.00	.49	—	2.7	272	183	40	95	79	17.02	—	.73	.9	62.4	23	105.8	1				
4609	2	9	26.44	11	82	63.4	62.9	35.0	1.63	.51	.63	2.5	66	69	17	94	18	.78	—	.40	.65	1.02	14	115.4	1				
*	4618	2	9	27.28	-5	356	20.5	17.3	37.0	2.22	.68	.72	3.7	73	4	2	77	101	1.92	—	.06	.82	1.9	35.3	49	98.4	1		
*	4622	2	9	27.30	47	108	67.8	66.7	41.9	78.83	.99	.95	156.7	153	184	2	57	114	1.74	—	.77	.91	53.4	13	113.8	1			
*	4624	2	9	27.30	-3	34	18.5	15.1	38.4	2.99	.72	.83	5.1	233	184	4	97	90	10.66	—	.13	.93	1.3	13.3	14	85.2	1		
4625	2	9	27.30	2	5	22.5	19.7	35.8	1.75	.67	.58	2.9	93	4	105	76	11.90	2.72	.92	—	.74	4	15	91.0	29	97.0	1		
4627	2	9	27.31	18	34	19.9	16.7	35.8	1.83	.60	.73	2.9	254	184	43	105	76	11.90	2.72	.92	—	.74	4	15	91.0	29	97.0	1	
4629	2	9	27.32	25	343	21.2	18.3	37.2	2.30	.67	.76	3.8	246	184	16	71	99	13.39	.07	.91	1.3	33.3	16	87.9	1				
4633	2	9	27.34	40	98	69.7	68.6	41.1	10.73	491	1.00	20.5	173	184	4	151	357	26	.71	3.11	1.34	.50	.6	87.5	15	112.9	1		
4637	2	9	27.37	22	31	3.4	29.6	40.4	6.33	.92	.49	12.2	273	184	21	98	86	10.24	1.19	.89	—	.6	11.3	22	98.4	1			
4639	2	9	27.38	35	7	39.1	37.7	41.7	3.07	.76	.99	4.1	65.1	281	184	43	105	76	11.90	2.72	.92	—	.74	4	15	91.0	29	97.0	1
*	4645	2	9	27.41	-7	62	58.8	57.7	41.9	5.25	.99	.46	10.2	90	95	4	115	99	44	4.50	3.05	.76	—	.1	11.3	22	111.5	1	
*	4646	2	9	27.43	46	47	59.4	58.5	42.9	—	12.97	1.04	.48	—	271	184	15	95	45	4.48	—	.97	—	.5	36.4	19	111.6	1	
*	4648	2	9	27.43	-5	95	65.9	64.8	41.3	13.94	.93	1.00	26.9	358	4	131	2	29	.00	1.57	.62	.3	11.4	15	112.8	1			
4650	2	9	27.44	37	76	68.5	67.6	41.4	25.94	.97	.77	51.1	58	4	158	62	21	.74	2.24	.88	1.2	76.5	24	119.0	1				
4652	2	9	27.45	21	30	47.8	46.8	41.1	11.56	1.00	.04	23.1	337	184	48	161	60	8.97	2.80	.88	—	.9	63.4	15	93.4	5			
4654	2	9	27.45	70	122	53.8	52.5	39.8	4.75	.80	.97	8.5	158	184	97	342	49	1.45	.62	.66	1.0	12.4	14	96.7	1				
*	4657	2	9	27.46	-9	3	23.7	21.4	38.4	3.00	.79	.64	5.4	80	4	6	84	96	4.91	.40	.37	.8	17.2	128	100.9	1			
*	4659	2	9	27.46	-9	11	18.1	14.8	33.0	1.31	.50	.66	2.0	92	4	6	96	70	7.43	—	.61	.50	4	16.2	54	87.6	1		
4660	2	9	27.46	37	76	68.5	67.6	41.4	16.22	.95	.81	31.6	233	184	154	57	21	.81	1.80	.98	.4	63.5	12	114.5	1				
4662	2	9	27.48	26	21	36.1	34.7	35.9	1.83	.89	.20	3.5	314	184	31	139	67	10.97	.50	.73	1.0	1.2	76.5	24	119.0	1			
4666	2	9	28.33	35	61	20.8	28.8	36.3	1.97	.84	.32	3.6	120	184	8	125	77	4.08	.35	.87	1.0	1.2	76.5	24	119.0	1			
4668	2	9	28.34	35	61	62.1	68.0	40.7	7.93	.89	.86	15.0	226	184	158	51	18	.56	1.14	.66	1.								

TABLE 7.—Orbital and physical parameters of 2,580 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True red.	ν_0	ν_0	ν_H	ν_0	ν	ν	ν	ν'	ν	ω	Ω	i	π	λ	C.M.	K	CZ_R	H	m_{∞}	n	H_B	A	
4670	2	9	28.34	-4	24	32.5	30.6	36.9	20.9	.86	.31	4.1	11.9	5	16	124	76	.829	.45	.82	2.0	33.4	19	99.9	1		
4673	2	9	28.37	-39	356	34.3	29.7	41.6	.97	.59	4.0	10.7	5.7	85	83	72	1.65	2.39	.48	.5	.50-1	.13	91.4	1			
* 4677	2	9	28.38	61	256	41.1	39.7	41.8	35.48	.97	1.00	7.0	182	185	65	7	1.65	2.34	.39	.48	-.5	.35-3	53	109.0	1		
* 4679	2	9	28.39	-3	333	17.5	18.0	39.0	35.53	.75	.88	223	185	3	49	122	3.34	.39	.43	-.2	.39-2	114	95.8	1			
* 4683	2	9	28.41	49	111	67.1	66.0	41.9	75.11	.99	.95	149.3	152	185	135	338	27	.52	3.07	.67	-.1.2	.74-4	25	114.2	1		
4684	2	9	28.44	6	14	32.2	30.5	38.7	3.30	.90	.34	6.3	293	185	2	118	80	1.17	.78	.68	1.4	41-4	14	89.5	1		
4688	2	9	28.45	1	25	46.6	45.5	42.2	-	83.82	1.00	.13	-	317	185	53	142	64	.999	-.74	.93	.24	93.4	17	99.4	-2	
4690	2	9	28.48	27	25	46.6	45.5	42.2	-	83.82	1.00	.13	-	199	187	44	26	91	4.73	-.63	-.6	.1	36-4	17	99.4	101.7	
* 8763	3	9	30.17	64	301	32.1	30.3	43.0	11.90	1.05	.97	4.0	86	7	6	93	93	4.35	.18	.66	-.4	23-2	91	101.6	1		
* 8766	3	9	30.19	-5	8	24.0	21.1	37.2	2.31	.74	.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
8767	3	9	30.19	5	15	31.1	28.9	38.5	3.08	.87	.39	5.8	267	187	7	1	115	.82	.73	.66	1.8	.99-4	4.0	100-1	1		
8769	3	9	30.21	21	359	27.0	24.5	38.5	3.05	.81	.58	5.5	235	187	8	62	110	7.97	.14	.95	.24	19-3	28	92.7	1		
8771	3	9	30.21	12	341	19.0	15.4	37.6	2.61	.66	.03	4.4	260	187	17	87	92	.92	.46	.94	.5	.56-3	.48	100-5	1		
8773	3	9	30.22	25	354	22.0	22.0	37.6	2.51	.74	.65	4.4	260	187	17	82	110	7.97	.14	.95	.24	19-3	28	92.7	2		
4692	2	9	30.43	25	122	66.4	65.2	39.0	3.59	.84	.59	6.6	96	187	21	2.7	283	170	1.46	.60	.57	-.4	.25-4	18	110.0	1	
* 4701	2	9	30.48	2	5	24	30.0	28.2	35.2	1.67	.82	.30	3.0	124	7	6	131	75	3.53	.23	.59	.21-3	.56	28	99.7	2	
4698	2	9	30.49	22	4	23.1	20.7	35.0	1.63	.65	.56	2.7	276	187	13	103	86	11.07	-.11	.48	.25	.26	.88-2	28	94.9	2	
8777	3	10	1.21	-3	19	29.4	21.0	37.4	2.37	.82	.62	4.3	107	8	10	114	82	5.73	.39	.63	1.5	.86-4	25	94.9	1		
8782	3	10	2.21	-18	21	28.2	25.7	38.5	3.07	.81	.57	5.6	87	9	21	96	88	11.53	.48	.47	1.0	16-3	29	93.1	1		
8788	3	10	2.26	60	35	27.6	46.2	39.6	4.35	.86	.62	8.1	260	189	61	89	58	7.03	.45	.79	1.0	21-4	16	107.4	1		
8790	3	10	2.27	6	358	23.4	20.7	38.9	3.39	.80	.68	6.1	255	189	4	83	99	3.29	.42	.91	1.0	21-4	16	107.4	1		
8794	3	10	2.29	0	9	13.9	8.4	31.0	1.10	.30	.77	1.4	90	9	1	98	91	3.17	.69	.90	1.0	67-3	21	81.3	1		
8796	3	10	2.30	7	26	30.8	28.7	34.8	1.59	.83	.28	2.9	127	9	5	136	73	2.74	.23	.89	1.4	12-3	39	103.3	1		
8798	3	10	2.30	21	5	26.0	23.6	36.9	2.16	.75	.54	3.8	274	189	14	103	87	9.68	.18	.98	.06	89-4	11	88-6	1		
8800	3	10	2.31	8	5	25.7	23.3	38.3	2.08	.87	.57	5.2	269	189	4	97	92	3.18	.42	.91	1.0	31-4	48	101.0	1		
8803	3	10	2.32	6	28	30.9	28.8	34.1	1.44	.83	.25	2.7	131	8	140	71	3.81	.19	.64	.34	.40	99.9	40	101.0	1		
8809	3	10	2.34	45	12	40.2	38.8	41.5	17.23	.97	.69	34.0	272	189	52	101	73	11.62	2.08	.96	-.1	.78-4	19	100.3	1		
8811	3	10	2.34	5	23	27.1	24.8	34.2	1.47	.75	.37	2.6	119	9	5	127	77	3.04	.01	.79	1.5	21-3	49	96.8	1		
8813	3	10	2.34	36	17	38.9	37.4	39.9	5.06	.93	.35	9.7	291	189	44	120	72	12.01	1.15	.99	1.0	31-4	21	104-4	1		
* 8817	3	10	2.35	37	120	68.8	61.7	61.4	.95	.83	.37	30.6	130	189	151	319	21	.86	1.77	.33	0.7	30	113-4	1			
8834	3	10	2.35	45	24	45.6	44.1	41.3	13.99	.97	.37	20.8	286	189	66	115	65	10.33	2.02	.98	.3	76-4	24	101.9	1		
8836	3	10	2.32	11	6	28.4	39.8	36.1	4.71	.89	.53	8.9	270	190	7	137	73	3.17	.44	.85	.0.9	13-3	36	102.3	1		
8838	3	10	2.26	29	346	16.6	12.5	34.0	1.45	.43	.32	2.1	247	190	12	76	99	12.62	-.44	.99	.0.6	12-3	23	95.5	1		
8844	3	10	3.30	10	342	11	14	30.0	27.9	38.4	2.94	.86	.42	5.5	285	190	5	115	83	2.88	.59	.92	1.7	54-4	19	95.4	1
8847	3	10	3.31	47	79	65.2	64.1	41.1	10.89	.93	.78	21.0	237	190	13	128	70	2.64	.22	.81	1.6-2	.64-2	31	84-6	1		
8849	3	10	3.31	7	28	33.9	31.6	38.0	2.75	.89	.50	5.2	119	10	13	101	90	7.60	.67	.81	1.0	59-4	17	97.5	1		
8853	3	10	3.32	50	72	32.9	30.9	36.3	1.94	.87	.26	3.6	127	10	16	133	73	3.06	.11	.88	.3.02	.25-3	27	102.5	1		
8855	3	10	3.33	6	29	31.6	29.6	34.7	1.57	.84	.25	2.9	130	10	8	140	72	4.13	.26	.90	1.2	49-3	14	88.4	1		
8857	3	10	3.34	25	10	31.6	29.7	38.9	3.38	.87	.43	6.3	283	190	21	113	82	10.09	.70	.96	.5	10-3	33	102.4	1		
8859	3	10	3.34	24	362	13.2	35.5	10.73	.51	.64	2.6	238	190	11	68	105	11.85	-.27	.83	.0.51-3	.17	86.6	1				
8863	3	10	3.37	58	126	60.8	59.6	40.8	8.67	.89	.93	16.2	149	190	115	339	13	1.17	.48	-.6	.33-2	.22	111.3	1			
8865	3	10	3.44	39	80	69.4	68.6	43.4	7.86	1.0	-.77	-	236	190	151	66	25	1.03	.492	.31	1.04	.49-3	14	88.4	1		
8867	3	10	3.45	36	111	67.1	66.0	38.1	2.75	.66	.94	4.6	149	190	156	339	15	.37	.12	.82	.0.6	85-5	13	112.1	1		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sh.	True red.	V_{∞}	V_0	V_H	ω	ϵ	q	q'	ϵ	μ	i	κ	λ	C_M	K	GZ_R	N_P	N_{B_R}	n	H_B	A			
8872	3	10	3.47	4	25.6	23.6	40.3	16.13	.90	.63	21.6	.258	190	2	.87	.98	1.38	1.05	.34	.26	.26	.26	96.8				
8870	3	10	3.48	4	89	66.9	40.4	16.56	.90	.62	28.2	.34	110	138	44	.26	.87	1.05	.34	.5	.78	.5	.13	111.4			
* 8881	3	10	6.25	27	259	17.0	13.5	38.8	.71	.99	16.7	.168	193	15	124	5.05	.29	.93	.67	.5	.12-1	.21	76.5				
8882	3	10	6.26	60	298	26.1	23.9	40.4	.634	.85	.98	11.07	.197	193	35	30	.97	1.95	.37	.87	.6	.2-3	.27	89.6			
8886	3	10	6.28	8	27	31.3	29.2	36.3	1.95	.85	.30	3.6	.122	13	4	134	.76	1.95	.37	.87	.6	1-3	.25	95.4			
* 8888	3	10	6.28	-2	16	21.3	18.2	34.8	1.58	.62	.61	2.5	.92	13	5	104	.90	4.49	-.18	.05	1.6	12.3	.18	77.0			
8891	3	10	6.30	55	71	30.4	32.7	30.9	46.9	.89	.97	16.1	.200	193	48	.33	.85	4.24	1.15	.62	.2	.593	.52	104.7			
8892	3	10	6.30	55	75	67.1	66.0	46.8	-	20.14	1.38	.00	2.07	.207	122	.62	.39	2.07	1.15	.62	.2	.593	.52	113.6			
* 8899	3	10	6.42	2	16	24.8	22.6	36.8	21.0	.75	.53	3.7	.95	13	4	108	.88	3.13	.16	.66	.1	.70	.1-4	.75	.21	99.1	
* 8917	3	10	7.39	1	9	20.6	17.7	36.2	1.92	.65	.67	3.62	.80	14	2	94	.96	1.97	-.04	.70	.6	.893	.48	87.5			
8918	3	10	7.42	16	97	57	66	23.7	21.1	39.0	3.55	.80	.70	6.4	.251	195	12	.86	.99	.99	.99	.99	.99	.99	97.5		
8920	3	10	7.48	57	66	20.8	23.9	21.1	39.0	2.56	.68	.81	4.3	.258	195	24	.72	.99	14.65	.94	.99	.99	.99	.99	.99	97.5	
8922	3	10	8.22	20	388	22.9	20.1	37.8	40.3	5.84	.89	.65	11.0	.255	195	29	.90	.89	13.15	.16	.66	.1	.70	.23	85.9		
8924	3	10	8.25	42	344	22.9	20.1	37.8	40.3	5.84	.89	.65	11.0	.255	195	29	.90	.89	13.15	.16	.66	.1	.70	.23	85.9		
8926	3	10	8.25	39	359	29.7	27.6	40.3	37.8	5.84	.89	.65	11.0	.255	195	29	.90	.89	13.15	.16	.66	.1	.70	.23	85.9		
8930	3	10	8.27	15	0	23.9	21.3	39.2	3.67	.82	.68	6.7	.253	195	9	.88	.99	7.17	.56	.96	.3	.263	.18	86.7			
8938	3	10	8.30	16	37	43.8	42.3	40.6	7.09	.99	.08	14.1	.328	195	4	163	.66	.99	2.09	.91	-.9	1-3	.29	103.1			
4722	2	10	9.16	-14	321	15.8	11.4	40.0	4.97	.81	.97	9.0	.202	196	0	38	148	1.06	.31	.04	.78	1.7	.23	81.6	3		
4724	2	10	9.17	0	1	19.2	15.6	37.0	22.7	.66	.78	3.8	.64	16	0	80	106	1.32	.65	.99	1.4	11.3	.24	101.6			
4728	2	10	9.19	8	14	27.3	24.8	39.1	3.61	.85	.54	6.7	.270	196	2	106	91	1.32	.65	.99	1.4	11.3	.24	101.6			
* 8943	3	10	9.19	9	49	12.6	5.4	26.9	3.84	.25	.63	1.1	.326	196	2	162	.53	1.23	-.85	.74	1.5	7-3	.16	77.9			
4730	2	10	9.19	9	47	271	20.2	17.2	38.9	3.37	.70	1.00	5.7	.25	13	109	1.96	2.72	.214	.68	-.4	15.2	.83	100.8			
* 4732	2	10	9.20	2	9	29	28.9	26.4	35.2	1.65	.79	.42	3.0	.118	16	5	134	77	2.72	.214	.68	-.4	15.2	.83	100.8		
* 8945	3	10	9.20	2	9	31.0	28.7	34.6	1.54	.83	.427	2.8	.128	16	6	144	73	2.91	.211	.62	1.7	14.3	.95	102.2			
* 8948	3	10	9.21	2	7	23.2	20.3	38.8	3.31	.80	.68	5.9	.74	16	1	89	100	.42	.46	.83	1.4	.36-3	.48	93.0			
* 8951	3	10	9.23	9	47	271	20.1	17.1	38.8	3.29	.70	1.00	5.6	.177	196	25	13	109	1.98	.27	.55	1	.39-2	.61	103.5		
8952	3	10	9.25	15	24	29.9	27.6	36.4	1.97	.82	.35	3.0	.25	196	6	131	.79	3.15	.20	.89	.5	.89	.15	88.8			
8954	3	10	9.25	17	33	31.5	29.3	35.3	1.68	.84	.28	3.1	.126	16	8	142	.73	3.07	.28	.79	1.0	.14-3	.38	101.1			
8956	3	10	9.25	9	30	31.5	31.5	37.5	2.41	.87	.27	4.6	.123	16	5	139	.75	2.21	.60	.83	1.6	.65-4	.29	99.1			
8964	3	10	9.29	-7	64	31.8	60.6	48.4	1.57	1.27	.42	-.92	16	106	5	106	.52	.518	-.61	.1	.12-4	.21	110.0				
8967	3	10	9.29	-12	20	28.6	26.4	40.8	8.18	.93	.59	15.8	.81	16	16	97	.93	9.05	1.34	.74	-.1	.26-3	.24	85.0			
8971	3	10	9.21	18	9	33	29.2	27.0	33.0	1.38	.79	.25	128	16	5	144	.72	3.04	.07	.84	1.0	.14-3	.34	105.2			
8958	3	10	9.43	1	101	66.1	65.0	59.2	2.76	.74	.98	6.5	.15	16	8	141	.31	.34	.40	.69	-.5	.17-4	.12	98.4			
8996	3	10	10.21	48	359	29.1	26.9	38.6	2.10	.78	.69	5.0	.253	197	34	.89	86	13.98	.03	.95	1.0	.13-3	.29	95.2			
8998	3	10	10.21	16	38	36.5	34.5	35.8	1.80	.72	.91	3.5	.321	197	1	158	.67	.62	.68	-.6	.41-3	.48	104.6				
* 8991	3	10	10.16	32	348	21.6	18.5	38.3	2.87	.72	.80	4.9	.238	197	17	5	91	.99	3.70	.84	.78	-.4	13-2	.56	101.0		
4734	2	10	10.25	35	322	16.9	13.0	37.2	2.27	.59	.94	3.6	.212	197	15	49	115	10.50	-.06	.96	-.3	.91-3	.22	86.7	7		
4736	2	10	10.21	62	316	23.2	20.6	37.2	2.28	.59	.94	3.6	.212	197	22	109	48	94	9.39	-.06	.84	2	.98-5	.51	98.9		
9009	3	10	10.26	54	310	23.5	21.0	39.8	4.67	.80	.76	8.4	.205	197	30	42	102	8.77	.61	.77	.8	.17-3	.16	92.2			
9012	3	10	10.29	33	27	25.7	25.3	32.5	1.23	.71	.35	2.1	.304	197	22	140	72	12.52	-.13	.98	-.3	.13-3	.14	90.5	3		
* 9015	3	10	10.29	2	7	32	30.8	28.7	35.6	1.75	.83	.30	3.2	.123	17	7	140	75	3.65	.27	.88	-.1	.72-3	.64	103.5		
9016	3	10	10.30	10	36	33.1	31.2	30.2	1.34	.71	.22	3.0	.133	17	6	133	17	10.5	2.83	.36	1.0	.10-3	.36	100.9			
9023	3	10	10.32	8	62	69.0	67.8	44.5	4.30	1.15	.63	3.6	.149	17	7	149	89	30	1.48	-.56	-.56	-.6	.37-4	.22	120.3		
9025	3	10	10.32	13	22	27.7	25.4	36.5	2.01	.79	.23	3.6	.287	197	3	124	62	2.20	.23	.95	2.0	.69-4	.25	97.2			
9027	3	10	10.39	-6	43	47.9	46.6	42.0	55.96	1.00	.24	119.7	.122	17	69	139	62	10.14	.34-8	.78	-.7	.55-4	.14	90.6			

