

*Curriculum Vitae*

# **Drew T. Shindell**

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## **EDUCATION**

Ph.D. (Physics), State University of New York at Stony Brook, 1995  
B.A. (Physics), University of California at Berkeley, 1988

## **EMPLOYMENT**

2014-present: Professor of Climate Sciences, Duke University  
2000-2014: Physical Scientist, NASA Goddard Institute for Space Studies, NYC  
1997-2010: Lecturer, Dept. of Earth and Environmental Sci., Columbia University  
1997-2000: Associate Research Scientist, Columbia University & NASA GISS  
1995-1997: NASA EOS Postdoctoral Researcher, Columbia Univ. & NASA GISS

## **RESEARCH INTERESTS**

Interactions between atmospheric composition and climate change  
Climate and air quality linkages and public policy  
Natural modes of climate variability and detection/attribution of climate change  
Historical and paleoclimate  
Interdisciplinary assessment of the impact of emissions and related metrics

## **PROFESSIONAL EXPERIENCE**

Chair, Scientific Advisory Panel to the Climate and Clean Air Coalition (35 nations plus various IGOs and NGOs), 2012-2014  
Review Panel, NOAA Office of Atmospheric Research, Laboratory Review, 2014  
Coordinating Lead Author, Anthropogenic and Natural Radiative Forcing chapter, Intergovernmental Panel on Climate Change Fifth Assessment Report, 2013  
Contributing Author, 3 chapters (Long-term Climate Change: Projections, Commitments and Irreversibility; Detection and Attribution of Climate Change: from Global to Regional; and Evaluation of Climate Models), IPCC Fifth Assessment Report, 2013  
Originator & Co-Lead, Atmospheric Chemistry and Climate Model Intercomparison Project, 2009-2013  
Chair, Integrated Assessment of Black Carbon and Tropospheric Ozone, United Nations Environment Programme & World Meteorological Organization, 2011.  
Member, National Academy of Sciences Assessment of the Effects of US Tax Policy on Greenhouse Gas Emissions, 2011-2013  
Member, National Academy of Sciences Assessment of Himalayan Glaciers: Climate Change, Water Resources, and Water Security, 2011-2012

Co-Editor, Atmospheric Chemistry and Physics, 2009-present  
Reviewer, US EPA-led USGCRP Research Program: Impacts of Global Change on Regional US Air Quality, 2008  
Co-Chair, US Climate Change Science Program Synthesis & Assessment Product 3.2: Climate Projections Based on Emissions Scenarios for Long-Lived and Short-Lived Radiatively Active Gases and Aerosols, 2006-2008  
Co-author, Arctic Climate Impacts Assessment, 2005  
Co-author, UNEP/WMO Scientific Assessment of Ozone Depletion, 1998, 2002, 2006  
Green Science steering committee, New York Academy of Sciences, 2006-2008  
AGU Atmospheric Physics and Climate Section Secretary, 2002-2004  
Visiting Scientist, Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France. 2009  
Visiting Scientist, Max-Planck Institute for Meteorology, Hamburg, Germany. 2003  
Visiting Scientist, Imperial College, London, UK, 2000

## **PUBLIC OUTREACH/GOVERNMENT/MEDIA**

Education: Co-creator of 'Climate Change Science' course offered by American Museum of Natural History (AMNH) to middle & high school teachers. Consultant on AMNH exhibits.  
Government: Testimony delivered to both houses of the US Congress, US EPA, US National Academy, US State Dept., the Arctic Council, and the UNFCCC.  
Media: Numerous outreach activities including interviews and appearances on NOVA, NPR, BBC, CBC, CNN, New York Times, Washington Post, etc.

## **AWARDS & HONORS**

AGU Fellow, 2014  
MIT Henry Kendall Honorary Lecturer, 2013  
NCAR Earth System Research Laboratory Distinguished Lecturer, 2013  
AGU Atmospheric Science Charney Lecturer, Fall meeting, 2012  
Ne'eman Distinguished Lecturer, Tel Aviv University, 2012  
Scientific American 'Top 50' Scientists, 2004  
NASA GISS 'Best Popular Science Article' peer award, 2002 and 2011  
NASA GISS 'Publication of the Year' peer award, 1998, 1999 and 2012  
National Science Foundation, Antarctic Service Medal, 1994

## **MENTORING**

Thesis committee: Mark Potosnak (Columbia), Sun Wong (Columbia), Jae Lee (Stony Brook), Ben Kravitz (Rutgers), Miriam Marlier (Columbia), Justin Wood (Murdoch)  
Postdoctoral: J. Lee Grenfell (now at Free U. Berlin), Volker Grewe (now at DLR), Nadine Unger (now at Yale), Daven Henze (now at U Colorado), Apostolos Voulgarakis (now at Imperial), Pavan Racherla (now at NextClimate), Olga Pechony, Yunha Lee (now at Duke)

## GRANTS

Funding as PI from NASA's Atmospheric Chemistry Modeling and Analysis Program (1998, 2003, 2006, 2010); NASA Applied Sciences program (2008); NASA Living with a Star (2009), NASA National Climate Assessment (2011, 2013), NASA Aura Science (2014); NSF (2000); California Air Resources Board (2008); US EPA (2010); US DoT (2014). Co-I on numerous NSF and NASA proposals.

