

Methods for Estimating Greenhouse Gas Emissions (to support monitoring international commitments on climate change)

Committee

Stephen W. Pacala

Chair

Stephen W. Pacala is Frederick D. Petrie Professor of Ecology and Evolutionary Biology at Princeton University and Director of the Princeton Environmental Institute. He also co-directs the Carbon Mitigation Initiative, a collaboration between Princeton University, British Petroleum, and the Ford Motor Company to develop strategies to reduce global carbon dioxide emissions. Dr. Pacala received his Ph.D. in biology from Stanford University. His research focuses on ecology and modeling, with an emphasis on the interactions between greenhouse gases, climate, and the biosphere. He was a coordinating lead author of a chapter on the North American carbon budget in the 2006 assessment "The First State of the Carbon Cycle Report: The North American Carbon Budget and Implications for the Global Carbon Cycle." Among his many honors are the David Starr Jordan Prize and the George Mercer Award of the Ecological Society of America. Dr. Pacala is a fellow of the American Association for the Advancement of Science and a member of the American Academy of Arts and Sciences and the National Academy of Sciences.

Clare Breidenich

Member

Clare Breidenich is an independent consultant with over 12 years of experience on climate change policy in general and on the Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) in particular. From 2002 to 2006, she was a senior program officer at the UNFCCC Secretariate, where she managed the review process for national greenhouse gas inventories of 40 countries and directed activities related to data systems and procedures for the Kyoto Protocol's reporting, review and compliance procedures. This experience, as well as work EPA and the State Department has given her extensive knowledge of the technical and policy options for greenhouse gas mitigation, including market mechanisms, and methodologies and protocols for estimation, reporting, and verification of greenhouse gas emissions and reductions. Ms. Breidenich has and M.S. in environmental science from Indiana University and a B.A. from the University of Michigan.

Peter G. Brewer

Member

Peter G. Brewer is an ocean chemist and senior scientist at the Monterey Bay Aquarium Research Institute. His research interests include the ocean chemistry of greenhouse gases, the geochemistry of gas hydrates, ocean acidification, and the evolution of the oceanic fossil fuel CO₂ signal. He has devised novel techniques for measuring and extracting the oceanic signatures of global change. Dr. Brewer has served on many committees associated with ocean trace gases, including the Joint Global Ocean Fluxes Committee, the NRC Panel on Policy Implications of Greenhouse Gas Warming: Mitigation, and the Scientific Committee on Oceanic Research's Working Group 75 on Ocean CO₂ Monitoring. He was a member of MEDEA. He is a fellow of the American Association for the Advancement of Science and of the American Geophysical Union, serving as president of the Ocean Sciences Section for two years. He received a Ph.D. and B.S. from Liverpool University in England.

Inez Y. Fung

Member

Inez Fung (NAS) is a professor of atmospheric sciences and founding Co-director of the Berkeley Institute of the Environment at the University of California, Berkeley. She studies the interactions between climate change and biogeochemical cycles, particularly the processes that maintain and alter the composition of the atmosphere. Her research emphasis is on using atmospheric transport models and a coupled carbon-climate model to examine how CO₂ sources and sinks are changing. She is also a member of the science team for NASA's Orbiting Carbon Observatory. Dr. Fung is a recipient of the American Geophysical Union's Roger Revelle Medal, and appears in a new NAS biography series for middle-school readers "Women's Adventure in Science." She is a fellow of the American Meteorological Society and the American Geophysical Union, and a member of the National Academy of Sciences. She received her B.S. in applied mathematics and her Ph.D. in meteorology from MIT.