ORBITAL ELEMENTS OF PHOTOGRAPHIC METEORS

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	E_0	V_0	V_H	θ	θ	q	q'	ω	i	Ω	λ	α_{H}	K	CZ_R	M_p	m_{∞}	n	H_B	A		
*	9030	3	10	10.40	13	6	a	24.0	21.6	36.2	1.00	.72	.54	3.3	276	197	4	113	88	3.02	.06	1.2	60-3	66	99.6	
*	9035	3	10	10.43	-10	43	30.5	39.8	4.67	9.0	.93	.34	.34	4.0	9.0	112	17	42	129	72	1.03	1.0	.6	67-3	26	105.4
*	9037	3	10	10.49	8	30	31.0	29.3	36.9	2.16	.85	.32	.40	4.0	118	17	5	135	77	2.85	.43	.54	1.7	12-3	44	98.0
4740	2	10	12.19	72	267	29.8	27.9	39.0	3.49	.71	1.00	6.0	183	199	45	22	85	1.22	.32	.60	-.7	.28-3	15	90.3		
4742	2	10	12.20	0	39	36.0	33.9	38.4	2.97	.91	.27	5.7	122	19	23	140	74	0.47	.79	.54	-.3	27-3	40	94.4		
4744	2	10	12.22	39	37	38.2	36.4	35.6	1.74	.87	.23	3.3	311	199	47	150	64	124.1	.39	.80	2.0	73-5	7	94.5		
9039	3	10	12.26	15	34	35.0	33.3	37.4	2.33	.91	.22	4.4	310	199	2	149	72	.86	.68	.91	1.0	75-4	28	105.5		
9041	3	10	12.28	15	34	35.2	33.3	37.4	1.81	.84	.30	3.3	123	199	6	142	75	3.15	.31	.20	.87	1.5	34	101.5		
4747	2	10	12.30	9	34	31.2	29.1	35.9	3.07	.68	.99	5.2	188	199	79	27	59	.65	.20	.87	1.5	14	98.7			
4750	2	10	12.33	80	140	45.3	43.9	38.6	1.90	.85	.07	3.2	329	200	22	169	65	4.95	2.86	.64	.24	.23-4	12	112.6		
*	9046	3	10	12.33	45	55	50.5	49.2	38.4	2.91	.91	.25	5.6	305	199	95	143	51	8.19	.81	.93	1.7	80-5	13	104.7	
9057	3	10	12.40	39	87	13.5	7.5	23.0	.72	.40	.43	1.0	348	199	5	187	27	1.95	-.77	.29	2.0	22-3	9	78.3		
*	9062	3	10	12.44	3	141	62.2	60.9	40.1	5.39	.94	.32	10.4	247	19	146	266	35	2.48	1.26	.34	.47	.32	41	95.0	
4752	2	10	13.19	22	42	45.7	44.0	41.5	16.38	1.00	.07	3.2	329	200	6	144	75	2.70	.37	.74	1.4	98-4	37	98.7		
4754	2	10	13.22	10	35	32.0	29.8	36.2	1.90	.85	.28	3.5	124	20	7	150	75	3.26	.22	.79	1.0	32-3	38	104.0		
4756	2	10	13.22	-1	310	15.5	11.2	40.1	5.35	.82	.98	9.7	194	200	5	153	51	2.50	.72	.70	1.5	26-2	80	80.5		
4760	2	10	13.24	51	13	33.9	32.1	39.3	3.77	.84	.60	6.9	263	200	42	103	79	13.04	.64	.94	-.6	31.3	29	104.5		
4762	2	10	13.25	-35	321	14.1	9.0	38.1	2.71	.64	.99	4.4	14	20	4	154	75	2.20	.09	.46	1.3	82-3	41	95.0		
4764	2	10	13.25	18	10	31.3	29.1	34.5	1.51	.63	.25	2.8	130	20	7	150	75	2.20	.09	.46	1.3	82-3	41	95.0		
4766	2	10	13.26	11	20	26.6	24.2	38.0	2.65	.80	.52	4.8	274	200	2	114	89	1.19	.39	.91	1.2	13-3	25	86.5		
4767	2	10	13.26	11	20	26.6	24.2	38.0	2.65	.80	.52	4.8	274	200	2	114	89	1.19	.39	.91	1.2	13-3	25	86.5		
4774	2	10	13.28	18	18	27.2	24.9	37.9	2.60	.81	.91	4.7	276	200	8	116	87	5.42	.38	.97	1.5	17-3	37	102.0		
4776	2	10	13.29	2	33	11.9	4.7	29.4	.97	.16	.81	1.6	274	200	2	130	79	.93	-.87	.91	2.0	31.3	10	79.0		
4781	2	10	13.30	45	84	59.2	58.0	36.6	2.04	.74	.54	3.5	275	200	132	115	33	2.66	.13	.67	1.3	48-5	9	107.4		
4783	2	10	14.23	45	1	25.3	22.8	37.4	2.33	.69	.71	4.0	252	201	27	93	89	13.04	.11	.98	1.3	11-3	17	98.2		
4787	2	10	14.23	25	328	15.4	11.0	37.0	2.15	.56	.94	3.4	212	201	10	122	89	8.56	-.11	.92	1.5	33-3	16	83.7		
4789	2	10	14.23	8	13	87	70.6	69.4	44.7	3.96	1.16	.63	-.72	21	159	93	27	126	78	.93	-.17	.5	27-4	39	119.8	
4791	2	10	14.25	-33	354	13.1	13.2	39.0	3.96	.73	.93	6.0	33	21	9	154	54	126	78	.35	.54	-.6	34-2	34	84.5	
4795	2	10	14.27	6	36	17.6	13.6	36.6	.99	.45	.54	1.4	118	21	4	139	76	4.55	-.58	.85	2.5	38-2	6	85.0		
4793	2	10	14.28	11	28	31.2	29.1	38.7	3.21	.88	.39	6.0	108	21	0	129	82	.00	.70	.92	-.7	37-3	26	90.6		
9063	3	10	14.29	8	37	32.4	30.4	36.3	1.91	.86	.27	3.6	125	21	9	146	74	4.29	.40	.88	1.1	11-3	34	102.7		
4799	2	10	14.30	59	356	32.9	31.2	41.0	8.83	.91	.78	16.9	237	201	43	78	115	8.12	1.28	.86	-.3	30-3	33	104.5		
4813	2	10	14.31	30	14	16.2	12.0	31.6	1.14	.39	.70	1.6	274	201	9	115	87	10.42	-.59	.93	1.7	23-3	35	116.1		
9070	3	10	14.31	14	24	28.9	26.8	38.0	2.63	.84	.43	4.8	284	201	3	125	84	2.06	.47	.95	1.3	15-3	36	95.0		
4811	2	10	14.32	8	15	89	70.7	69.6	4.01	5.62	1.13	.67	68	21	163	89	24	71	.02	.92	-.2	16-2	40	103.2		
4832	2	10	14.35	-16	37	33.0	31.1	40.7	7.22	.93	.52	13.9	90	21	30	139	77	3.06	.64	.88	1.5	79-4	29	97.0		
9074	3	10	14.38	12	40	31.6	29.7	34.4	1.50	.84	.24	2.8	132	21	6	153	71	2.90	.24	.94	.9	14-3	33	103.0		
4824	2	10	14.36	38	72	61.7	60.6	4.01	9.82	1.00	.32	196.1	291	201	137	132	3.37	3.78	.93	.1	77-5	8	106.3			
4827	2	10	14.37	24	129	70.6	69.4	41.2	11.4	.93	.82	.69	2.1	234	201	170	130	.27	1.66	.36	0	27-4	28	114.1		
9077	3	10	14.41	23	11	39	34.8	33.1	37.0	2.17	.90	.22	4.1	131	21	7	152	72	3.00	.62	.92	-.2	16-2	40	103.2	
4830	2	10	14.38	18	11	39	34.8	33.1	37.0	2.17	.90	.22	4.1	131	21	6	164	85	.65	.65	.96	1.4	11-4	15	113.3	
4839	2	10	16.19	9	34	31.3	29.4	37.1	2.20	.85	.32	4.1	264	203	5	107	93	4.47	.10	.87	1.1	11-3	13	88.9		
4842	2	10	16.21	-9	359	16.8	12.6	37.5	2.36	.63	.87	3.9	48	23	3	170	118	2.92	.02	.81	2.4	32-3	30	84.8		
4847	2	10	16.27	23	43	42.0	42.2	15.0	1.01	.1	.13	.13	.31	203	21	160	69	5.41	.91	.91	4.4-4	30	104.0			
4852	2	10	16.28	32	39	39.5	37.8	38.5	2.99	.93	.20	5.8	311	203	34	154	68	9.95	.94	.95	5.4-4	26	106.5			
4854	2	10	16.29	16	31	25.5	23.0	34.0	1.42	.71	.41	2.4	294	203	3	137	79	2.18	-.08	.95	.5	50-3	47	98.9		
4856	2	10	16.29	21	26	28.1	25.9	36.8	2.07	.79	.43	3.7	287	203	9	129	82	5.54	.25	.98	1.5	78-4	23	91.1		