## PUBLICATIONS

- Shindell, D. T., Inhomogeneous forcing and transient climate sensitivity, *Nature Climate Change*, doi:10.1038/nclimate2136, 4, 274-277, 2014.
- Anenberg, S. C., et al., Impacts of intercontinental transport of anthropogenic fine particulate matter on human mortality, *Air Qual. Atmos. Health*, in press, 2014.
- Schmidt, G.A., et al., Configuration and assessment of the GISS ModelE2 contributions to the CMIP5 archive, *J. Adv. Model. Earth Syst.*, 6, 141-184, 2014.
- Miller, R. L., et al., CMIP5 Historical Simulations (1850-2012) with GISS ModelE2, *J. Adv. Model. Earth Syst.*, in press, 2014.
- Cooper, O. R., et al., Global distribution and trends of tropospheric ozone: An observation-based review, *Elementa*, in press, 2014.
- Parrish, D. D., et al., Long-term changes in lower tropospheric baseline ozone concentrations: Comparing chemistry-climate models and observations at northern midlatitudes, *J. Geophys. Res.*, 119, 5719-5736, doi:10.1002/2013JD021435, 2014.
- Marlier, M. E., A. Voulgarakis, D. T. Shindell, G. Faluvegi, C. Henry, and J. T. Randerson, The role of temporal evolution in modeling atmospheric emissions from tropical fires, *Atmos. Env.*, 89, 158-168, 2014.
- Schmidt, G.A., D. T. Shindell, and K. Tsigaridis, Reconciling warming trends, *Nature Geoscience*, 7, 158-160, 2014.
- Nolte, C., T. Otte, R. Pinder, J. Bowden, J. Herwehe, G. Faluvegi, D. Shindell, Influences of Regional Climate Change on Air Quality Across the Continental U.S. Projected from Downscaling IPCC AR5 Simulations, in Air Pollution Modeling and its Application XXII, NATO Science for Peace and Security Series C: Environmental Security, D. G. Steyn, P. J. H. Builtjes, and R. M. A. Timmermans, Eds., Springer Netherlands, 2014.
- IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T. F., et al., (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2013.
- Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T. F., et al., (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2013.
- Kirschke, S., et al., Three decades of global methane sources and sinks, *Nature Geoscience*, 6, 813-823, 2013.
- Streets, D. G., D. T. Shindell, Z. Lu, and G. Faluvegi, Radiative forcing due to major aerosol emitting sectors in China and India, *Geophys. Res. Lett.*, 40, 4409-4414, doi:10.1002/grl.50805, 2013.
- Silva, R. A., et al., Global premature mortality due to anthropogenic outdoor air pollution and the