Michael R. Gunson

Member

Michael R. Gunson is an atmospheric scientist and the Chief Scientist of the Jet Propulsion Laboratory's Earth Science and Technology Directorate. His research interests focus on understanding the physical and chemical processes of the Earth's atmosphere using space-based instruments. He is the deputy principal investigator of NASA's Tropospheric Emission Spectrometer, which measures the radiance emitted by Earth's surface and by gases and particles in Earth's atmosphere. The data are used to study air quality and transport of pollution around the globe. Dr. Gunson was awarded several NASA exceptional service medals for his leadership and scientific achievements associated with space-based instruments that measure atmospheric radiative transfer, chemistry, and physical processes. He received a Ph.D. and B.S. in chemistry from Bristol University.

Gemma Heddle

Member

Gemma Heddle is the Carbon Management Advisor with Corporate Health, Environment, and Safety at Chevron. She is responsible for managing the development and deployment of Chevron's new energy and emissions inventory system, for revising Chevron's greenhouse gas emissions reporting protocol; for leading the EU and U.S. focus areas of the company's carbon markets team, and for managing Chevron's internal carbon trading registry. Prior to joining Chevron in 2005, she worked as a technology policy analyst at the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC) in Australia. Ms. Heddle holds a dual M.S. in technology and policy and in civil and environmental engineering from MIT, an M.S. in chemical engineering from the University of Sydney, Australia, and a double B.S and B.A. from the University of Adelaide, Australia.

Beverly E. Law

Member

Beverly E. Law is a professor of global change forest science in the College of Forestry at Oregon State University. Her research focuses on the role of forests, woodlands, and shrublands in the global carbon cycle. Her approach is interdisciplinary, involving observations and models to study changes in climate, management, and other land use changes that influence carbon and water cycling across a region over seasons to decades. Dr. Law is the science chair of the AmeriFlux network, which provides continuous observations of ecosystem level exchanges of CO₂, water, and energy at more than 100 research sites in the Americas. She is a member of the Science Steering Group of the US Carbon Cycle Science Program and the Science Steering Committee of the North American Carbon Program. She also serves as the U.S. point of contact on scientific exchanges in carbon cycle science for State Department bilateral agreements with Italy, Canada, and the European Union. She received a Ph.D. in forest science from Oregon State University and a B.S. in forest resources and conservation from the University of Florida.

Gregg Marland

Member

Gregg Marland is a senior research staff member in the Environmental Sciences Division at Oak Ridge National Laboratory. In addition to research on the sources of greenhouse gas emissions and mitigation options, he helped define the methodologies and emissions coefficients now used to estimate CO₂ emissions to the atmosphere. He is currently convener for the Global Emissions Inventory Activity (GEIA), which develops and distributes inventories of global gas and aerosol emissions from natural and anthropogenic sources. Dr. Marland served on the NRC Panel on Policy Implications of Greenhouse Warming and is the U.S. team leader on an International Energy Agency Biomass Agreement task on biomass fuels and greenhouse gas emissions. He is co-editor of a recent volume on Greenhouse Gas Emissions and Response Policies in Central and Eastern Europe. Dr. Marland received a Ph.D. in geology from the University of Minnesota and a B.S. from Virginia Tech.

Keith Paustian

Member

Keith Paustian is Professor of Soil Ecology, Dept. of Soil and Crop Sciences and Senior Research Scientist, Natural Resources Ecology Laboratory (NREL), Colorado State University, Fort Collins. His main fields of interest include agroecosystem ecology, soil organic matter dynamics and global change and he has written more than 80 journal articles and book chapters on these topics. He is currently leading projects to elucidate the factors and processes controlling soil organic matter dynamics and to develop better methods to measure and predict changes in soil carbon as a function of management and environmental variables. Other work includes projects to assess soil carbon sequestration and greenhouse gas mitigation potential in several states, including Iowa, Indiana and Nebraska, and to develop national US inventories of C emissions and sequestration of C in soil. His research also involves development of ecosystem and economic assessments to advise policy makers on the climate change mitigation. He has served as co-chair of an InterGovernmental Panel on Climate Change (IPCC) workgroup on developing methodologies for estimating CO₂ emissions from soils as part of the IPCC Guidelines for National Greenhouse Gas Inventories. He was a Lead Author on an IPCC special report evaluating carbon sinks as a mitigation option for greenhouse gas mitigation and a Lead Author on the IPCC Good Practice Guidelines for National Greenhouse Gas Inventories.. He was also a member of IPCC workgroup II on Agricultural Options for Mitigation of Greenhouse Gas Emissions and a member of the IGBP/GCTE Soil Organic Matter Scientific Steering Committee. He is currently co-chairing a CAST taskforce on "Agricultural Mitigation of Greenhouse Gases: Science and Policy Options". He is an editor of a recent book entitled "Soil Organic Matter in Temperate Agroecosystems. Long-term Experiments in North America (CRC Press)" and of two special issues dealing with soil C sequestration in the journals 'Soil Tillage Research' and 'Climatic Change'.