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail Nr.	No.	Day	Sh.	True red.	L_0	V_0	V_R	α	δ	q	q'	ω	$\ell\delta$	ι	λ	CN	K	GZ_R	K_{PG}	n_{PG}	n_{B}	n	H_B	A		
4862	2	10	16.33	18	9	38	30.8	28.8	36.0	1.64	.83	.31	3.4	121	23	165	144	76	3.57	.30	.93	.29	102.3	39		
4864	2	10	16.34	18	14	106	72.7	71.6	42.0	-1.68	.05	.95	—	24	23	165	47	12	.20	.45	.01	.174	24	117.0		
4866	2	10	16.34	18	18	41	36.3	34.6	21.5	.92	.17	4.1	316	203	3	159	70	1.22	.77	—	.1	.263	47			
4870	2	10	16.38	13	25	7.7	25.7	23.4	35.7	.74	.66	3.1	286	203	2	128	83	1.20	.07	.7	.07	.303	34	97.3		
4872	2	10	16.40	25	17.3	13.6	34.8	1.55	.48	.81	2.3	65	203	13	88	99	15.32	—	.35	.53	.3	12.2	34	89.7		
9002	3	10	16.43	23	28	98	69.8	68.8	41.2	10.44	.93	.79	20.1	236	203	172	78	17	.27	1.42	.91	.02	.645	10	110.9	
* 4877	2	10	16.45	—25	31	19.8	16.7	35.3	1.67	.55	.76	2.6	72	23	7	95	100	5.03	1.11	.42	.9	.485	.52	99.2		
* 9088	3	10	16.46	75	205	40.4	38.8	39.7	4.43	.78	.99	7.9	167	203	66	10	69	1.65	.55	.43	.8	.434	.18	93.8		
9090	3	10	16.47	8	16	90	67.9	67.0	41.8	30.73	.98	.60	60.9	78	23	164	101	25	.74	.49	.96	1.3	.335	.11	112.6	
4876	2	10	16.48	8	14	90	72.0	71.2	46.0	—	2.61	1.26	.67	66	23	162	89	25	.75	—	.95	.5	.375	.8	109.8	
4883	2	10	17.37	18	10	38	31.7	29.8	36.0	2.08	.86	.30	3.9	121	24	6	145	76	2.97	.43	.91	1.1	.345	.30	101.4	
4889	2	10	17.40	23	26	102	20.4	69.4	41.1	10.12	.92	.83	19.4	229	204	175	73	15	.15	1.37	.82	1.0	.345	.10	113.3	
4891	2	10	17.42	—7	36	67.3	66.3	44.7	1.77	.79	.38	3.2	114	24	7	138	79	4.47	.17	.78	1.5	.195	.49	97.0		
4895	2	10	17.42	—6	97	67.3	66.3	44.7	4.06	1.21	.87	—	40	24	126	64	34	1.43	—	.70	.7	.385	.6	110.6		
4903	2	10	19.23	25	323	16.8	13.0	39.3	3.75	.74	.96	6.5	204	203	12	50	78	128	7.80	.41	.41	.04	.223	.18	82.1	
4905	2	10	19.24	10	338	14.8	9.9	35.1	1.61	.46	.88	2.3	232	206	3	78	114	3.31	.37	.95	.24	.202	.50	91.0		
4907	2	10	19.25	18	12	40	31.2	29.1	36.2	1.89	.84	.30	3.5	122	26	5	147	76	2.35	.33	.84	1.6	1.35	.45	104.0	
4912	2	10	19.26	18	10	38	27.8	26.2	1.89	.82	.24	3.4	117	26	6	143	78	3.36	.28	.87	1.8	.183	.41	100.3		
4918	2	10	19.28	—11	22	18.0	14.6	35.6	1.72	.55	.77	2.7	69	26	8	95	100	8.91	—	.22	.78	.194	.202	17	83.2	
4920	2	10	19.28	—80	132	13.6	7.9	32.3	1.19	.17	.99	1.4	342	33	14	15	100	3.12	—	.77	.74	1.1	.693	.15	81.9	
4922	2	10	19.28	8	15	91	70.2	69.0	44.5	—	4.38	1.14	.55	77	26	162	102	27	.86	—	.82	.45	2.1	.103	.22	116.5
4924	2	10	19.29	9	45	2.6	28.6	28.6	.92	.25	.69	1.1	123	26	2	148	72	1.75	—	.77	.82	1.5	.152	.13	78.7	
4926	2	10	19.29	5	360	16.3	13.0	36.7	2.06	.58	.86	3.3	231	206	2	77	115	2.00	—	.11	.87	1.8	1.7	.12	83.3	
4928	2	10	19.29	15	41	33.5	31.6	37.0	2.17	.88	.26	4.1	126	26	2	152	74	.81	—	.54	.93	2.0	.284	.18	102.3	
4930	2	10	19.30	58	57	47.7	46.3	39.5	4.02	.88	.47	7.6	277	206	80	123	58	8.16	.81	.85	.9	.304	.20	108.1		
4933	2	10	19.38	66	222	39.6	8.0	42.0	—	8.28	1.01	.96	—	159	206	60	5	76	5.02	—	.21	.5	.504	.30	108.4	
4936	2	10	19.39	6	16	93	72.8	71.8	46.5	—	2.31	1.29	.66	66	206	165	92	25	19	.62	—	.84	.214	.24	118.5	
4938	2	10	19.39	16	32	27.9	25.8	36.5	1.97	.79	.41	3.5	289	206	3	135	81	1.94	.23	.87	1.9	.694	.24	97.5		
4940	2	10	19.41	11	62	16.5	12.4	25.1	.77	.49	.39	1.2	147	26	5	173	56	5.46	—	.65	.94	.1	.172	.34	83.1	
4942	2	10	19.42	8	28	85	61.5	60.5	38.5	2.96	.90	.30	5.6	299	206	167	145	32	.96	.75	.98	.6	.685	.10	110.0	
5097	3	10	19.42	8	16	93	67.3	66.3	41.0	.74	.94	.60	18.9	80	26	164	106	25	.91	.49	1.03	.82	1.414	.18	115.2	
9099	3	10	19.42	8	14	94	66.1	65.0	39.7	4.36	.86	.81	.80	82	26	161	107	24	.91	.77	.89	.283	.29	117.4		
4944	2	10	19.43	23	27	100	72.1	71.1	43.8	6.42	1.12	.77	—	235	206	173	81	19	.24	—	.92	.4	.54	.9	112.7	
4948	2	10	19.43	—36	119	54.4	53.1	44.4	—	4.61	1.21	.96	—	339	26	69	5	57	1.81	—	.21	—	1.23	.28	113.9	
4952	2	10	19.44	—7	50	11.6	3.9	29.0	.95	.14	.81	1.1	119	26	3	145	73	1.56	—	.90	.85	1.6	.213	.35	74.5	
4954	2	10	19.44	3	59	32.8	38.0	42.0	1.08	.84	.18	2.0	144	26	32	170	61	12.31	—	.82	1.05	.414	.18	99.1		
4950	2	10	19.45	65	112	45.7	44.4	41.4	12.72	.93	.245	204	206	75	50	64	2.75	1.51	.60	.0	.64	.23	95.7			
4956	2	10	19.45	23	103	70.5	69.6	41.7	22.25	.96	.82	43.7	231	206	169	77	16	.32	2.08	.96	.8	.435	.12	115.7		
4959	2	10	19.46	5	33	26.2	23.6	36.9	2.12	.76	.50	3.7	98	28	6	126	86	4.47	.42	.42	.63	.26	.44	.26	101.9	
9101	3	10	19.47	19	92	61.9	60.9	36.1	1.86	.77	.44	3.3	107	26	169	133	25	.66	.14	.96	1.02	.534	.19	111.5		
* 9104	3	10	20.48	2	11	42	30.3	28.5	35.7	1.74	.83	.30	3.2	122	27	6	149	75	3.35	.26	.65	—	.1	.743	.59	100.9
9105	3	10	20.49	14	93	53.1	52.0	28.3	.90	.74	.23	1.6	143	27	155	170	26	1.93	—	.22	.95	1.03	.13	.755	.13	87.1
* 4964	2	10	21.20	25	283	15.9	11.8	38.8	3.24	.69	.99	5.5	176	208	13	24	132	124	.20	.25	.60	.1.07	.13	.61	.92.5	
* 4966	2	10	21.23	5	33	26.2	23.6	36.9	2.12	.76	.50	3.7	98	28	6	126	86	4.47	.20	.80	1.04	.263	.44	101.9		
4967	2	10	21.24	17	20	23.0	20.1	37.1	2.18	.71	.63	3.7	264	208	5	112	94	4.35	.11	.96	.24	.984	.26	94.5		
* 4974	2	10	21.26	5	95	67.0	65.8	42.0	5.71	.18	.99	113.7	71	28	145	99	2.44	2.99	.31	—	.05	10.5	.47	117.7		
4975	2	10	21.28	18	11	38	28.2	35.8	1.77	.78	.88	3.1	114	28	4	141	79	1.6	.91	.24	.6	.323	.46	101.1		
4977	2	10	21.28	16	16	19	24.9	22.4	39.0	2.04	.62	.82	6.2	261	208	5	109	95	4.09	.53	.21	.32	.97	.12	97.0	
4987	2	10	21.31	6	25	22.9	20.2	37.1	2.19	.77	.62	3.8	219	208	5	112	94	2.44	.22	.90	.27	.984	.12	97.7		

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Year	No.	Mo.	Day	Sh.	True rad.	V_{∞}	V_H	V_G	α	δ	q	q'	ω	Ω	i	π	λ	C.W.	K	CZ_R	H_{DG}	H_{∞}	n	H_B	A		
4992	2	10	21.32	39	35	14.9	10.1	29.0	1.94	.33	.63	1.2	.299	208	8	146	75	.920	-.73	.99	1.0	.50-3	15	79.3	2		
4997	2	10	21.33	-12	22	18.0	14.4	35.9	.56	.79	.65	.65	.65	28	9	93	103	-.31	-.74	1.9	1.0	.50-3	15	89.5	3		
4999	2	10	21.34	-5	35	26.2	23.9	36.4	1.95	.75	.48	3.4	.102	28	7	130	84	.510	.14	.92	1.4	.24-3	46	100.2	5		
5001	2	10	21.34	8	15	97	66.4	65.3	39.7	.434	.86	.60	.81	.82	28	164	110	.277	.77	.64	-.5	.30-4	20	117.7	7		
5003	2	10	21.34	10	36	26.4	24.1	35.7	1.76	.75	.44	3.1	.108	28	4	135	82	.260	.09	.92	1.9	.71-4	20	95.7	1		
*	5006	2	10	21.35	8	15	96	68.1	67.0	41.5	14.98	.96	.61	29.4	.77	28	165	105	.24	.70	1.87	.69	-.3	.30-4	23	115.5	2
5007	2	10	21.35	17	27	56	19.3	34.5	1.60	.45	.88	2.3	.232	208	23	80	95	1.446	-.37	.69	-.7	.11-2	18	85.2	2		
5009	2	10	21.37	13	90	69.3	68.2	43.3	31.6	33.9	1.40	.95	.07	2.07	.335	208	26	183	59	.747	-.74	.99	1.0	.37-4	19	100.1-13	1
5011	2	10	21.37	8	18	93	69.7	68.6	43.9	-	6.08	1.09	.57	-	80	28	168	108	.26	.57	-	.81	-.2	11-4	11	115.3	1
5013	2	10	21.37	8	15	95	68.1	67.0	41.5	14.98	.96	.61	29.4	.77	28	165	105	.24	.70	1.87	.69	-.3	.30-4	23	115.5	2	
5015	2	10	21.38	8	15	95	68.0	66.9	41.8	23.52	.98	.60	46.4	.79	28	163	107	.25	.80	2.26	.80	1.02	.35-5	10	112.6	1	
5019	2	10	21.40	3	32	26.6	24.5	37.9	2.56	.80	.51	4.6	.95	28	8	123	88	.556	.36	.75	1.1	.53-4	10	85.6	1		
*	5022	2	10	21.40	2	11	40	30.1	28.2	36.7	2.06	.83	.35	3.8	.116	28	6	144	78	.324	.35	.85	-.6	.14-5	55	100.5	1
*	5023	2	10	21.41	8	17	98	67.1	66.0	40.6	6.67	.91	.55	12.8	.82	28	167	110	.24	.61	.63	.66	1.6	.14-4	13	113.6	1
5027	2	10	21.41	-18	75	48.4	47.1	41.0	8.74	.94	.55	16.9	.86	28	80	114	59	.763	1.43	.66	1.6	.14-4	20	98.6	1		
5029	2	10	21.42	44	87	62.8	61.8	42.0	57.50	.99	.69	114.5	.271	208	132	119	37	.286	3.13	.96	*1	.16-4	17	113.5	1		
5031	2	10	21.42	47	97	63.5	63.5	40.9	62.20	.92	.67	15.7	.251	208	132	99	33	.218	1.28	.92	.9	.67-5	13	112.3	1		
5034	2	10	21.42	47	80	59.5	58.5	41.7	23.24	.98	.41	46.1	.281	208	120	129	43	.428	2.42	.97	1.8	.43-5	12	113.3	1		
5039	2	10	21.44	8	16	97	68.0	67.0	41.3	12.39	.95	.63	24.2	.76	28	165	104	.24	.67	.68	.92	.3	11-4	17	113.4	1	
5041	2	10	21.46	8	16	94	71.3	70.5	45.6	-	2.93	1.21	.62	-	72	28	165	100	.26	.71	-	.96	-.2	12-4	14	116.6	1
*	5045	2	10	21.49	85	127	42.4	40.9	39.1	3.51	.73	.95	6.1	.206	208	71	54	.65	3.01	.35	.61	-.1.2	.24-5	27	99.9	1	
*	5047	2	10	22.13	-5	17	39	36.0	17.4	13.3	34.0	1.58	.48	.83	2.3	.62	29	4	91	106	4.47	-.35	.35	2.42	.86-5	1	
5048	2	10	22.13	29	28	16.9	13.2	37.6	2.39	.60	.60	.97	3.8	.158	209	16	6	115	6.30	-.03	.37	1.6	.68-5	40	90.5	1	
5050	2	10	22.14	-1	346	14.9	10.3	37.7	2.47	.62	.97	4.0	.213	209	1	61	133	1.38	.02	.83	2.6	27-3	22	81.1	1		
*	5058	2	10	22.25	-1	346	14.9	10.3	37.7	2.47	.62	.97	4.0	.213	209	1	61	133	1.38	.02	.83	2.6	27-3	22	81.1	1	
*	5063	2	10	22.26	23	104	70.6	69.4	41.8	26.77	.97	.77	52.8	.237	209	173	86	17	.22	2.26	.31	.1	.30-4	34	118.9	1	
5064	2	10	22.28	9	32	24.1	21.5	37.8	2.52	.76	.61	4.4	.85	.29	5	113	93	4.13	.21	.87	2.89	2.3	.48-5	16	83.3	1	
*	5073	2	10	22.29	51	32	20.2	17.2	38.6	3.02	.69	.95	5.3	.257	209	23	57	107	.106	.47	.37	.92	1.4	.17-3	11	84.8	1
*	5074	2	10	22.30	17	19	40	30.5	28.5	36.0	1.82	.83	.31	3.3	.301	209	3	150	76	.183	.29	.96	.9	.18-3	42	103.9	1
5076	2	10	22.31	8	16	96	65.3	64.1	39.0	3.39	.84	.54	6.2	.90	29	164	119	.25	.83	.54	1.2	.61-5	13	110.9	1		
*	5079	2	10	22.32	8	15	96	67.8	66.6	41.4	12.67	.95	.59	24.7	.80	29	164	109	.25	.74	1.72	.58	-.1.2	24	118.4	1	
5080	2	10	22.33	36	110	60.8	63.9	1.40	.46	.75	2.0	.51	.209	153	106	19	.81	4.13	.42	.87	1.42	.87-5	14	110.3	1		
*	5083	2	10	22.34	8	15	94	67.2	66.1	41.7	10.94	.97	.53	37.3	.87	29	164	116	.27	.86	2.12	.69	-.2.4	21-3	29	117.6	1
5087	2	10	22.35	-19	7	15	94	68.0	66.9	42.4	-	55.77	1.01	.56	-.82	29	162	111	.27	.91	-.77	.59	2.0	.35-3	19	85.3	1
5089	2	10	22.36	8	15	99	62.4	61.2	35.5	1.69	.68	.54	2.8	.98	29	162	127	.23	.89	-.05	.72	.9	.97	16	112.6	1	
*	5101	2	10	22.38	9	15	96	67.4	66.3	41.3	11.18	.95	.57	21.8	.83	29	164	111	.25	.83	1.63	.80	-.1.3	.55-4	21	116.7	1
5102	2	10	22.40	8	16	96	69.6	68.6	43.1	11.35	1.05	.62	-	75	29	168	104	.24	.53	-.87	.2	.98-5	15	110.5	1		
5107	2	10	22.42	82	22	19.7	16.3	30.7	1.06	.10	.95	1.2	.241	209	31	90	77	.4.93	-.69	.52	.6	.81-3	37	84.3	1		
*	5112	2	10	22.43	8	17	95	67.5	66.5	41.9	29.38	.98	.58	.2	.85	29	166	114	.26	.74	-.2.50	.94	-.2.3	13-3	24	114.9	1
5115	2	10	22.44	10	11	92	30.4	28.7	36.5	1.96	.83	.33	3.6	.119	29	6	148	77	.3.43	.33	.74	.6	.15-3	28	97.0	1	
5117	2	10	22.46	-22	97	55.9	54.0	41.6	16.42	.95	.88	.82	.32.0	40	29	100	69	.4.51	1.70	.60	-.5	.15-4	7	111.2	1		
*	5119	2	10	22.46	8	16	95	67.6	66.7	41.9	30.22	.98	.57	.59.9	.82	29	164	111	.26	.79	2.50	.96	-.7	.19-4	14	109.8	1
5121	2	10	22.46	66	323	13.6	8.2	31.4	1.11	.15	.95	1.3	.232	209	14	81	93	.6.58	-.82	.53	.7	.82-2	1	82.2	1		
*	5124	2	10	22.47	8	17	94	27.8	25.9	38.2	2.76	.83	.47	.5	.90	29	165	127	.23	.77	.04	.54	.4	.12-2	91	101.6	1
5125	2	10	22.48	8	16	99	62.7	61.6	36.0	1.83	.71	.53	3.1	.98	29	165	127	.23	.77	.04	.56	-.3	.22-4	16	112.2	1	
5127	2	10	22.49	8	16	97	66.0	65.2	40.0	4.78	.88	.57	.57	.88	25	164	114	.25	.79	.08	.96	0	12-4	14	108.8	1	