- contribution of past climate change, *Environ. Res. Lett.*, 8, doi:10.1088/1748-9326/8/3/034005, 2013.
- Hsu, A., A. Reuben, D. Shindell, A. de Sherbinin, M. Levy, Toward the next generation of air quality monitoring indicators, *Atmos. Env.*, 80, 561-570, 2013.
- Pechony, O., D. T. Shindell, and G. Faluvegi, Direct top-down estimates of biomass burning CO emissions using TES and MOPITT versus bottom-up GFED inventory, *J. Geophys. Res.*, 118, 8054–8066, doi:10.1002/jgrd.50624, 2013.
- Naik, V., et al., Preindustrial to present-day changes in tropospheric hydroxyl radical and methane lifetime from the Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP), *Atmos. Chem. Phys.*, 13, 5277–5298, 2013.
- Charlton-Perez, A. J., et al., Mean Climate and Variability of the Stratosphere in the CMIP5 models, *J. Geophys. Res.*, 118, 2494-2505, 2013.
- Lamarque, J.F., et al., Multi-model mean nitrogen and sulfur deposition from the Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP): evaluation of historical and projected future changes, *Atmos. Chem. Phys.*, 13, 7997–8018, 2013.
- Eyring, V. et al., Long-term changes in tropospheric and stratospheric ozone and associated climate impacts in CMIP5 simulations, *J. Geophys. Res.*, doi:10.1002/jgrd.50316, 2013.
- Doherty, R. M., Wild, O., Shindell, D. T., Zeng, G., Collins, W. J., MacKenzie, I. A., Fiore, A. M., Stevenson, D. S., Dentener, F. J., Schultz, M. G., Hess, P., Derwent, R. G. and Keating, T. J., Impacts of climate change on surface ozone and intercontinental ozone pollution: A multi-model study, *J. Geophys. Res.*, 118, 3744-3763, 2013.
- Nabat, P. et al., A 4-D climatology (1979-2009) of the monthly tropospheric aerosol optical depth distribution over the Mediterranean region from a comparative evaluation and blending of remote sensing and model products, *Atmos. Meas. Tech.*, 6, 1287–1314, 2013.
- Shindell, D. T. et al., Radiative forcing in the ACCMIP historical and future climate simulations, *Atmos. Chem. Phys.*, 13, 2939–2974, 2013.
- Stevenson, D. S. et al., Tropospheric ozone changes, radiative forcing and attribution to emissions in the Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP), *Atmos. Chem. Phys.*, 13, 3063–3085, 2013.
- Bowman, K. W. et al., Evaluation of ACCMIP outgoing longwave radiation from tropospheric ozone using TES satellite observations, *Atmos. Chem. Phys.*, 13, 4057–4072, 2013.
- Bond, T., et al., Bounding the role of black carbon in the climate system: A scientific assessment, *J. Geophys. Res.*, doi:10.1002/jgrd.50171, 2013.
- Shindell, D., G. Faluvegi, L. Nazarenko, K. Bowman, J.-F. Lamarque, A. Voulgarakis, G. A. Schmidt, O. Pechony, R. Ruedy, Attribution of historical whole-atmosphere ozone forcing to emissions, *Nature Climate Change*, 3, 567-570, doi:10.1038/nclimate1835, 2013.
- Marlier, M. E., R. S. DeFries, A. Voulgarakis, P. L. Kinney, J. T. Randerson, D. T. Shindell, Y. Chen, and G. Faluvegi, El Niño and health risks from landscape fire emissions in Southeast Asia, *Nature Climate Change*, 3, 131–136, 2013.
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- Shindell, D. T., Pechony, O., Voulgarakis, A., Faluvegi, G., Nazarenko, L., Lamarque, J.-F., Bowman, K., Milly, G., Kovari, B., Ruedy, R. and Schmidt, G. A., Interactive ozone and methane chemistry in GISS-E2 historical and future climate simulations, *Atmos. Chem. Phys.*, 13, 2653–2689, 2013.
- Collins, W. J., Fry, M. M., Yu, H., Fuglestedt, J. S., Shindell, D. T. and West, J. J., Global and regional temperature-change potentials for near-term climate forcers, *Atmos. Chem. Phys.*, 13, 2471–2485, 2013.
- Kobashi, T., Shindell, D. T., Kodera, K., Box, J. E., Nakaegawa, T. and Kawamura, K., On the

- origin of multidecadal to centennial Greenland temperature anomalies over the past 800 yr, *Clim. Past*, 9, 583–596, 2013.
- Lee, Y. H. et al., Evaluation of preindustrial to present-day black carbon and its albedo forcing from Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP), *Atmos. Chem. Phys.*, 13, 2607–2634, 2013.
- Voulgarakis, A. et al., Analysis of present day and future OH and methane lifetime in the ACCMIP simulations, *Atmos. Chem. Phys.*, 13, 2563–2587, 2013.
- Young, P. J. et al., Pre-industrial to end 21st century projections of tropospheric ozone from the Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP), *Atmos. Chem. Phys.*, 13, 2063–2090, 2013.
- Lamarque, J.-F., D. T. Shindell, et al., The Atmospheric Chemistry and Climate Model Intercomparison Project (ACCMIP): overview and description of models, simulations and climate diagnostics, *Geosci. Model Dev.*, 6, 179–206, 2013.
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- United Nations Environment Programme and World Meteorological Organization, Integrated Assessment of Black Carbon and Tropospheric Ozone, Nairobi, Kenya, 2011.
- Callaghan, T. V., Johansson, M., Brown, R. D., et al., The Changing Face of Arctic Snow Cover: A Synthesis of Observed and Projected Changes, *AMBIO*, 40, 17–31, 2011.
- Shindell, D., G. Faluvegi, M. Walsh, S. C. Anenberg, R. Van Dingenen, N. Z. Muller, J. Austin, D. Koch, and G. Milly, Climate, health, agricultural and economic impacts of tighter vehicle-emission standards, *Nature Climate Change*, 1, 59-66, 2011.
- Aghedo, A. M., K. W. Bowman, D. T. Shindell, G. Faluvegi, The impact of orbital sampling, monthly averaging and vertical resolution on climate chemistry model evaluation with satellite observations, *Atmos. Chem. Phys.*, 11, 6493–6514, 2011.
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