Global Carbon Budget 2019

1 College of Engineering, Mathematics and Physical Sciences, University of Exeter, Exeter EX4 4QF, UK
2 Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, Norwich Research Park, Norwich NR4 7TJ, UK
3 CICERO Center for International Climate Research, Oslo 0349, Norway
4 Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Postfach 120161, 27515 Bremerhaven, Germany
5 Wageningen University, Environmental Sciences Group, P.O. Box 47, 6700AA, Wageningen, The Netherlands
6 University of Groningen, Centre for Isotope Research, Groningen, The Netherlands
7 Ludwig-Maximilians-Universität Munich, Luisenstr. 37, 80333 München, Germany
8 Max Planck Institute for Meteorology, Hamburg, Germany
9 College of Life and Environmental Sciences, University of Exeter, Exeter EX4 4RJ, UK
10 CSIRO Oceans and Atmosphere, GPO Box 1700, Canberra, ACT 2601, Australia
11 Laboratoire des Sciences du Climat et de l’Environnement, Institut Pierre-Simon Laplace, CEA-CNRS-UVSQ, CE Orme des Merisiers, 91191 Gif sur Yvette Cedex, France
12 Department of Earth System Science, Woods Institute for the Environment, and Precourt Institute for Energy, Stanford University, Stanford, CA 94305–2210, United States of America
13 German Helmholtz Association in its ATMO programme
14 Cooperative Institute for Marine and Atmospheric Studies, Rosenstiel School for Marine and Atmospheric Science, University of Miami, Miami, FL 33149, USA
15 National Oceanic & Atmospheric Administration/Atlantic Oceanographic & Meteorological Laboratory (NOAA/AOML), Miami, FL 33149, USA
16 Geophysical Institute, University of Bergen, Bergen, Norway
17 Bjerknes Centre for Climate Research, Allégaten 70, 5007 Bergen, Norway
18 Laboratoire de Météorologie Dynamique, Institut Pierre-Simon Laplace, CNRS-ENS-UPMC-X, Département de Géosciences, Ecole Normale Supérieure, 24 rue Lhomond, 75005 Paris, France
19 Earth Surface System Research Center (ESS), Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokohama, 236-0001, Japan
20 Department of Geographical Sciences, University of Maryland, College Park, Maryland 20742, USA
21 NIWA / UoO Research Centre for Oceanography, PO Box 56, Dunedin 9054, New Zealand
22 Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration, 7600 Sand Point Way NE, Seattle, WA 98115-6349, USA
23 Research Institute for Environment, Energy, and Economics, Appalachian State University, Boone, North Carolina, USA
24 Flanders Marine Institute (VLIZ), InnovOceanSite, Wandelstraat 7, 8400 Ostend, Belgium
25 Lehrstuhl für Physische Geographie mit Schwerpunkt Klimaforschung, Universität Augsburg, Augsburg, Germany
26 Environmental Physics Group, ETH Zürich, Institute of Biogeochemistry and Pollutant Dynamics and Center for Climate Systems Modeling (C2SM)
27 GEOMAR Helmholtz Centre for Ocean Research Kiel, Düsternbrooker Weg 20, 24105 Kiel, Germany
28 NCAS-Climate, Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ, UK
29 Woods Hole Research Center (WHRC), Falmouth, MA 02540, USA
30 Department of Atmospheric Sciences, University of Illinois, Urbana, IL 61821, USA
31 Centre National de Recherche Meteorologique, Unite mixte de recherche 3589 Météo-France/CNRS, 42 Avenue Gaspard Coriolis, 31100 Toulouse, France
32 Department of Earth Sciences, University of Hong Kong, Pokfulam Road, Hong Kong
33 Institute of Applied Energy (IAE), Minato-ku, Tokyo 105-0003, Japan
34 PBL Netherlands Environmental Assessment Agency, Bezuidenhoutseweg 30, P.O. Box 30314, 2500 GH, The Hague, the Netherlands
35 Faculty of Geosciences, Department IMEW, Copernicus Institute of Sustainable Development, Heidelberglaan 2, P.O. Box 80115, 3508 TC, Utrecht, Netherlands
36 NORCE Norwegian Research Centre, NORCE Climate, Jarnehakken 70, 5008 Bergen, Norway
37 LOCEAN/IPSL laboratory, Sorbonne Université, CNRS/IRD/MNHN, Paris, France
38 CSIRO Oceans and Atmosphere, Hobart, TAS, Australia
39 Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania
40 Climate and Environmental Physics, Physics Institute and Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland
41 National Center for Atmospheric Research, Climate and Global Dynamics, Terrestrial Sciences Section, Boulder, CO 80305, USA
42 Department of Meteorology, Department of Geography & Environmental Science, National Centre for Atmospheric Science, University of Reading, Reading, UK,
43 Climate Research Division, Environment and Climate Change Canada, Victoria, BC, Canada
44 Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO, USA
45 Center for Global Environmental Research, National Institute for Environmental Studies (NIES), 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan
46 Japan Fisheries Research and Education Agency, 2-12-4 Fukuura, Kanazawa-Ku, Yokohama 236-8648, Japan
47 NASA Goddard Space Flight Center, Biospheric Sciences Laboratory, Greenbelt, Maryland 20771, USA
48 Leibniz Institute for Baltic Sea Research Warnemünde (IOW), Seestrasse 15; 18119 Rostock, Germany
49 Princeton University, Department of Geosciences and Princeton Environmental Institute, Princeton, NJ, USA
50 Met Office Hadley Centre, FitzRoy Road, Exeter EX1 3PB, UK
51 Max Planck Institute for Biogeochemistry, P.O. Box 600164, Hans-Knöll-Str. 10, 07745 Jena, Germany
52 CNRM (Météo-France/CNRS)-UMR 3589
53 ICOS Carbon Portal, Lund University, Lund, Sweden
54 National Oceanic & Atmospheric Administration, Earth System Research Laboratory (NOAA/ESRL), Boulder, CO 80305, USA
Correspondence: Pierre Friedlingstein (p.friedlingstein@exeter.ac.uk)