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Mo.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	α	δ	q	q'	α	δ	l	m	λ	C.H.	K	C^*_R	N_R	R_p	n	H_B	A		
5129	2	10	22+49	8	6	97	66.2	65+4	40.0	4+90	.88	.57	9+2	.84	29	165	113	.24	.72	.90	.96	.5	.64-5	13	110+9	
5131	2	10	22+50	22	37	160	64+1	63+0	43+1	-11.82	1.05	.64	108	209	125	317	37	2.67	-	.72	.66	.0	.15-4	16	114+9	
5136	2	10	23+27	41	345	19.8	16.6	38.4	2.06	.69	.88	4+8	224	210	18	74	108	1.01	.20	.90	.62	.0	.48-3	23	85+5	
5138	2	10	23+28	-27	60	13+4	7.2	29.2	.95	.18	.78	1+1	114	30	11	143	77	7.02	-	.86	.62	.7	.10-2	16	81+4	
5140	2	10	23+31	8	17	96	72+2	71.1	46+0	-	.63	-	70	30	167	100	26	.57	-	.56	1.7	.94-6	4	108.1		
5142	2	10	23+31	24	49	35.9	34+1	35.9	1.80	.91	.17	3+4	319	210	11	168	68	4.24	.57	.97	.64	.45-4	21	102+0		
5145	2	10	23+33	8	16	47	28+7	26.5	35.6	1.73	.79	.36	3+1	117	30	166	103	.25	.63	.17	.95	.1.0	.16-3	33	116+0	
5147	2	10	23+34	14	41	71.5	70.5	46+2	-	2.53	1.23	.58	-	76	30	164	106	28	.76	-	.77	1.3	.39-5	13	111+6	
5153	2	10	23+36	8	16	94	69.1	68.0	43.8	-	6.40	1.09	.54	-	83	30	165	113	28	.78	-	.79	0.0	.14-4	16	114+3
5155	2	10	23+36	8	16	94	69.1	68.0	43.8	-	6.40	1.09	.54	-	83	30	165	113	28	.78	-	.79	0.0	.14-4	16	114+3
5157	2	10	23+36	8	17	98	70+1	69.0	43+3	-	9.38	1.07	.64	-	72	30	167	102	24	.55	-.30	.75	.3	.74-5	10	113+5
5159	2	10	23+37	30	10	17.8	14.3	35.0	1.60	.52	.77	2+4	250	210	10	100	99	11.21	-.30	.81	.1.7	.91-4	8	86+5		
5163	2	10	23+38	8	17	94	71.9	70.9	46.6	-	2.30	1.25	.58	-	76	30	168	105	28	.60	-.30	.86	-.5	.18-4	16	117+8
5165	2	10	23+38	8	17	94	69.2	68.0	44.2	-	5.04	1.11	.59	-	77	30	158	107	28	1.10	-.30	.82	-.3	.12-4	16	115+8
* 5176	2	10	23+43	18	11	42	30.4	28.6	36.7	2.02	.84	.33	3+7	118	30	158	6	147	78	3.04	.35	.80	-.8	.11-2	55	102+3
* 5177	2	10	23+43	8	13	99	67.7	66.8	41+4	12.53	.95	.64	24+4	74	30	159	104	24	.93	1.68	.00	1.6	.30-5	11	109+5	
* 5180	2	10	23+44	17	19	41	31.8	30+2	3+3	2.06	.87	.31	4+2	300	210	4	150	77	1.99	.49	.76	-.6	.39-3	37	93+4	
5183	2	10	23+45	8	16	97	65.2	64+2	39.3	3+77	.86	.53	7+0	91	30	164	121	25	.86	.70	.96	-.6	.17-4	12	109+3	
5185	2	10	23+46	8	16	95	67.1	66.2	41.7	22.03	.98	.53	43+5	87	30	165	116	27	.81	.25	.96	-.3	.14-4	16	108+4	
5192	2	10	23+48	29	53	35+3	33.8	33.6	33.6	1.35	.90	.14	2+6	325	210	22	175	63	7.97	.40	.81	1.0	.60-4	21	104+3	
* 5195	2	10	23+48	18	11	40	28+9	27+1	36+7	2.05	.81	.38	3+7	112	30	5	142	80	3.05	.30	.57	.9	.45-3	58	102+1	
5196	2	10	23+48	8	16	96	68.3	67.5	42.7	-19.80	1.03	.57	8+1	81	30	164	111	26	.81	.22	.96	-.2	.11-4	12	113+2	
5204	2	10	23+49	6	139	61.6	60.4	34+1	1.43	.62	.54	2+3	259	30	160	289	21	.93	-.22	.73	1.1	.10-4	19	110+7		
5206	2	10	23+49	50	112	64.2	63+0	40.9	7.08	.89	.86	14+8	225	210	129	74	32	1.01	1.13	.95	-.0	.51-5	25	111+5		
5208	2	10	23+49	8	16	98	68.2	67.4	42.0	57.23	.99	.61	113.9	78	30	165	108	25	.69	3.03	.96	.1	.81-5	11	111+6	
5210	2	10	23+50	8	13	96	66.7	65.9	41+4	12.93	.96	.57	25+3	83	30	159	113	27	1.08	1.76	.04	.6	.60-5	12	113+6	
5212	2	10	23+51	-2	105	70.4	69.0	63.9	3.11	1.29	.90	3+4	34	30	137	64	136	.04	.96	-.07	.68	-.4	.98-5	13	111+1	
5217	2	10	24+21	-15	321	13.3	7.8	37.4	2.32	.58	.99	3+7	192	211	0	130	4	163	.04	.96	-.07	.68	-.4	.84-5	35	94+0
5221	2	10	24+22	27	29	22.2	19.1	34.2	1.45	.61	.56	2+3	276	211	9	129	86	7.97	-.22	.93	1.6	.95-4	15	84+8		
5225	2	10	24+25	-26	30	20+1	16.7	3+1	2.18	.63	.82	3+5	.97	31	17	88	102	132	-.02	.57	.95	-.3	.34	.87-7	17	
5227	2	10	24+27	-30	340	12.3	5+8	34+9	1.58	.38	.98	2+2	.19	31	3	10	146	1.54	-.46	.85	1.2	.88-3	14	81+5		
* 5231	2	10	24+28	33	100	67.8	66.6	41.8	22.76	.97	.61	44+9	258	211	158	108	26	1.01	2.22	.50	.6	.75-4	32	116+7		
* 5234	2	10	24+30	13	55	20.8	17.6	28+1	.89	.59	.36	1+4	135	31	5	166	67	430	-.46	.94	1.6	.28-3	35	94+0		
* 5237	2	10	24+30	-9	32	28.6	26+4	41.6	1.64	.96	.62	31+1	.97	211	0	107	95	1.91	1.92	.78	.8	.30-3	47	102+0		
* 5239	2	10	24+31	15	34	33.8	32.0	41.8	28.38	.99	.40	56.4	282	211	1	133	85	.42	2.60	.95	.8	.10-3	30	100+6		
5242	2	10	24+31	11	8	19.0	15+8	38+3	2.81	.71	.80	4+8	237	211	3	88	110	3.23	.23	.86	.6	.65-3	30	85+5		
* 5244	2	10	24+31	16	47	32.4	30+5	36.0	1.83	.86	.26	3+4	127	31	3	158	73	1.33	.38	.95	1.2	.79-4	25	99+4		
5246	2	10	24+32	58	62	11.2	29.1	1.7	.95	.07	.88	1+0	317	211	2	168	59	.19	-.96	.95	.7	.18-2	17	75+2		
5248	2	10	24+32	8	17	95	64.0	62.7	3.25	.87	.44	6+1	102	31	165	133	28	.66	.63	.65	.6	.48-5	7	112+7		
5250	2	10	24+35	-1	19	20+4	17+4	38+2	2.71	.72	.75	4+7	.65	31	4	104	96	4.24	.23	.75	1.3	.22-3	19	84+7		
* 5254	2	10	24+37	-18	19	17.8	14+3	37.3	2.25	.62	.84	3+6	.53	31	10	84	110	10.02	-.01	.57	-.8	.13-2	16	84+0		
* 5257	2	10	24+39	17	19	44	32.8	31.1	31.0	2.15	.88	.27	4+0	304	211	3	155	75	1.02	.51	.92	1.6	.16-2	48	102+4	
5260	2	10	24+40	8	16	96	68.1	67.1	42.7	-21.19	1.03	.55	-	84	31	164	115	27	.83	-.83	.86	1.1	.41-5	10	114+0	
5262	2	10	24+40	37	112	67.7	66.6	39.8	4.46	.81	.84	8+1	229	211	153	80	20	.71	.64	.74	.7	.14-4	16	108+4		
5266	2	10	24+41	14	87	63.7	62.7	42.4	-68.00	1.01	.31	-	112	31	154	143	36	1.93	-.93	.63	.6	.48-5	7	112+7		
5268	2	10	24+42	16	95	59+0	57+9	34+3	1.67	.77	.34	2+6	122	31	161	152	28	1.33	.06	.93	1.0	.72-5	12	111+2		
* 5270	2	10	24+42	35	61	36.6	34+6	36.0	1.08	.86	.11	2+6	332	211	36	183	57	11.66	.32	.97	1.6	.27-4	18	89+5		
5272	2	10	24+42	22	36	158	63.5	62.3	40.8	7+55	.91	.65	1+6.5	106	211	120	217	34	1.20	1.22	.44	.1	.14-4	16	112+8	
* 5273	2	10	24+43	22	37	162	63.0	61.8	42.0	58+59	.99	.64	1+6.5	102	211	124	217	37	2.71	3.03	.41	-.8	.67-4	21	113+1	
* 5282	2	10	24+47	8	15	97	64.8	64.8	40+3	5.64	.91	.52	10+8	106	90	91	162	27	1.00	.95	.95	1.4-4	16	115+8		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail. Ir. No.	Day	Sh.	Tree rad.	V _O	V _H	a	e	q	q'	θ	θ	δθ	1	η	λ	C.W.	K	G.Z.R.	M.P.B.	M _{GO}	M _{GO}	B	A	
No.																								
5284	2	10	24.48	11	135	74.1	73.1	44.6	-4.38	1.20	.87	.24	-	.75	1.4	10.5	5	99.9						
5289	2	10	24.49	17	160	63.4	62.1	42.2	327.82	1.00	.20	.22	.50	.54	.22	32.4	22	110.5						
5292	2	10	27.34	34	20	18.2	15.9	1.79	.62	.69	.2.9	12.11	-5.02	.92	.2.0	26.3	21	94.1						
5294	2	10	27.36	75	99	55.3	52.1	44.0	-5.02	1.15	.86	.229	1.13	.93	.2.0	2.0	19	105.0						
5298	2	10	27.36	13	50	34.5	32.8	37.7	2.46	.90	.25	4.7	1.26	.34	.8	160	74	3.25	.67	.94	2.1	23.4	17	
5304	2	10	27.37	-7	114	65.2	64.0	40.6	6.66	.86	.96	12.4	.21	.34	130	.54	.29	.59	.93	.47	.7	12.4	18	
5309	2	10	27.39	23	27	108	65.5	68.5	41.4	.94	.72	23.8	.245	.214	.172	98	.19	.29	1.61	.83	-.5	.5	108.4	-5
5313	2	10	27.47	8	92	63.4	62.6	42.4	85.83	1.01	.40	101	.101	.34	.135	36	.260	.90	.1.0	.12	10.4	12		
5315	2	10	27.48	63	136	55.1	54.0	38.5	2.90	.66	.97	4.8	.91	.234	.104	.53	.44	.93	.16	.80	-.4	27.4	13	
5317	2	10	27.50	8	15	96	67.6	66.9	43.8	-	6.69	1.07	.47	-.8	91	.34	.162	.125	.31	1.08	-.95	-.3	17.4	16
9107	3	10	29.11	7	339	16.2	11.8	39.8	4.37	.78	.95	2.8	.205	.215	.4	60	.14	.34	.32	.55	.92	.7	12.2	36
9109	3	10	29.41	26	47	29.7	27.0	108	56.1	55.0	41.0	.80	.32	.216	.10	158	.75	.57.9	.17	.89	.1.3	74.4	20	
9113	3	10	29.44	61	99	55.1	50.1	9.2	.93	.68	18.3	.250	.216	.103	.105	.47	4.07	1.41	.87	1.1	60.5	9	108.2	
9114	3	10	31.24	19	29	15.1	10.3	32.5	1.21	.37	.76	1.07	.309	.216	.4	165	.67	1.82	-.90	.94	1.7	11.2	22	
9121	3	10	31.31	21	48	35.3	33.6	4.2	28.6	.92	.16	7.8	.300	.218	.4	157	.77	1.54	1.06	.98	1.5	37	106.2	
9122	3	10	29.46	16	100	67.8	66.9	42.8	-20.55	1.03	.52	-.87	.36	.165	.123	.28	1.25	.80	-.96	1.1	14.4	16		
5329	2	10	29.47	39	129	72.3	72.3	45.5	-3.14	1.31	.98	-.194	.216	.147	.50	.21	.29	-.91	-.2.5	.10	3	19	119.5	
9123	3	10	31.20	1	26	21.8	18.6	38.9	3.27	.77	.97	5.8	.66	.37	.5	104	.104	.450	.41	.96	.1	32.3	14	
9124	3	10	31.24	19	29	15.1	10.3	32.5	1.21	.37	.76	1.07	.262	.218	.2	119	.95	2.82	-.58	.97	.5	66.3	13	
9125	3	10	31.31	21	48	35.3	33.6	4.2	28.6	.92	.16	7.8	.300	.218	.4	181	.65	6.65	.62	.674	.96	91.7		
9123	3	11	21.10	46	316	16.1	11.8	36.8	4.04	.52	.98	3.1	.197	.219	.16	57	.116	6.42	-.19	.97	.9	88.3	28	
9130	3	11	21.12	31	279	17.9	14.5	39.6	4.02	.76	.98	7.1	.168	.219	.17	219	.17	4.72	.46	.73	1.4	86.3	54	
9131	3	11	21.13	69	38	17.5	13.5	29.6	.97	.28	.77	1.02	.290	.219	.21	150	.75	14.65	-.76	.74	1.0	53.3	24	
9134	3	11	21.17	4	34	23.6	20.6	38.3	2.77	.76	.66	4.9	.78	.39	.6	117	.97	4.63	.31	.74	1.2	29.3	35	
9136	3	11	21.19	30	62	33.4	31.3	32.8	1.25	.37	.76	1.07	.322	.219	.16	181	.65	6.65	.62	.674	.96	91.7		
9138	3	11	21.21	54	337	35.1	4.02	5.23	.90	.50	10.0	.272	.219	.4	144	.76	12.21	1.02	.74	1.4	28.4	15		
9144	3	11	2.28	10	59	36.8	35.0	38.3	2.77	.92	.22	5.3	.129	.40	.19	168	.72	6.67	.82	.86	1.4	30.4	18	
9147	3	11	2.29	45	92	56.7	57.5	41.0	10.6	.97	.31	21.0	.293	.220	.121	152	.44	4.72	1.85	.74	1.1	55.4	29	
9149	3	11	2.31	51	68	48.4	47.1	41.6	5.2	.98	.31	31.5	.305	.220	.74	153	.61	9.53	2.21	.91	1.9	27.3	24	
9150	3	11	2.32	2	13	50	26.6	25.4	35.4	1.66	.77	.39	12.4	.76	.40	117	.82	12.29	1.10	.32	1.3	105.0	53	
9156	3	11	2.34	43	337	11.8	4.7	32.3	1.19	.19	.97	1.4	.214	.279	.221	2	140	.86	1.42	-.08	.97	.9	41.3	43
9158	3	11	2.35	2	11	49	26.7	24.7	35.7	1.73	.75	.43	3.0	.108	.40	6	148	.81	4.15	.08	.93	3.0	60.4	32
9162	3	11	2.36	83	108	43.2	41.7	40.3	5.47	.84	.89	10.0	.220	.220	.70	79	.66	4.77	.79	.69	.9	14.4	8	
9164	3	11	2.36	16	58	34.4	32.7	36.4	1.60	.89	.81	3.6	.132	.40	.172	71	.71	2.87	.51	.96	1.6	52.4	29	
9167	3	11	2.36	21	60	37.1	4.06	4.2	25.4	1.25	.77	11.9	.229	.214	.5	153	.75	3.27	.10	.91	1.3	105.0	53	
9168	3	11	4.31	-19	93	65.2	64.0	50.3	-	1.19	.68	.80	4.6	.42	.105	.87	50	2.80	-.32	-.1	.51.4	42		
9203	3	11	4.33	40	119	57.6	56.3	32.3	1.19	.56	.53	1.9	.288	.222	.139	150	.27	1.96	-.37	.64	-.8	10.4	12	
9206	3	11	6.33	-15	17	17.4	13.8	39.2	3.48	.74	.90	6.1	.39	.44	.8	122	.83	7.40	.37	.60	-.1	15.2	29	
9210	3	11	6.33	17	22	54	32.9	31.3	36.8	2.05	.87	.27	3.8	.305	.224	.5	161	.78	1.47	.67	.98	1.4	105.2	38
9212	3	11	6.35	22	52	26.4	21.0	30.0	33.5	1.33	.96	0.5	2.6	.159	.221	.4	165	.74	4.20	.84	.97	1.3	93.7	24
9220	3	11	6.38	39	92	57.1	55.9	40.8	7.23	.98	.18	14.3	.311	.224	.123	175	.45	5.39	1.76	.97	.8	67.5	9	
9222	3	11	6.40	101	631	62.1	41.2	9.36	.97	3.0	.53	18.4	.115	.244	.44	158	.35	1.70	1.76	.91	1.1	48.5	10	
9224	3	11	6.40	-21	113	70.5	69.2	44.7	-	4.31	1.22	.98	-	3.01	.226	.31	28	134	.31	3.37	-.44	13.4	24	
9226	3	11	6.41	43	20	23.0	20.0	38.4	2.79	.73	.75	4.8	.245	.225	.13	110	.98	12.61	.90	.52	1.1	116.6	24	
* 5332	2	11	7.09	-36	254	12.6	6.6	1.38	3.08	.32	.94	4.8	.243	.225	.13	110	.98	12.61	.90	.52	1.1	92.8	24	
* 5335	2	11	7.09	-37	21	17.7	13.8	2.00	2.00	.73	.75	4.8	.243	.225	.13	110	.98	12.61	.90	.52	1.1	84.2	24	
* 5335	2	11	7.11	-37	22	21.0	17.7	38.4	2.00	.73	.75	4.8	.243	.225	.13	110	.98	12.61	.90	.52	1.1	84.2	24	

