

# FORC: A GLOBAL DATABASE OF FOREST CARBON STOCKS AND FLUXES

KRISTINA J. ANDERSON-TEIXEIRA,<sup>1,2,8</sup> MARIA M. H. WANG,<sup>1,3</sup> JENNIFER C. MCGARVEY,<sup>1,4</sup>

VALENTINE HERRMANN,<sup>1</sup> ALAN J. TEPLEY,<sup>1,5</sup> BEN BOND-LAMBERTY,<sup>6</sup> AND DAVID S.

LEBAUER<sup>7</sup>

<sup>1</sup> *Conservation Ecology Center; Smithsonian Conservation Biology Institute; Front Royal, Virginia, USA;*

<sup>2</sup> *Center for Tropical Forest Science-Forest Global Earth Observatory; Smithsonian Tropical Research Institute; Panama, Republic of Panama*

<sup>3</sup> *Current affiliation: Department of Animal and Plant Sciences, University of Sheffield, Sheffield, UK*

<sup>4</sup> *Current affiliation: Independent Scholar, Richmond, Virginia, USA*

<sup>5</sup> *Current affiliation: W. A. Franke College of Forestry & Conservation, University of Montana, Montana, USA & Division of Biological Sciences, University of Montana, Montana, USA*

<sup>6</sup> *Joint Global Change Research Institute, Pacific Northwest National Laboratory, College Park, Maryland, USA*

<sup>7</sup> *Carl Woese Institute for Genomic Biology, University of Illinois, Urbana, Illinois, USA*

**Abstract.** Forests play an influential role in the global carbon (C) cycle, storing roughly half of terrestrial C and annually exchanging with the atmosphere more than ten times the carbon dioxide (CO<sub>2</sub>) emitted by anthropogenic activities. Yet, scaling up from field-based measurements of forest C stocks and fluxes to understand global scale C cycling and its climate sensitivity remains an important challenge. Tens of thousands of forest C measurements have been made, but these data have yet to be integrated into a single database that makes them accessible for integrated analyses. Here we present an open-access global Forest Carbon database (ForC) containing previously published records of field-based measurements of ecosystem-level C stocks and annual fluxes, along with disturbance history and methodological information. ForC expands upon the previously published tropical portion of this database, TropForC (DOI: 10.5061/dryad.t516f), now including 17,367 records (previously 3,568) representing 2,731 plots (previously 845) in 826 geographically distinct areas. The database covers all forested biogeographic and climate zones, represents forest stands of all ages, and currently includes data collected between 1934 and 2015. We expect that ForC will prove useful for macroecological analyses of forest C cycling, for evaluation of model predictions or remote sensing products, for quantifying the contribution of forests to the global C cycle, and for supporting international efforts to inventory forest carbon and greenhouse gas exchange. A dynamic version of ForC is maintained at on GitHub (<https://GitHub.com/forc-db>), and we encourage the research community to collaborate in updating, correcting, expanding, and utilizing this database.

*Key words:* forest; global; carbon; biomass; productivity; respiration; net ecosystem exchange; carbon dioxide (CO<sub>2</sub>); carbon sequestration; stand age; disturbance; regrowth.

The complete data set is available online at: [to be completed at proof stage].

Corresponding Editor: William K. Michener.

<sup>8</sup> E-mail: teixeirak@si.edu