Michael J. Prather

Member

Michael J. Prather is the Fred Kavli Chair and Professor in the Department of Earth System Science at the University of California, Irvine. From 2005 to 2006, he was a Jefferson Science Fellow at the State Department. His research focuses on simulation of the physical, chemical and biological processes that determine atmospheric composition, including global chemical transport models that describe ozone and other trace gases. Dr. Prather has played a leading role in international assessments of ozone and climate change. He has served on numerous NRC committees and chaired the Planning Group for the Workshop on Direct and Indirect Human Contributions to Terrestrial Greenhouse Gas Fluxes. He is a fellow of the American Geophysical Union and the American Association for the Advancement of Science and is a member of the Norwegian Academy of Science and Letters. Dr. Prather received his undergraduate degrees in Mathematics from Yale in 1969 and Physics from Merton, Oxford in 1971). He received a Doctorate in Astronomy and Astrophysics from Yale in 1976.

James T. Randerson

Member

James T. Randerson is an assistant professor in the Department of Earth System Science at the University of California, Irvine. Dr. Randerson uses atmospheric trace gas observations from ground and space-based instruments and models to study global carbon and nutrient cycles in the biosphere. He is currently investigating pathways of rapid carbon loss from terrestrial ecosystems, including fire emissions and permafrost degradation. He is a member of the science team for NASA's Orbiting Carbon Observatory, which will collect precise global measurements of carbon dioxide in the Earth's atmosphere beginning in 2009. He received a Ph.D. in biological sciences and a B.S. in chemistry from Stanford University.

Pieter P. Tans

Member

Pieter P. Tans is senior scientist at the Earth System Research Laboratory of the National Oceanic and Atmospheric Administration in Boulder, Colorado. His research interests focus on inverse models and data assimilation, atmospheric chemistry and transport, carbon cycle, and global climate change. His group maintains the world's largest global monitoring network of atmospheric greenhouse gas concentrations, and provides reference gas mixtures to calibrate high accuracy greenhouse gas measurements worldwide. Dr. Tans serves on several advisory committees related to the carbon cycle and climate. He has received several medals from the Department of Commerce and is a fellow of the American Geophysical Union. He received a Ph.D. in physics and a Doctorandus (roughly equivalent to an M.S.) in theoretical physics from Rijksuniversiteit Groningen, The Netherlands.

Steven C. Wofsy

Member

Steven C. Wofsy is the Abbott Lawrence Rotch Professor of Atmospheric and Environmental Sciences at Harvard University. His work focuses on the chemical composition of the atmosphere, using data analysis and modeling to understand sources, sinks, transformations, and transport of atmospheric trace gases. His research group also develops airborne sensors to make accurate measurements of CO₂, CH₄, CO, and N₂O. He has chaired or been a member of several carbon cycle and NRC advisory committees. Dr. Wofsy is a recipient of the American Geophysical Union's James B. MacIlwaine Award and NASA's Distinguished Public Service Medal. He is a fellow of the American Geophysical Union and the American Association for the Advancement of Science. He received a Ph.D. in chemistry from Harvard and a B.S. in chemistry from the University of Chicago.