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True red.	V_{∞}	V_0	V_H	α	δ	θ	η	η'	μ	μ'	μ_H	μ'_{∞}	μ_R	μ'_R	μ_M	μ'_M	μ_{CR}	μ'_{CR}	μ_A	μ'_A	
5339	2	11	7.14	31	6	20.6	17.3	38.9	3.23	.75	.81	5.7	235	225	11	100	108	9.45	.35	.94	1.3	12.3	1.3	83.0	2	
5341	2	11	7.17	17	20	5.5	30.3	38.0	1.92	.82	.34	3.5	297	225	11	102	78	.48	.29	.69	1.9	16-3	1.9	100.2	1	
9235	3	11	7.31	75	334	26.4	24.1	38.1	2.63	.65	.92	4.3	216	225	37	80	89	9.32	.06	.67	1.7-5	20	1.7-5	90.3	1	
* 9236	3	11	7.37	2	13	54	26.3	26.6	1.97	.79	.41	3.5	110	45	6	154	81	3.72	.23	.91	.2	34-3	44	100.6	1	
* 9240	3	11	7.38	2	13	51	26.2	23.9	1.88	.75	.47	3.3	103	45	5	148	84	3.69	.12	.88	.3	65-3	48	98.0	0	
9241	3	11	7.39	24	63	33.4	31.6	35.3	1.63	.87	.21	3.0	314	225	4	179	70	1.82	.38	.96	1.7	51-4	27	102.3	3	
9243	3	11	7.43	-43	15	54	29.3	27.4	2.19	.82	.39	4.0	110	45	5	155	81	2.90	.35	.76	1.1	71-4	12	92.5	2	
* 9246	3	11	7.43	2	15	54	29.3	27.4	2.19	.82	.39	4.0	110	45	4	155	81	2.90	.35	.76	1.1	71-4	12	92.5	2	
9247	3	11	7.44	20	136	78.4	77.4	47.5	1.92	1.52	.99	-	185	225	175	45	155	81	2.08	.42	.77	1.5	13-3	39	103.5	5
9249	3	11	7.44	17	22	28.8	28.0	37.6	2.34	.84	4.3	291	225	4	155	81	2.08	.42	.77	1.5	13-3	39	103.5	5		
* 9252	3	11	7.46	13	31	19.8	16.9	37.4	2.29	.68	.74	3.8	249	225	0	114	102	1.39	.42	.63	1.7	50-3	49	86.2	2	
* 9257	3	11	7.48	17	21	54	30.4	28.6	37.4	2.26	.84	.35	4.2	294	225	3	159	79	1.39	.42	.63	1.7	27	91	103.7	1
9258	3	11	7.50	16	107	66.3	55.5	42.1	56.67	.99	.45	112.9	96	45	165	141	30	93	3.16	.95	.95	.5	90-5	15	110.9	1
* 9265	3	11	9.26	17	23	54	30.5	28.3	37.5	2.33	.84	.37	4.3	292	227	4	158	80	1.88	.43	.93	1.0	18-3	35	100.0	1
9277	3	11	9.27	-17	79	45.6	44.0	43.1	12.90	1.04	.53	85	47	65	132	68	9.16	-.48	1.34	1.3	31-2	63	96.1	1		
9279	3	11	9.27	-2	55	32.3	30.3	40.9	7.42	.93	.49	14.4	93	47	21	139	85	9.67	1.34	.60	-.2	31-2	63	96.1	1	
9276	3	11	10.30	19	60	21.2	24.8	34.2	1.43	.75	.36	4.3	104	48	1	167	76	.78	-.01	.96	2.0	20-4	89.8	1		
9280	3	11	10.34	2	13	54	28.5	26.4	37.6	2.35	.81	.44	4.3	104	48	6	152	83	3.62	.36	.94	.6	33-3	43	102.9	1
9287	3	11	10.37	32	67	39.0	37.5	38.6	2.96	.94	.17	5.8	315	228	22	183	69	7.10	1.00	.99	-.5	24-3	34	101.9	1	
* 5346	2	11	11.21	2	15	58	28.7	26.3	36.7	2.00	.80	.41	3.6	109	49	6	158	81	3.42	.25	.79	.7	30-3	50	102.3	3
5347	2	11	11.22	2	14	52	25.0	26.7	37.0	2.12	.81	.41	3.8	108	49	6	157	81	3.73	.30	.82	2.0	22	99.7	1	
5351	2	11	11.25	2	13	56	25.2	22.6	37.0	2.12	.75	.54	3.7	274	229	3	143	88	2.40	.17	.96	2.0	20-4	96.7	1	
5353	2	11	11.25	2	13	56	25.3	26.0	31.0	2.16	.80	.43	3.9	105	49	6	154	83	3.86	.29	.88	2.0	20-4	96.7	1	
5357	2	11	11.34	21	52	27.2	25.0	37.4	2.27	.79	.47	4.1	281	229	2	150	85	1.28	.29	.96	-.1	85-3	62	98.8	1	
9311	3	11	11.44	49	71	44.6	43.4	41.8	18.71	.98	.29	37.1	295	229	58	164	66	10.74	2.38	-.88	-.8	99-4	19	94.1	1	
9314	3	11	11.47	24	67	28.2	26.3	36.3	1.87	.79	.39	3.7	26.3	229	4	161	80	2.29	.21	.96	1.6	66	99-6	1		
5361	2	11	12.16	-6	89	40.0	38.1	33.2	1.28	.80	.26	2.3	131	50	65	181	57	11.07	.05	.70	1.5	99-4	57	102.4	1	
5363	2	11	12.17	13	64	27.5	24.9	34.2	1.63	.74	.37	2.5	118	50	9	168	76	5.20	-.02	.62	.6	10-3	14	88.4	1	
5367	2	11	12.18	24	21	341	15.1	10.5	38.7	3.04	.68	.97	5.1	200	230	7	69	140	4.65	.21	.94	1.5	75-3	35	90.1	1
* 5369	2	11	12.19	24	338	17.6	13.9	41.5	13.34	.93	.97	25.7	198	230	10	68	138	5.99	1.55	.89	1.5	55-3	36	74.5	1	
* 5370	2	11	12.19	24	21	342	14.8	10.3	38.4	3.86	.75	.97	6.8	196	230	8	65	142	4.42	.43	.88	1.3	97-3	40	75.4	1
5373	2	11	12.19	22	342	15.6	11.6	39.5	3.49	.72	.96	6.0	200	230	8	70	139	5.01	.34	.91	2.0	82-3	55	90.7	1	
5371	2	11	12.20	17	24	57	31.3	29.1	38.3	2.76	.87	.37	5.1	290	230	4	160	81	2.20	.58	.80	2.0	20-4	96.7	1	
5380	2	11	12.20	30	61	31.1	28.9	36.2	1.83	.83	.32	3.3	300	230	11	170	76	5.59	.28	.81	2.1	46-4	95.6	1		
5382	2	11	12.23	31	21	20.6	17.4	39.0	3.40	.77	.80	6.0	236	230	10	106	108	6.71	.41	.99	2.3	86-3	23	93.4	1	
5384	2	11	12.23	33	23	11.4	2.7	30.9	1.06	.11	.94	1.2	239	230	2	109	105	.46	-.88	.99	2.0	46-3	14	76.0	1	
5388	2	11	12.25	10	60	26.9	24.4	35.6	1.69	.74	.44	2.9	108	50	9	158	81	5.98	.05	.85	1.7	13-3	29	97.8	1	
5390	2	11	12.25	-3	53	27.9	25.6	39.5	3.87	.85	.58	7.2	84	50	17	134	90	10.14	.68	.80	1.4	94-4	21	93.5	1	
5392	2	11	12.26	32	22	21	18.1	39.3	3.60	.78	.79	6.4	238	230	10	107	107	9.13	.47	.98	1.7	68-3	45	98.2	1	
5401	2	11	12.33	-11	63	34.3	32.5	41.5	13.59	.96	.54	26.6	86	50	3	111	107	1.95	2.80	.93	1.8	13-3	32	81.2	1	
5402	2	11	12.29	7	358	15.4	11.1	39.1	3.42	.72	.94	5.9	207	230	2	77	139	1.87	.33	.72	1.4	63-3	46	88.1	1	
5405	2	11	12.30	45	51	28.7	26.6	36.9	2.05	.76	.49	3.6	280	230	24	150	81	12.60	.18	.98	1.7	78-4	24	92.4	1	
5407	2	11	12.33	-11	63	34.3	32.5	41.5	1.28	.40	.77	1.8	240	230	2	77	139	1.87	.33	.72	1.4	63-3	46	88.1	1	
5449	2	11	12.34	21	40	15.3	10.9	33.1	2.80	.66	.97	4.6	200	230	7	70	138	5.03	.13	.74	2.0	63-3	46	88.1	1	
5450	2	11	12.35	22	123	73.6	72.5	46.4	-	2.42	1.35	.85	1.7	240	230	2	77	139	1.87	.33	.72	1.4	63-3	46	88.1	1
5443	2	11	12.35	2	12	51	26.6	27.7	31.7	2.41	.84	.40	4.4	289	230	2	159	81	.93	.43	.94	-.2	45-3	41	99.7	1
5447	2	11	12.37	17	22	51	29.6	27.7	31.7	2.41	.84	.40	4.4	289	230	6	171	75	.97	.41	.97	-.2	46-4	26	98.6	1

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	V_{∞}	V_0	V_H	a	e	q	q'	ω	Ω	i	λ	C.W.	K	CZ_R	M_{pg}	m_{co}	n	H_B	A							
5421	2	11	12.39	15	60	47.9	46.7	41.4	11.15	1.00	.05	.22.2	155	.50	.43	205	61	8.19	2.71	.95	.2	23-4	12	92.4							
9321	3	11	13.22	14	53	26.1	43.0	51.4	1.05	1.35	.36	.96	146	.51	.8	146	87	18.59	—	.86	.02	.89	.7	56-3	18	63.2	-3				
9323	3	11	13.25	28	17.2	13.3	37.6	2.23	.64	.85	.3	.8	51	.51	3	101	114	3.72	.02	.00	.40	.97	1.1	17-3	25	100.6					
9325	3	11	13.32	18	50	26.4	24.0	38.0	2.01	.80	.53	.49	92	.51	0	143	89	.00	.40	.97	.1.1	17-3	25	100.6							
9328	3	11	13.34	22	56	31.2	29.3	39.4	3.73	.89	.40	.7.0	285	.231	2	156	83	1.11	.82	.97	.5	22-3	34	100.4							
*	9331	3	11	13.35	17	23	61	30.7	28.8	36.9	2.07	.84	.34	.3.8	297	.231	3	167	78	1.66	.37	.98	1.19	26-2	56	105.3					
*	9335	3	11	13.36	-3	7	104	60.4	59.4	41.1	17.86	.98	.39	.3.03	103	.251	114	153	45	4.00	2.20	.86	1.0	16-3	31	109.9					
9346	3	11	13.42	30	148	70.7	69.7	41.7	15.79	.94	.99	.29	17.5	116	.51	134	167	40	3.65	1.73	.90	1.12	64-4	21	112.2						
5423	2	11	15.29	29	85	42.4	40.8	35.9	1.76	.97	.05	3.5	338	.233	26	211	59	6.35	1.11	.94	1.0	25-4	18	96.5							
5425	2	11	15.29	17	24	60	29.5	27.4	2.19	.82	.39	.4.0	290	.233	3	163	81	1.90	.35	.98	1.02	11-3	28	94.6							
5427	2	11	15.30	30	40	29.5	19.7	37.8	2.43	.72	.67	.4.2	256	.233	8	129	96	7.28	.18	.98	1.0	11-3	23	94.6							
5429	2	11	15.32	17	23	59	29.1	27.0	31.7	2.36	.82	.4.3	286	.233	3	159	82	1.72	.39	.98	.0	41-3	41	101.6							
5433	2	11	15.34	17	5435	2	11	15.36	17	25	170	55.7	54.3	30.0	1.00	.52	4.8	1.5	59	233	137	292	26	2.02	-.50	.21	1.0	12-4	15	98.0	
5437	2	11	15.36	-6	63	32.9	31.3	41.4	11.49	.96	.52	.22.5	88	.53	.27	141	85	11.62	1.70	.66	1.0	72-4	33	99.7							
5439	2	11	15.42	10	154	74.3	73.2	43.7	7.75	1.12	.92	.331	53	179	24	9	.02	.62	-.8	.00	.20	4-4	16	114.1							
5444	2	11	15.43	23	152	61.7	70.7	41.5	12.55	.92	.98	.24.1	171	.233	162	44	11	.11	1.49	.05	-.3	.45-3	39	127.6							
*	5450	2	11	15.49	13	45	165	61.4	60.2	39.8	4.018	.76	.99	.7.4	172	.234	118	46	36	.29	.49	.96	.2	19-4	17	111.2					
*	9358	3	11	16.40	32	79	40.1	38.7	37.2	2.15	.95	.11	.4.2	326	.234	25	199	64	7.24	.91	.97	.0	.80-4	20	98.3						
9360	3	11	16.41	9	112	59.9	58.8	37.9	2.51	.88	.31	.4.7	119	.54	.45	172	34	2.62	.59	.67	.5	12-4	14	106.1							
9362	3	11	16.41	32	79	40.1	38.7	37.2	2.15	.95	.11	.4.2	326	.234	25	199	64	7.24	.91	.97	.0	.80-4	20	98.3							
9364	3	11	16.50	11	125	70.4	69.0	43.0	1.67	.72	.37	.4.2	353	.234	5	227	21	1.10	-.80	.98	.1.1	48-3	10	111.9							
13278	3	11	16.50	33	140	13.1	6.8	23.8	1.67	.72	.37	.4.2	353	.234	5	227	21	1.10	-.80	.98	.1.1	48-3	10	111.9							
9366	3	11	16.51	13	22	152	72.8	71.9	42.6	-39.66	1.03	.98	—	172	.234	163	46	10	.00	—	.93	.9	44-5	13	115.1						
9368	3	11	17.51	21	151	74.4	73.5	43.9	6.49	1.15	.99	—	178	.235	166	53	9	.05	.93	-.02	.75-5	9	112.6								
5461	2	11	18.43	71	91	41.0	39.6	39.7	4.09	.84	.64	.7.5	257	.236	63	133	68	9.39	-.68	.78	1.02	37-4	21	103.6							
5463	2	11	18.50	45	187	56.3	56.0	50.3	5.16	.83	.89	.9.4	141	.236	102	17	46	2.20	.74	.73	.0	11-4	13	97.3							
*	5472	2	11	19.50	69	181	46.7	45.3	39.8	4.21	.77	.97	.7.5	198	.237	79	75	60	1.67	.51	.71	-.1.2	27-3	37	104.7						
*	5473	2	11	20.29	66	356	15.4	10.9	33.8	.36	.32	.93	1.8	223	.238	16	100	100	10.67	-.58	.75	-.2	14-2	21	82.8						
5477	2	11	20.30	15	84	46.7	45.3	42.4	-24.7	1.00	.08	—	146	.58	.33	204	65	7.34	—	.08	.3	46-4	23	100.1							
5479	2	11	20.30	-24	71	33.3	33.3	33.3	1.30	.42	.75	.1.8	79	.58	.23	137	86	15.10	-.50	.62	-.1.4	25-4	26	64.7							
5485	2	11	20.34	34	102	54.4	53.2	40.5	5.88	.95	.97	.11.7	330	.238	116	208	49	7.08	1.98	.91	1.03	76-5	12	98.0							
5487	2	11	20.37	-19	186	11.5	1.3	29.3	.94	.05	.90	1.0	201	.58	1	259	47	.02	-.98	.68	.0.7	23-2	26	76.2							
5489	2	11	20.37	43	121	58.8	57.6	39.7	4.06	.90	.93	7.7	286	.238	123	164	40	2.61	.90	.67	—	25-4	18	111.7							
5491	2	11	20.39	2	131	69.7	68.6	42.3	29.8	74	1.00	.81	596	.50	151	108	22	6.61	4.34	.68	.9	59-5	12	111.9							
5495	2	11	21.37	41	136	65.3	64.3	41.7	16.20	.96	.70	31.7	247	.238	125	32	1.87	1.07	.93	.0.1	77-5	9	107.1								
5502	2	11	21.37	-1	148	69.1	67.9	39.2	3.39	.71	.99	.5.8	353	.59	157	52	13	.09	.30	.61	.7	48-5	9	111.9							
5505	2	11	21.44	21	67	13.2	7.4	29.9	.99	.26	.73	.9.3	39.3	.186	.238	163	64	10	.03	1.91	.98	—	2.2	44-3	20	78.2					
5508	2	11	21.40	21	65	31.0	29.2	39.3	3.54	.89	.40	.6.7	4.67	.6.9	165	0	165	83	.22	.73	.49	.6	60-3	68	99.2						
*	5511	2	11	21.44	17	21	65	31.0	29.2	39.3	3.54	.89	.40	.6.7	315	.243	30	198	66	9.78	.51	.99	.0.4	59-4	17	90.5	1				
*	5523	2	11	25.37	38	88	36.9	35.2	36.1	1.79	.89	.19	3.4	315	.243	30	198	67	9.29	.30	.80	.0.7	35-3	38	91.1						
9385	3	12	4.36	18	76	30.1	28.1	39.6	3.78	.88	.45	7.1	99	.72	5	171	85	2.52	.78	.94	.6	28-3	41	101.3							
9387	3	12	4.36	-2	70	21.2	18.3	36.3	1.85	.62	.70	.3.0	77	.72	13	148	94	11.69	—	.10	.74	.41-3	24	85.9	-6						
9390	3	12	4.37	33	106	36.5	34.8	36.4	1.18	.91	.11	2.3	331	.252	27	223	59	8.03	.39	.99	.5	98-4	21	102.0							
9392	3	12	4.37	31	111	13.3	7.0	26.7	.82	.31	.57	1.0	325	.252	2	217	55	1.99	—	.81	.98	.9	10-3	18	76.5	2					
9396	3	12	4.39	6	76	26.8	24.6	37.9	2.47	.78	.54	4.4	92	.72	14	164	87	9.29	.30	.80	.0.7	35-3	38	91.1							

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Day	Sh.	True red.	V_{∞}	V_0	V_H	a	e	q	q'	ω	Ω	i	λ	α_{M}	K	CZ_R	H_{pg}	H_{∞}	n	H_B	A				
9338	3	12	4.40	34	55	26.0	19.4	39.0	2.18	.77	.72	5.6	247	252	8	139	101	6.98	.39	.74	2.1	32-3	48			
9400	3	12	4.40	25	80	28.0	26.9	30.3	2.18	.81	.71	4.0	280	252	2	180	81	1.46	.32	.89	.8	25-3	99-6			
9402	3	12	4.41	21	84	30.3	28.5	36.9	2.02	.83	.34	3.7	116	72	2	188	78	1.27	.34	.89	.4	32-3	39			
9406	3	12	4.43	-6	71	27.5	25.6	40.9	7.04	.91	.66	13.4	72	21	144	94	12.00	1.15	1.7	.52	1-7	101-3				
9406	3	12	4.44	-1	141	63.4	62.3	36.9	2.03	.68	.66	3.4	80	72	148	152	24	1.30	.02	.80	.0	16-4	13			
*	9411	3	12	4.45	16	3	122	60.3	59.4	42.2	56.66	1.00	.28	113.1	116	72	129	188	4.2	4.16	3.36	.87	-.9	10-3	31	
9412	3	12	7.38	12	94	45.4	44.2	45.2	4.2	56.64	1.05	.19	126	75	29	201	72	6.90	.19	.92	.43	19	95-7			
*	9416	3	12	7.40	15	78	25.6	23.3	37.3	2.17	.76	.53	3.8	94	75	27	169	87	4.77	.19	.86	-.4	12-2	64	100-2	
*	9418	3	12	7.40	4	33	105	36.3	34.6	34.0	1.38	.90	.13	2.6	325	255	21	220	63	7.38	.43	.99	-.9	56-3	36	98-1
*	9419	3	12	7.42	5	135	68.2	67.2	44.2	-	5.65	1.09	.49	-	88	75	154	163	31	1.47	-	.86	-.7	20-4	12	110-1
9421	3	12	7.42	4	34	107	136	68.1	67.1	43.8	1.09	.14	2.4	325	255	25	220	62	8.87	.33	.98	-.1	42-3	31	97-6	
9423	3	12	7.43	-3	136	68.1	67.1	43.8	-	7.43	1.09	.14	1.6	70	255	162	145	30	1.66	-.80	1.2	.92	1-1	116-2		
9425	3	12	7.47	4	34	107	25.6	34.1	33.1	1.26	.89	.14	2.4	326	255	26	221	62	9.01	.35	.89	1.1	74-4	24	96-7	
9422	3	12	8.32	7	74	21.6	18.7	36.3	1.83	.64	.66	3.0	82	76	9	158	93	8.28	1.07	.91	-.6	63-3	36	93-4		
9436	3	12	8.35	22	105	42.8	41.4	38.3	2.68	.98	.07	5.3	153	76	1	229	62	.37	1.34	.97	.9	22-4	14	94-3		
9438	3	12	8.35	25	24	53	18.2	14.8	38.0	2.47	.67	.81	4.1	228	256	2	132	110	1.11	.10	.83	1.3-2	28	82-4		
5527	2	12	9.15	35	45	17.0	12.8	37.2	2.15	.60	.86	3.4	228	256	6	125	113	6.35	-.07	.99	.5	78-3	23	88-9		
5529	2	12	9.19	15	86	32.9	30.7	39.6	3.86	.90	.38	7.3	107	77	10	184	81	4.40	.87	.71	.1	21-3	32	100-5		
5521	2	12	9.19	30	69	17.7	13.7	34.6	1.43	.90	.73	2.1	257	257	3	155	96	3.67	-.92	2.3	20	87-6	1			
5533	2	12	9.20	4	32	114	36.0	34.0	30.8	1.04	.91	.10	2.0	334	257	27	231	57	8.61	.33	.94	1.7	60-3	27	98-8	
5535	2	12	9.20	29	33	17.0	13.0	39.2	3.34	.73	.90	5.8	217	257	5	114	125	4.69	.33	.99	1.0	14-2	61	91-1		
5537	2	12	9.20	18	85	30.4	28.1	38.5	2.77	.85	.42	5.1	105	277	5	182	83	2.77	.54	.79	1.6	84-4	28	102-1		
5539	2	12	9.21	62	76	13.9	8.3	30.9	2.05	.22	.82	1.3	267	257	10	164	87	6.39	-.07	.78	.88	1.9	40-5	15		
5541	2	12	9.22	-13	62	27.6	25.3	44.8	-	4.29	.77	.80	-	49	277	20	126	107	10.39	-.78	.87	1.5	82-4	21	97-2	
*	5557	2	12	9.23	4	30	110	35.8	33.8	32.4	1.18	.90	.12	2.2	329	257	20	226	61	6.74	.36	.68	.7	63-4	19	97-5
5556	2	12	9.23	9	29	14.6	9.8	38.0	2.47	.62	.94	4.0	27	77	1	105	137	.60	.02	.89	1.7	36-3	17	79-7		
5558	2	12	9.24	11	111	40.6	38.8	34.0	1.38	.94	.08	2.7	154	277	10	231	58	9.51	.66	.88	.8	31-4	15	94-5		
*	5551	2	12	9.25	31	134	60.7	59.4	42.1	3.87	.99	.22	69.5	304	257	135	201	42	3.84	3.04	.52	.6	22-4	25	112-6	
*	5552	2	12	9.27	25	24	52	17.9	14.3	37.9	2.44	.66	.83	4.0	233	257	2	130	112	2.17	.06	.98	.9	52-3	25	88-7
*	5554	2	12	9.27	5	43	16.5	12.5	38.7	2.92	.69	.90	4.9	38	77	4	115	124	3.82	.21	.86	1.5	60-3	30	81-2	
*	5557	2	12	9.27	-11	68	22.6	19.8	39.3	3.45	.77	.78	6.1	58	77	17	135	102	12.16	.43	.77	-.6	28-2	74	99-5	
*	5558	2	12	9.28	4	2	79	27.5	31.1	39.1	3.25	.82	.55	5.9	85	77	17	162	122	7.01	.52	.86	.8	32	88-2	
*	5556	2	12	9.28	33	107	35.8	33.8	34.0	1.38	.89	.15	2.6	323	257	22	220	64	8.17	.37	.87	.8	23	99-7		
*	5551	2	12	9.37	4	33	109	35.2	33.4	33.0	1.24	.89	.14	2.3	325	257	23	222	62	8.35	.31	.99	0	20-3	35	101-5
*	9552	3	12	9.40	3	123	58.3	57.3	42.2	45.83	1.00	.20	91.5	127	77	122	204	46	5.35	3.32	.87	.7	74-4	27	103-0	
*	9454	3	12	9.43	29	108	43.9	42.7	39.0	3.18	.98	.07	6.3	332	257	25	229	62	6.01	1.48	.96	-.1	74-4	23	101-8	
*	5552	2	12	10.21	53	353	47.1	43.4	39.0	3.17	.70	.96	5.4	199	258	15	97	122	7.12	.25	.79	1.4	12-2	70	92-7	
*	5553	2	12	10.22	23	52	15.9	11.5	36.3	1.84	.54	.86	2.8	231	258	1	129	113	1.58	-.22	.99	1.6	62-3	32	87-9	
*	5561	2	12	10.25	4	32	109	36.7	34.6	34.2	1.41	.90	.14	2.7	325	258	22	223	63	7.34	.44	.80	.2	11-3	24	100-8
*	5583	2	12	10.26	-2	57	13.7	13.7	37.6	2.30	.63	.86	3.7	49	78	8	127	112	8.19	.00	.85	.4	98-3	30	84-1	
5587	2	12	10.28	-40	76	16.4	12.1	33.6	1.32	.30	.92	1.7	44	78	19	122	95	10.25	-.61	.47	1.1	38-3	15	86-4		
5590	2	12	10.32	4	9461	3	12	10.32	4	9463	3	12	10.37	4	9459	3	12	10.32	4	9463	3	12	10.37	4		

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Date	Sh.	True red.	V _o	V _H	V _G	a	e	q	q'	w	δL	1	λ	C.N.	K	CFR	M _{Dg}	n _{oo}	n	H _B				
5598	2 12 11 20	4	33	110	36.6	34.6	36.0	1.38	.90	.14	2.6	324	259	24	223	63	8.00	.41	.58	.4	15-3	36			
5601	2 12 11 22	4	33	111	36.1	34.1	35.0	1.31	.89	.14	2.5	325	259	24	224	62	7.94	.37	.66	-.7	51-2	69			
5605	2 12 11 22	4	33	111	36.1	34.1	35.0	1.66	.41	.98	2.3	11	259	24	224	62	3.29	-.40	.45	-.5	12-2	18			
5606	2 12 11 24	-46	38	14.0	8.7	35.6	35.6	1.66	.41	.98	2.3	11	259	24	223	63	3.29	-.40	.45	-.5	12-2	18			
5616	2 12 11 25	4	11	110	36.3	34.4	34.1	1.38	.90	.14	2.6	324	259	22	223	63	7.39	.41	.80	1.4	46-4	21			
5614	2 12 11 26	4	32	110	36.3	34.4	34.1	1.38	.90	.14	2.6	324	259	22	223	63	7.39	.41	.80	1.4	46-4	21			
9481	3 12 11 26	4	32	111	35.6	33.7	34.0	1.38	.90	.14	2.6	324	259	24	223	63	9.97	.47	.84	.1	17-3	16			
9483	3 12 11 27	4	32	111	35.6	33.7	34.0	1.38	.90	.14	2.6	324	259	24	224	62	7.88	.53	.85	.4	58-4	18			
5618	2 12 11 27	4	32	111	35.6	33.7	34.0	1.38	.90	.14	2.6	325	259	24	224	62	1.40	.29	.97	1.0	14-3	26			
5620	2 12 11 28	26	87	26.4	26.1	37.3	37.3	2.17	.80	.43	3.9	285	259	2	184	83	1.40	.29	.97	1.0	14-3	26			
9488	3 12 11 28	25	25	59	16.8	12.7	18.0	1.80	.55	.82	2.8	239	259	2	137	108	1.95	-.21	.97	.7	11-2	36			
9488	3 12 11 28	14	86	27.1	24.8	36.6	36.6	1.94	.76	.46	3.4	103	79	9	182	83	5.84	.15	.93	-.3	73-3	38			
5622	2 12 11 29	26	86	21.7	18.7	33.6	33.6	1.31	.60	.53	2.1	283	259	2	183	83	1.37	-.29	.99	1.3	34-3	35			
5624	2 12 11 30	4	35	115	32.4	30.4	30.0	1.98	.84	.16	1.8	327	259	26	226	59	10.15	.06	.87	.8	42-4	10			
9495	3 12 11 30	13	82	13.5	7.9	30.9	1.05	.26	.77	1.3	.92	79	3	171	67	2.96	-.74	.96	2.2	39-3	18				
9498	3 12 11 34	7	62	16.8	15.5	37.9	2.42	.67	.80	4.0	.58	79	6	137	107	6.36	.08	.81	.0	78-3	18				
9500	3 12 11 34	4	33	111	35.3	33.6	33.0	1.26	.89	.14	2.4	35	259	24	224	62	8.60	.32	.99	-.4	28-3	30			
5630	2 12 11 35	4	5902	3 12 11 37	4	33	111	35.3	33.6	33.0	1.26	.89	.14	2.4	35	259	24	224	62	8.60	.32	.99	-.4	28-3	30
9507	3 12 11 40	4	33	111	35.3	33.6	33.0	1.26	.89	.14	2.4	35	259	24	224	62	8.60	.32	.99	-.4	28-3	30			
9508	3 12 11 40	4	32	111	35.4	33.7	33.0	1.27	.89	.15	2.4	325	260	22	225	63	7.71	.32	.56	.4	11-3	26			
5637	2 12 12 19	4	32	111	35.4	33.7	33.0	1.27	.89	.15	2.4	325	260	24	224	63	7.70	.47	.66	.9	67-4	27			
5640	2 12 12 21	4	33	111	35.4	33.7	33.0	1.27	.89	.14	2.4	324	260	22	225	63	7.61	.33	.72	-.7	27	101-4			
5644	2 12 12 22	33	111	35.5	33.8	33.0	1.28	.89	.15	2.4	325	260	22	225	63	7.99	.37	.72	-.7	47-3	45				
5648	2 12 12 23	33	111	36.2	33.7	33.0	1.34	.89	.14	2.5	324	260	24	224	63	7.99	.37	.72	-.7	47-3	45				
5653	2 12 12 23	4	32	111	36.4	34.5	33.9	1.36	.90	.14	2.6	325	260	22	225	63	7.52	.41	.76	.6	49-4	15			
5654	2 12 12 24	4	33	113	36.4	34.5	33.4	1.30	.90	.13	2.5	326	260	25	226	62	8.11	.38	.77	.9	49-4	18			
5659	2 12 12 24	4	33	113	36.4	34.5	33.4	1.30	.90	.13	2.5	326	260	25	226	62	8.11	.38	.77	.9	49-4	18			
5661	2 12 12 25	4	31	111	37.3	35.7	35.7	1.69	.93	.12	3.3	326	260	24	226	63	7.00	.68	.83	1.0	34-4	17			
9510	3 12 12 25	4	27	109	42.7	41.1	38.5	2.81	.97	.08	5.5	330	260	17	230	63	4.36	1.29	.77	.2	83-4	24			
5667	2 12 12 26	4	27	112	36.2	34.3	33.0	1.29	.90	.13	2.4	326	260	25	226	62	8.19	.37	.79	1.1	40-4	16			
5671	2 12 12 26	27	73	22.2	19.3	37.6	2.28	.71	.66	3.9	256	260	3	158	96	2.24	.13	.99	1.9	13-3	24				
5673	2 12 12 27	31	111	39.1	37.3	35.7	1.69	.93	.12	3.3	326	260	24	226	63	7.00	.68	.83	1.0	34-4	17				
9512	3 12 12 27	4	33	112	36.6	34.8	34.0	1.37	.90	.14	2.6	325	260	25	225	62	8.16	.42	.94	-.4	14-3	19			
5677	2 12 12 32	4	33	112	36.6	34.8	34.0	1.37	.90	.14	2.6	325	260	25	225	62	9.92	-.46	.90	1.0	19-3	14			
5680	2 12 12 32	4	32	112	36.6	34.8	34.0	1.37	.90	.14	2.6	324	260	24	226	62	7.80	.44	.96	1.0	44-4	19			
5683	2 12 12 32	4	32	112	36.6	34.8	34.0	1.38	.91	.13	2.6	326	260	23	223	63	8.21	.30	.96	1.4	44-4	22			
5685	2 12 12 33	4	33	111	35.1	33.3	33.3	1.28	.88	.16	2.4	324	260	23	223	63	9.9	-.46	.90	1.0	19-3	14			
5688	2 12 12 33	4	33	111	35.1	33.3	33.3	1.28	.88	.16	2.4	324	260	23	223	63	8.21	.30	.96	1.4	44-4	22			
5692	2 12 12 33	4	33	111	35.1	33.3	33.3	1.28	.88	.16	2.4	324	260	23	223	63	8.21	.30	.96	1.4	44-4	22			
5694	2 12 12 33	4	33	111	35.1	33.3	33.3	1.28	.88	.16	2.4	324	260	23	223	63	8.21	.30	.96	1.4	44-4	22			

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	No.	Day	Sho.	True	rad.	V_{∞}	V_0	V_H	Δ	ϵ	q	q'	ω	J_0	i	π	λ	$C.M.$	K	C_{2R}	N_{DG}	n_{∞}	n	H_B	A																																				
9535	3	12	12.33	4	32	107	35.6	40.0	38.4	1.07	.92	.22	2.5	129	80	49	209	65	11.14	.81	.03	.7	52.4	19	98.9																																				
5690	2	12	12.34	4	32	111	35.4	33.6	35.6	1.32	.89	.15	2.5	323	260	21	224	63	7.50	.34	.98	.0	10.5	19	96.1																																				
5846	2	12	12.34	4	32	111	35.4	33.6	35.6	1.32	.89	.15	2.5	323	260	21	224	63	7.50	.34	.98	.0	10.5	19	96.1																																				
5850	2	12	12.35	4	32	111	35.4	33.6	35.6	1.32	.89	.15	2.5	323	260	21	224	63	7.50	.34	.98	.0	10.5	19	96.1																																				
9540	3	12	12.35	4	33	109	44.6	43.2	39.6	3.79	.98	.08	7.5	149	80	36	229	62	8.01	1.54	.93	.5	37.4	15	98.7																																				
9544	3	12	12.35	4	33	111	36.2	34.5	34.5	1.38	.90	.14	2.6	324	260	24	224	63	8.08	.40	.99	-.1	41.3	34	100.5																																				
* 5697	3	12	12.35	4	32	128	30.5	28.3	26.0	1.74	.86	.10	1.4	340	260	27	240	69	10.38	.00	.94	-.3	19.3	17	96.5																																				
5699	2	12	12.36	4	32	111	39.4	37.9	36.0	1.77	.94	.12	3.4	326	260	27	226	63	7.95	.72	.99	.7	63.4	26	103.0																																				
5701	2	12	12.36	4	32	111	39.4	37.9	36.0	1.77	.94	.12	3.4	326	260	27	226	63	7.95	.72	.99	.7	63.4	26	103.0																																				
5705	2	12	12.36	4	33	113	35.5	33.7	32.7	1.22	.89	.14	2.3	326	260	25	226	61	8.69	.31	.99	.0	20.3	36	101.2																																				
5854	2	12	12.36	4	32	12.36	4	128	57.5	56.4	40.0	4.37	.96	.18	8.5	132	80	128	212	43	4.81	1.31	.82	.1	24.4	19	107.8																																		
5856	2	12	12.36	4	32	112	37.2	35.6	34.1	1.39	.91	.12	2.7	327	260	24	227	62	7.76	.49	.99	.3	72.4	20	99.1																																				
5707	2	12	12.37	4	32	112	37.2	35.6	34.1	1.39	.91	.12	2.7	327	260	24	227	62	7.76	.49	.99	.3	72.4	20	99.1																																				
5709	2	12	12.37	4	32	112	37.2	35.6	34.1	1.39	.91	.12	2.7	327	260	24	227	62	7.76	.49	.99	.3	72.4	20	99.1																																				
5711	2	12	12.37	4	33	111	36.1	34.4	34.1	1.40	.89	.15	2.6	323	260	24	223	63	8.24	.40	.99	.5	53.4	15	96.4																																				
9551	3	12	12.37	-6	33	111	37.4	35.7	34.2	1.16	.40	.69	1.6	92	80	13	17.2	85	13.3	-.57	.79	1.0	45	19	90.4																																				
9553	3	12	12.37	-1	33	111	37.0	35.3	34.0	1.36	.44	.76	2.0	75	80	10	15.5	95	10.75	-.45	.78	1.8	21.3	14	83.6																																				
5714	2	12	12.38	4	33	111	34.6	32.8	33.2	1.27	.88	.16	2.4	323	260	21	223	63	7.85	.28	.99	1.1	48.1	18	97.5																																				
5720	2	12	12.38	4	33	111	35.3	33.6	33.6	1.34	.88	.16	2.5	323	260	23	223	64	8.22	.34	.99	1.3	30.4	15	96.6																																				
9555	3	12	12.39	4	9	102	42.9	41.6	41.6	12.90	.99	.18	25.6	131	80	34	211	69	8.50	2.27	.89	-.7	13.3	23	103.5																																				
9557	3	12	12.40	19	32	153	68.1	67.0	44.7	-4.51	1.14	.61	-	254	260	140	154	33	1.90	-.66	-.66	-.1	18.4	16	117.6																																				
9559	3	12	12.40	32	110	38.7	35.1	35.1	1.35	.93	.12	3.0	147	80	30	227	62	6.92	.60	.92	.8	25.9	11	95.6																																					
5725	2	12	12.41	4	33	111	36.4	34.8	34.8	1.43	.90	.15	2.7	323	260	24	224	63	8.26	.43	.99	.1	15.3	29	100.2																																				
5729	2	12	12.41	4	57	203	43.9	42.3	37.3	2.16	.55	.98	3.3	191	260	77	91	59	.93	-.13	.53	.7	52.4	24	95.5																																				
9561	3	12	12.41	4	57	203	43.9	42.3	37.3	2.16	.55	.98	3.3	191	260	77	91	59	.93	-.13	.53	.7	52.4	24	95.5																																				
9563	3	12	12.41	4	57	203	42.4	41.6	41.6	12.90	.99	.18	25.6	131	80	34	211	69	8.50	2.27	.89	-.7	13.3	23	103.5																																				
5732	2	12	12.42	4	32	108	36.8	35.3	35.8	1.72	.91	.16	3.3	320	260	21	220	66	7.34	.54	.97	-.9	29.3	28	100.0																																				
5734	2	12	12.42	4	32	108	36.8	35.3	35.8	1.72	.91	.16	3.3	320	260	21	220	66	7.34	.54	.97	-.9	29.3	28	100.0																																				
9567	3	12	12.42	4	9571	3	12	12.44	4	9573	3	12	12.44	4	9576	3	12	12.45	4	9578	3	12	12.45	4	9580	3	12	12.46	4	9582	3	12	12.47	4	9587	3	12	12.49	4	-1	203	71.5	70.4	47.4	-	1.98	1.24	.47	-	93	260	162	353	32	.98	-	.52	.1	17.4	22	113.9
9573	3	12	12.44	4	9576	3	12	12.44	4	9578	3	12	12.45	4	9580	3	12	12.46	4	9582	3	12	12.47	4	9584	3	12	12.47	4	9587	3	12	12.49	4	35	155	63.3	62.6	41.2	8.77	.93	.58	17.0	261	260	132	161	35	2.52	1.41	.99	.5	10.4	14	107.9						
5742	2	12	13.12	-5	36	85	20.6	17.0	17.0	2.55	.72	.72	4.4	69	81	17	150	96	11.46	.19	.45	-2.1	49.2	40	87.6																																				
5750	2	12	13.13	36	43	17.1	13.0	13.0	1.33	.55	.60	2.1	276	261	7	177	86	6.81	-.34	.68	.7	26.3	16	66.7																																					
5752	2	12	13.13	36	43	17.1	13.0	13.0	1.33	.55	.60	2.1	222	261	7	123	119	6.17	-.10	.96	1.2	65.3	30	96.6																																					
* 5759	2	12	13.14	4	33	112	36.4	34.3	33.8	1.35	.89	.14	2.6	324	261	24	225	63	7.90	.38	.36	1.0	97.4	41	100.8																																				
5762	2	12	13.14	5	59	38	18.9	15.3	37.9	2.44	.64	.88	4.0	223	261	16	124	108	11.88	.04	.90	.6	80.3	36	84.6																																				
5764	2	12	13.16	4	31	116	36.5	34.5	32.4	1.18	.91	.11	2.2	330	261	24	231	60	7.81	.38	.37	-.1	11.2	73	98.9																																				
5944	2	12	13.16	4	31	116	36.5	34.5	32.4	1.18	.91	.11	2.2	330	261	24	231	60	7.81	.38	.37	-.1	11.2	73	98.9																																				
5770	2	12	13.17	6	346	18.6	15.2	39.1	3.24	.70	.97	5.5	198	261	20	199	115	6.90	.27	.78	-.7	91.3	36	91.9																																					
5772	2	12	13.18	25	21	50	16.5	12.2	37.7	2.32	.62	.88	3.8	225	261	21	226	119	7.75	-.06	.96	-.1	2.2	50	82.0																																				

ORBITAL ELEMENTS OF PHOTOGRAPHIC METEORS

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	\mathbf{L}_o	\mathbf{v}_G	\mathbf{v}_H	\mathbf{a}	\mathbf{e}	\mathbf{q}	\mathbf{q}'	ω	$\delta\theta$	i	π	λ	C_{Mo}	K	C_{Fr}	H_p	m_{∞}	n	H_B	A																																																																																															
5777	2	12	13.20	4	33	110	37.5	35.6	1.66	.91	.15	3.2	321	261	24	222	.65	.64	.63	.2	13.3	.27	97.6																																																																																																	
5783	2	12	13.20	4	15	15	13.9	8.8	2.57	.62	.97	4.2	197	261	2	228	151	.04	.89	1.5	1.11	.29	80.8																																																																																																	
5785	2	12	13.21	4	32	114	34.7	32.6	1.14	.86	.14	2.2	327	261	22	228	61	.25	.62	.4	14.3	.32	97.5																																																																																																	
5789	2	12	13.23	4	33	112	37.7	35.8	35.1	.56	.91	3.0	323	261	26	224	64	.08	.52	.70	.1	13.3	.28	101.7																																																																																																
5795	2	12	13.24	4	17	85	27.0	24.5	2.30	.78	.50	4.1	97	81	5	178	86	.27	.90	.9	20.3	.30	96.8																																																																																																	
5797	2	12	13.24	4	33	114	37.7	35.8	34.3	1.42	.91	.13	2.7	326	261	28	227	62	.51	.48	.71	.5	41.4	.12	99.6																																																																																															
5801	2	12	13.25	4	-15	356	13.8	6.8	38.9	3.10	.68	.98	5.2	360	81	3	81	168	.61	.22	.51	1.2	43.2	.108	87.7																																																																																															
5986	2	12	13.25	4	5988	2	12	13.25	4	62	355	18.9	15.6	39.3	3.46	.72	.96	6.0	202	261	19	103	114	.34	.66	.7	15.2	.64	94.5																																																																																											
5810	2	12	13.26	4	5814	2	12	13.26	4	33	111	35.9	34.0	34.1	1.40	.89	.16	2.6	322	261	23	223	64	.05	.37	.63	.0	15.3	.30	98.5																																																																																										
5817	2	12	13.29	4	32	113	35.8	33.9	33.3	1.28	.89	.14	2.4	325	261	23	227	62	.90	.35	.88	1.4	18.4	.10	95.6																																																																																															
5824	2	12	13.30	4	33	114	36.4	34.6	33.4	1.29	.90	.13	2.5	326	261	26	227	62	.43	.38	.89	-2.0	11.2	.40	100.8																																																																																															
5959	3	12	13.30	4	5826	2	12	13.31	4	9599	3	1	13.31	4	9606	3	12	13.31	4	9608	3	12	13.32	4	* 9611	3	12	13.32	4	9613	3	12	13.33	4	9615	3	12	13.33	4	5888	2	12	13.34	4	9617	3	12	13.34	4	9621	3	12	13.34	4	9623	3	12	13.34	4	* 8645	3	12	13.35	4	16777	3	12	13.35	4	16779	3	12	13.35	4	16781	3	12	13.35	4	16783	3	12	13.35	4	16785	3	12	13.35	4	9630	3	12	13.36	4	5862	2	12	13.37	4	33	110	37.4	35.6	1.67	.91	.15	3.2	321	261	23	223	65	.66	.39	.98	-3.5	.68-2	.67	102.2	
16779	3	12	13.35	4	17	84	25.2	22.8	37.1	2.08	.74	.53	1.09	1.4	.93	1.02	238	261	6	139	107	.69	.21	.91	1.3	23-3	.14	88.3																																																																																												
16781	3	12	13.35	4	37	196	56.3	54.9	37.2	2.12	.54	.97	3.3	162	261	109	63	40	.72	-.14	.37	.8	17.4	.19	101.7																																																																																															
16783	3	12	13.35	4	4	33	111	36.9	35.1	34.6	1.47	.90	.14	2.8	324	261	24	225	64	.34	.66	.95	-.8	32-3	.34	100.2																																																																																														
16785	3	12	13.35	4	33	112	36.2	34.4	33.9	1.36	.90	.14	2.6	324	261	23	225	63	.15	.94	1.2	15.3	.22	85.0	1																																																																																															
16786	2	12	13.37	4	33	110	37.4	35.8	35.6	1.67	.91	.15	3.2	321	261	23	223	65	.76	.56	.99	-2.0	12-2	.46	102.6																																																																																															
5876	2	12	13.38	4	60	51	14.3	9.6	33.5	1.39	.89	.15	2.6	323	261	25	225	63	.37	.40	.99	.6	57-4	.17	96.4																																																																																															
5878	2	12	13.38	4	20	50	17.9	14.5	39.3	3.48	.75	.86	6.1	225	261	1	126	119	.53	.39	.62	1.4	66-3	.39	88.5																																																																																															
9641	3	12	13.39	4	9643	3	12	13.39	4	9645	3	12	13.35	4	9649	3	12	13.39	4	9650	3	12	13.36	4	5882	2	12	13.37	4	33	111	36.2	34.7	1.48	.90	.15	2.8	323	261	20	224	64	.22	.45	.96	1.7	33-4	.19	97.3																																																																							
9645	3	12	13.39	4	4	11	78	23.1	20.6	38.1	2.56	.71	.74	4.4	67	81	20	148	95	13.98	.18	.56	.6	74-3	.56	97.1																																																																																														
5880	2	12	13.40	4	5882	2	12	13.40	4	31	111	36.2	34.7	34.7	1.36	.90	.14	2.6	324	261	23	225	63	.09	.40	.97	-1.3	69-3	.38	102.9																																																																																										
5886	2	12	13.42	4	33	112	36.0	34.4	33.9	1.36	.90	.14	2.9	274	261	3	175	88	2.30	.22	.82	1.0	19-3	.33	96.0																																																																																															
* 9656	3	12	13.43	4	9651	3	12	13.42	4	9653	3	12	13.42	4	9655	3	12	13.42	4	5884	2	12	13.42	4	31	111	36.2	34.7	1.48	.90	.15	2.8	323	261	20	224	64	.09	.45	.96	1.7	33-4	.19	97.3																																																																												

TABLE 7.—Orbital and physical parameters of 2,559 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	V_{∞}	V_g	V_h	a	e	q	q'	ω	δ	1	α	λ	$C.M.$	K	CZ_R	H_{pg}	H_{∞}	n	H_B	A										
5693	2	12	13.44	4	32	112	36.7	35.2	34.4	1.44	.91	.17	2.9	325	261	23	226	63	7.84	.67	.94	.3	13-3	20	99.8										
5697	2	12	13.44	4	33	110	35.9	34.0	35.1	1.55	.89	.25	2.9	320	261	22	221	65	7.83	.64	.94	.5	58.4	16	94.6										
9657	3	12	13.44	4	2	129	60.0	59.0	42.4	-	1.00	.23	22.1	120	81	128	201	43	5.10	.85	.8	60-4	26	110.1											
* 9659	3	12	13.44	16	1	128	58.6	57.6	41.5	11.18	.98	.23	22.1	124	81	125	205	44	4.84	2.04	.86	.5	58.4	28	111.5										
9661	3	12	13.44	16	17	88	27.1	25.1	37.1	2.08	.78	.46	3.7	102	81	5	183	84	3.64	.22	.75	1.6	14-3	33	97.2										
9665	3	12	13.44	4	16	4	134	64.7	63.8	44.2	-	5.74	1.06	.32	-	109	81	145	190	38	2.55	-	.87	1.4	44.5	12	108.4								
9666	3	12	13.44	4	33	108	36.8	35.3	36.5	.90	.91	.18	3.6	316	261	22	218	67	7.69	.58	.93	.3	75-4	18	98.5										
5699	2	12	13.45	4	32	111	35.1	33.5	33.8	1.35	.89	.16	2.6	323	261	20	224	64	7.44	.35	.94	1.2	56-4	24	98.5										
5901	2	12	13.45	4	32	111	35.1	33.5	33.8	1.35	.89	.16	2.6	323	261	20	224	64	7.44	.35	.94	1.2	56-4	24	98.5										
5907	2	12	13.45	4	-10	188	65.3	64.1	37.4	2.21	.74	.58	3.8	272	81	167	353	21	.60	.16	.47	.9	74-5	14	103.3										
5919	2	12	13.45	4	32	111	37.2	35.7	35.2	1.58	.91	.14	3.0	323	261	23	225	64	7.57	.54	.92	1.3	23-4	13	99.9										
9667	3	12	13.45	4	9672	3	12	13.45	4	26	84	26.4	24.3	37.6	2.30	.78	.50	4.1	277	261	3	178	87	1.84	.27	.73	.6	49-3	55	102.2					
9674	3	12	13.45	4	9676	3	12	13.45	4	32	105	34.5	33.0	35.8	1.70	.88	.21	3.2	313	261	17	215	69	6.72	.42	.89	1.6	24-4	11	95.7					
9678	3	12	13.45	4	9678	3	12	13.45	4	33	105	37.6	36.2	38.0	2.62	.92	.20	5.0	312	261	20	215	70	7.01	.82	.86	-1.3	54-3	38	99.5					
5911	2	12	13.46	4	5922	2	12	13.46	4	32	105	34.5	33.0	35.8	1.70	.88	.21	3.2	313	261	17	215	69	6.72	.42	.89	1.6	24-4	11	95.7					
5926	2	12	13.47	4	5928	2	12	13.47	4	34	111	38.8	37.4	36.8	1.99	.93	.15	3.8	320	261	29	221	65	8.75	.71	.89	.6	64-4	22	104.3					
5962	3	12	13.47	4	9684	3	12	13.47	4	33	113	36.0	34.4	34.1	1.38	.89	.15	2.6	323	261	25	225	63	8.65	.39	.92	1.1	33-4	15	96.3					
9686	3	12	13.47	4	9689	3	12	13.47	4	32	110	35.0	33.4	34.1	1.39	.88	.16	2.6	322	261	19	223	65	7.26	.35	.87	.6	64-4	17	96.0					
5933	2	12	13.48	4	9691	3	12	13.48	4	33	112	35.8	34.4	33.9	1.36	.90	.14	2.6	324	261	24	225	63	8.40	.39	.74	-.2	21-3	36	99.5					
9694	3	12	13.49	4	9698	3	12	13.50	4	9700	3	12	13.51	4	129	57.1	56.3	41.2	8.40	.95	.43	16.4	99	81	110	180	46	5.03	1.50	.63	.9	18-4	22	109.2	
* 9702	3	12	13.51	4	9709	3	12	13.51	4	32	112	35.8	34.4	33.9	1.36	.90	.14	2.6	324	261	24	225	63	8.40	.39	.74	-.2	21-3	36	99.5					
9710	3	12	13.51	4	9712	3	12	13.53	4	9712	3	12	13.53	4	68	44	17.1	13.0	35.1	1.55	.43	.89	2.2	228	262	17	130	101	12.39	-.41	.80	.7	12-2	37	81.2
5935	2	12	14.09	4	5939	2	12	14.15	4	32	115	37.5	35.5	33.9	1.37	.91	.12	2.6	327	262	25	229	62	7.69	.47	.87	1.6	101.6							
11401	2	12	14.15	4	29	111	37.4	35.4	35.2	1.57	.92	.13	3.0	324	262	16	226	64	5.21	.55	.41	0	22-3	43	100.1										
5946	2	12	14.18	4	31	112	36.7	34.7	34.4	1.43	.90	.14	2.7	324	262	21	226	64	6.96	.44	.55	84.5													
5948	2	12	14.19	4	61	42	17.3	13.4	36.2	1.81	.51	.88	2.7	226	262	15	128	105	12.19	-.25	.90	1.5	58-3	38	86.9										
5952	2	12	14.23	4	30	114	36.8	34.8	33.8	1.35	.91	.13	2.6	327	262	21	229	62	6.83	.44	.67	.6	72-4	22	100.1										
5953	2	12	14.24	25	20	48	16.8	12.7	38.5	2.78	.68	.88	4.7	221	262	1	124	122	.17	.97	2.3	31-3	31	90.0											
5960	2	12	14.25	4	5962	2	12	14.26	4	22	12	12.8	7.0	36.4	1.85	.48	.97	2.7	196	262	3	98	148	1.53	-.28	.80	1.7	27-3	8	79.9					
5964	2	12	14.26	4	32	113	37.7	35.9	34.9	1.51	.91	.13	2.9	325	262	25	227	63	7.79	.52	.81	.8	41-4	16	97.0										
5967	2	12	14.27	4	40	41	17.1	13.3	38.4	2.47	.72	.67	.89	4.6	220	262	8	123	119	7.63	.14	.91	1.5	29-3	18	80.4									
5970	2	12	14.28	4	18	104	44.1	42.7	42.5	-11.6	30.1	0.0	.12	138	82	13	153	69	3.33	-.9	.96	1.3	30-4	14	92.4										
5972	2	12	14.34	17	71	24.9	22.6	22.5	6.4	6.4	12.1	.99	.67	12.1	71	82	8	155	100	2.43	1.06	.89	1.0	75-3	38	103.1									
5974	3	12	14.34	17	75	23.3	20.8	20.6	3.16	3.16	5.7	.79	.68	5.7	75	82	8	155	67.79	6.79	.42	.98	.9	36-3	40	92.3									
5974	2	12	14.35	19	75	23.3	20.8	20.6	3.16	3.16	5.7	.79	.68	5.7	75	82	8	155	67.79	6.79	.42	.98	.9	36-3	40	92.3									

TABLE 7.—Orbital and physical parameters of 2,629 double-station meteors (continued)

Trail No.	Yr.	No.	Day	Sh.	True rad.	V_{\odot}	V_g	V_h	a	e	q	q'	ω	Ω	1	κ	λ	G.W.	K	CZ _R	H_{pg}	H_{∞}	n	H_B	A																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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*	9719	3	12	14.35	4	31	113	36.4	34.6	36.2	1.40	.90	.14	2.7	324	262	23	226	63	7.74	.42	.98	.9	10.3	31	101.3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
*	9720	3	12	14.36	28	93	33.5	31.7	39.8	4.13	.92	.35	7.9	291	262	6	193	80	2.61	.97	.98	-1.5	50.3	21	87.5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
*	9720	3	12	14.37	8	31	38.1	36.5	35.9	1.73	.92	.14	3.3	323	262	23	225	64	7.23	.62	.99	-1.6	25.3	33	103.9																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
*	9722	3	12	14.37	4	33	114	36.1	34.3	33.9	1.35	.90	.14	2.6	324	262	24	226	63	8.06	.39	.99	-2.4	43.2	56	92.2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
*	9725	3	12	14.38	4	9726	3	12	14.38	4	9730	3	12	14.39	4	9732	3	12	14.40	4	9735	3	12	14.40	-38	81	19.8	/16.7	35.4	1.62	.45	.90	2.3	45	82	25	127	93	12.69	-37	.31	1.2	41.3	28	101.7	-3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
*	9739	3	12	14.40	4	9750	3	12	14.41	4	9752	3	12	14.41	4	9754	3	12	14.41	4	9756	3	12	14.41	4	9758	3	12	14.42	4	9761	3	12	14.42	4	9762	3	12	14.43	-43	152	55.7	54.5	42.0	2.73	.96	.98	4.45	353	82	97	75	50	.66	2.01	.22	-1.6	68.3	72	111.2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
*	8642	3	12	14.40	4	9767	3	12	14.43	16	165	76.1	75.1	46.7	-	234	185	9	185	83	5.79	.13	.84	1.2	85.4	14	84.2	2	9742	3	12	14.40	33	113	36.7	35.1	34.6	1.46	.90	.14	3.0	324	103	82	9	2.6	324	262	24	226	63	8.09	.41	.99	-2.5	25.2	51	100.3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
*	9749	3	12	14.41	4	9773	3	12	14.44	4	9775	3	12	14.43	17	192	72.9	71.8	44.5	-	5.05	1.16	.80	-	131	262	160	33	19	.58	-	.52	.5	85.5	16	120.6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
*	9750	3	12	14.41	4	9791	2	12	14.45	4	9798	2	12	14.46	4	9799	2	12	14.46	4	9800	2	12	14.46	4	9801	2	12	14.46	4	9802	2	12	14.47	4	9803	2	12	14.46	4	9804	2	12	14.47	4	9805	2	12	14.48	4	9806	2	12	14.48	4	9807	2	12	14.48	4	9808	2	12	14.48	4	9809	2	12	14.48	4	9810	2	12	14.48	4	9811	2	12	14.48	4	9812	2	12	14.48	4	9813	2	12	14.48	4	9814	2	12	14.48	4	9815	2	12	14.48	4	9816	2	12	14.48	4	9817	2	12	14.48	4	9818	2	12	14.48	4	9819	2	12	14.48	4	9820	2	12	14.48	4	9821	2	12	14.48	4	9822	2	12	14.48	4	9823	2	12	14.48	4	9824	2	12	14.48	4	9825	2	12	14.48	4	9826	2	12	14.48	4	9827	2	12	14.48	4	9828	2	12	14.48	4	9829	2	12	14.48	4	9830	2	12	14.48	4	9831	2	12	14.48	4	9832	2	12	14.48	4	9833	2	12	14.48	4	9834	2	12	14.48	4	9835	2	12	14.48	4	9836	2	12	14.48	4	9837	2	12	14.48	4	9838	2	12	14.48	4	9839	2	12	14.48	4	9840	2	12	14.48	4	9841	2	12	14.48	4	9842	2	12	14.48	4	9843	2	12	14.48	4	9844	2	12	14.48	4	9845	2	12	14.48	4	9846	2	12	14.48	4	9847	2	12	14.48	4	9848	2	12	14.48	4	9849	2	12	14.48	4	9850	2	12	14.48	4	9851	2	12	14.48	4	9852	2	12	14.48	4	9853	2	12	14.48	4	9854	2	12	14.48	4	9855	2	12	14.48	4	9856	2	12	14.48	4	9857	2	12	14.48	4	9858	2	12	14.48	4	9859	2	12	14.48	4	9860	2	12	14.48	4	9861	2	12	14.48	4	9862	2	12	14.48	4	9863	2	12	14.48	4	9864	2	12	14.48	4	9865	2	12	14.48	4	9866	2	12	14.48	4	9867	2	12	14.48	4	9868	2	12	14.48	4	9869	2	12	14.48	4	9870	2	12	14.48	4	9871	2	12	14.48	4	9872	2	12	14.48	4	9873	2	12	14.48	4	9874	2	12	14.48	4	9875	2	12	14.48	4	9876	2	12	14.48	4	9877	2	12	14.48	4	9878	2	12	14.48	4	9879	2	12	14.48	4	9880	2	12	14.48	4	9881	2	12	14.48	4	9882	2	12	14.48	4	9883	2	12	14.48	4	9884	2	12	14.48	4	9885	2	12	14.48	4	9886	2	12	14.48	4	9887	2	12	14.48	4	9888	2	12	14.48	4	9889	2	12	14.48	4	9890	2	12	14.48	4	9891	2	12	14.48	4	9892	2	12	14.48	4	9893	2	12	14.48	4	9894	2	12	14.48	4	9895	2	12	14.48	4	9896	2	12	14.48	4	9897	2	12	14.48	4	9898	2	12	14.48	4	9899	2	12	14.48	4	9900	2	12	14.48	4	9901	2	12	14.48	4	9902	2	12	14.48	4	9903	2	12	14.48	4	9904	2	12	14.48	4	9905	2	12	14.48	4	9906	2	12	14.48	4	9907	2	12	14.48	4	9908	2	12	14.48	4	9909	2	12	14.48	4	9910	2	12	14.48	4	9911	2	12	14.48	4	9912	2	12	14.48	4	9913	2	12	14.48	4	9914	2	12	14.48	4	9915	2	12	14.48	4	9916	2	12	14.48	4	9917	2	12	14.48	4	9918	2	12	14.48	4	9919	2	12	14.48	4	9920	2	12	14.48	4	9921	2	12	14.48	4	9922	2	12	14.48	4	9923	2	12	14.48	4	9924	2	12	14.48	4	9925	2	12	14.48	4	9926	2	12	14.48	4	9927	2	12	14.48	4	9928	2	12	14.48	4	9929	2	12	14.48	4	9930	2	12	14.48	4	9931	2	12	14.48	4	9932	2	12	14.48	4	9933	2	12	14.48	4	9934	2	12	14.48	4	9935	2	12	14.48	4	9936	2	12	14.48	4	9937	2	12	14.48	4	9938	2	12	14.48	4	9939	2	12	14.48	4	9940	2	12	14.48	4	9941	2	12	14.48	4	9942	2	12	14.48	4	9943	2	12	14.48	4	9944	2	12	14.48	4	9945	2	12	14.48	4	9946	2	12	14.48	4	9947	2	12	14.48	4	9948	2	12	14.48	4	9949	2	12	14.48	4	9950	2	12	14.48	4	9951	2	12	14.48	4	9952	2	12	14.48	4	9953	2	12	14.48	4	9954	2	12	14.48	4	9955	2	12	14.48	4	9956	2	12	14.48	4	9957	2	12	14.48	4	9958	2	12	14.48	4	9959	2	12	14.48	4	9960	2	12	14.48	4	9961	2	12	14.48	4	9962	2	12	14.48	4	9963	2	12	14.48	4	9964	2	12	14.48	4	9965	2	12	14.48	4	9966	2	12	14.48	4	9967	2	12	14.48	4	9968	2	12	14.48	4	9969	2	12	14.48	4	9970	2	12	14.48	4	9971	2	12	14.48	4	9972	2	12	14.48	4	9973	2	12	14.48	4	9974	2	12	14.48	4	9975	2	12	14.48	4	9976	2	12	14.48	4	9977	2	12	14.48	4	9978	2	12	14.48	4	9979	2	12	14.48	4	9980	2	12	14.48	4	9981	2	12	14.48	4	9982	2	12	14.48	4	9983	2	12	14.48	4	9984	2	12	14.48	4	9985	2	12	14.48	4	9986	2	12	14.48	4	9987	2	12	14.48	4	9988	2	12	14.48	4	9989	2	12	14.48	4	9990	2	12	14.48	4	9991	2	12	14.48	4	9992	2	12	14.48	4	9993	2	12	14.48	4	9994	2	12	14.48	4	9995	2	12	14.48	4	9996	2	12	14.48	4	9997	2	12	14.48	4	9998	2	12	14.48	4	9999	2	12	14.48	4	9900	2	12	14.48	4	9901	2	12	14.48	4	9902	2	12	14.48	4	9903	2	12	14.48	4	9904	2	12	14.48	4	9905	2	12	14.48	4	9906	2	12	14.48	4	9907	2	12	14.48	4	9908	2	12	14.48	4	9909	2	12	14.48	4	9910	2	12	14.48	4	9911	2	12	14.48	4	9912	2	12	14.48	4	9913	2	12	14.48	4	9914	2	12	14.48	4	9915	2	12	14.48	4	9916	2	12	14.48	4	9917	2	12	14.48

TABLE 7.—Orbital and physical parameters of 2,529 double-station meteors (continued)

Trail No.	Ir. Mo.	Day	Sh.	true rad.	V_0	V_G	V_H	α	δ	q	q'	ω	δ_B	1	π	λ	C.M.	K	CZ_R	H_{PG}	H_{∞}	n	H_B	A	
6057	2	12	16+45	6	161 ^a	63.8	62.7	40.8	66.44	.91	.61	12.3	258	264	134	163	33	2.23	1.11	.95	-.6	22+4	14	111+6	
9798	3	12	16+49	18	97	35.0	33.6	40.2	67.74	.94	.30	19.2	116	84	8	200	78	3.37	1.16	.27	1.1	59+4	23	91+4	
9800	3	12	16+50	7	176	72.0	71.1	41.0	75.56	.87	.95	14.0	183	264	171	87	5	.02	1.04	.86	-.6	21+4	16	110+0	
6029	2	12	16+51	-8	149	57.7	56.8	33.3	1.28	.59	.52	2.0	105	85	136	190	28	2.21	-.30	.74	-.4	12+6	12	107+0	
6031	2	12	16+51	1	185	71.3	70.3	40.8	65.57	.86	.90	12.2	144	265	175	48	10	.09	.95	.79	.7	77+5	17	112+9	
9802	3	12	16+53	32	160	61.2	60.3	38.6	2.83	.88	.56	5.0	269	264	133	173	33	2.52	*4.2	.99	.7	57+5	8	110+8	
6035	2	12	17+27	-3	103	40.8	39.2	41.9	18.45	.98	.35	36.5	107	85	43	192	73	10.67	2.28	.72	.5	76+4	27	103+6	
6037	2	12	17+27	17	147	59.4	58.1	36.1	1.79	.88	.22	3.0	311	265	168	216	32	.96	.43	.41	.8	16+4	21	102+0	
6536	2	12	17+34	32	145	62.5	61.3	43.6	6.58	1.04	.59	4.0	292	267	132	197	42	3.66	.40	1.0	.79	.5	16	102+8	
6538	2	12	17+36	30	163	61.7	60.5	37.6	2.30	.74	.59	4.0	267	265	136	172	30	2.11	.19	.69	.8	64+5	10	109+5	
6040	2	12	17+37	19	11	106	43.3	41.9	42.3	91.58	1.00	.17	183+0	131	85	29	216	70	7.38	3.99	.93	-.7	12+3	21	107+5
6042	2	12	17+37	47	52	18.5	15.1	38.3	26.66	.68	.86	4.5	228	265	11	133	111	10.20	*14	.74	1.9	41+3	38	87+7	
6044	2	12	20+34	-1	144	64.4	63.3	42.1	26.72	.99	.40	53+0	102	88	145	190	35	2.29	*2.55	.66	.8	87+5	16	108+7	
6046	2	12	20+36	21	110	46.0	44.7	44.5	44.86	1.02	.02	12	138	88	4	226	70	.98	-.98	1.3	19+4	20	98+1		
6048	2	12	20+36	43	23	15.4	11.2	38.6	2.81	.66	.95	4.7	204	268	9	112	131	6.30	.14	.54	-.1	10+2	14	82+5	
6050	2	12	20+42	34	100	37.3	35.0	42.9	23.95	1.01	.34	—	288	268	15	196	80	5.69	—	.89	.2	78+4	18	108+0	
6052	2	12	20+45	26	99	29.1	27.2	37.3	2.14	.81	.00	3.9	289	269	3	197	81	1.60	*32	.81	.5	96+4	14	89+3	
6054	2	12	20+46	-13	182	72.9	71.9	43+2	13.18	1.07	.93	—	333	269	160	61	14	*32	.54	.64	.71	13	114+4		
* 9333	3	12	29+24	-5	94	24.9	22.2	38.2	2.60	.74	.68	4.5	75	97	19	172	92	12.05	.24	.78	-.2	42+3	31	88+6	
9841	3	12	30+30	40	66	15.2	10.8	36.3	1.84	.52	.89	2.8	224	278	5	142	116	5.66	—	.24	.93	2.0	41+3	21	78+0
9843	3	12	30+34	48	114	17.2	13.2	31.2	1.07	.38	.66	1.5	281	278	12	200	81	11.89	-.62	.97	-.1	97+3	17	82+4	
9850	3	12	31+16	35	73	24.1	21.3	43+2	1.13	1.06	.80	—	231	279	7	150	113	4.88	—	.94	—	28+2	29	108+8	
9852	3	12	31+26	49	54	19.5	16.3	41.0	7.43	.88	.90	14.0	215	279	12	135	121	8.71	1.06	.69	.5	36+3	15	83+9	
9854	3	12	31+27	49	25	17.5	13.9	40.9	6.80	.86	.96	12.6	199	279	12	118	132	6.12	.95	.71	0	55+2	79	95+7	
9856	3	12	31+28	-19	146	61.2	60.0	43.5	9.60	1.06	.57	—	80	99	113	179	44	3.76	—	.31	.5	32+4	32	111+9	
9858	3	12	31+28	64	99	11.8	4.3	30.8	1.04	.12	.92	1.0	249	279	5	168	93	2.19	—	.88	.3	92+3	15	78+3	
9862	3	12	31+32	26	108	28.3	26.1	37.7	2.32	.81	.45	4.0	282	279	3	202	84	1.78	.33	.99	.3	46+3	43	99+6	
9864	3	12	31+34	-5	150	66.7	65.6	45.9	2.88	1.14	.40	—	96	99	139	196	38	2.65	—	.63	.3	19+4	19	109+1	
9866	3	12	31+34	57	116	17.6	13.7	31.9	1.13	.37	.71	1.5	272	279	15	191	84	13.92	—	.61	.93	.4	11+2	26	85+5