

Nicole Smith-Downey

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Education

California Institute of Technology , Pasadena, CA	2001 to 2006
Ph.D. Environmental Science and Engineering	7/2006
<i>Thesis: Soil uptake of molecular hydrogen and remote sensing of soil freeze and thaw.</i>	
M.S. Environmental Science and Engineering	5/2003
Beloit College , Beloit, WI	1997 to 2001
B.S. Environmental Biology, <i>summa cum laude</i>	5/2001

Honors, Awards and Fellowships

Harvard Center for the Environment Postdoctoral Fellow	2006 to 2008
EPA Science to Achieve Results (STAR) Fellow	2003 to 2006
NASA Earth System Science Fellow <i>(declined for EPA Fellowship)</i>	2003
Institute Fellow, California Institute of Technology	2001 to 2002
Departmental Honors, Beloit College Biology	2001
Phi Beta Kappa	2001
Morris K. Udall Scholar	2000 to 2001

Peer-Reviewed Publications

- Smith-Downey, N.V., Selin, N.E. and D.J. Jacob, *in preparation for submission to Global Biogeochemical Cycles*. A global mechanistic model of biosphere-atmosphere mercury fluxes.
Soils are the largest surface reservoir of mercury (Hg) on Earth, and the fluxes of Hg between soils and the atmosphere are of critical importance for understanding both the present and future Hg budget. Here, we present a global monthly model of mercury biogeochemistry in the terrestrial environment and discuss the environmental controls on Hg cycling.
- Smith-Downey, N.V., Eiler, J.M. and J.T. Randerson, *in press*. Molecular hydrogen (H₂) uptake by soils in forest, desert and marsh ecosystems in California. *Journal of Geophysical Research – Biogeosciences*.
We established three field sites in different California biomes to test the ecosystem controls on H₂ uptake by soils. We found that the diffusion of H₂ into soils controls surface fluxes, and that diffusion is limited by soil structure, soil moisture and the vertical distribution of biological uptake capacity in the soil profile.
- Smith-Downey, N.V., Eiler, J.M. and J.T. Randerson, 2006. Temperature and moisture dependence of soil H₂ uptake measured in the laboratory, *Geophysical Research Letters*, v 33, L14813.
We present the relationship between soil temperature and moisture and H₂ uptake by different soils in the laboratory. This was the first comprehensive investigation of the temperature and moisture response of H₂ uptake at atmospherically relevant concentrations.

- Euskirchen, E.S., McGuire, A.D., Kicklighter, D.W., Zhuang, Q., Clein, J.S., Dargaville, R.J., Dye, D.G., Kimball, J.S., McDonald, K.C., Melillo, J.M., Romanovsky, V.E. and N. Smith-Downey. 2006. Importance of recent shifts in soil thermal dynamics on growing season length, productivity and carbon sequestration in terrestrial high-latitude ecosystems. *Global Change Biology*, v12.
- Smith, N.V., Saatchi, S.S. and J.T. Randerson. 2004. Trends in high northern latitude freeze and thaw cycles from 1988 to 2002, *Journal of Geophysical Research – Atmospheres*, v 109, D12101.
We developed a new remote sensing technique to identify the timing of soil freeze and thaw using passive microwave satellite data. We found that the growing season length has increased at a rate of 5 days per decade in North America since 1988. These data provide a new metric of ecosystem function and global climate change, and were cited in the latest IPCC report.

Talks and Presentations

- Smith-Downey, N.V. A global mechanistic model of biosphere-atmosphere mercury fluxes. Harvard University Center for the Environment, May 2008. *invited.*
- Smith-Downey, N.V. Mercury in the Environment. Harvard University Earth and Planetary Sciences Day, April 2008. *invited.*
- Smith-Downey, N.V., Selin, N., Holmes, C., Sunderland, E. and D. Jacob. Mercury in the future: Simulating the global mercury cycle through 2050. GCAP Team Meeting, October 2007. *invited.*
- Smith-Downey, N.V., Saatchi, S.S. and J.T. Randerson. Changes in the growing season length at high northern latitudes from 1988 to 2005. AGU Fall Meeting, December 2006.
- Smith-Downey, N.V., and D. Jacob. Mercury in the terrestrial environment. Harvard School of Public Health. October 2006. *invited.*
- Smith-Downey, N.V., Randerson, J.T. and J.M. Eiler. Field and laboratory measurements of H₂ uptake by soils designed to yield parameters for a global model. AGU Fall Meeting, December 2005.
- Smith-Downey, N.V., and J.T. Randerson. Observations of molecular hydrogen uptake by soils in a mixed conifer and hardwood forest in California. AGU Fall Meeting, December 2004.
- Smith, N.V., Randerson, J.T., Eiler, J.M., Leadbetter, J. and P. Ghosh. Environmental Implications of a Global Hydrogen Economy. EPA STAR Graduate Fellowship Conference, 2004.
- Smith, N.V., Saatchi, S.S. and J.T. Randerson. Remote sensing of soil freeze-thaw cycles: Growing season changes in North America and Eurasia. EPA Science Forum, 2004. *invited.*
- Smith, N.V., Saatchi, S.S. and J.T. Randerson. Detecting and analyzing trends in freeze-thaw cycles of high northern latitude soils using passive microwave satellites since 1988. AGU Fall Meeting, December 2003.

Research Experience

Postdoctoral Fellow, Harvard University Center for the Environment	2006 to 2008
Research Assistant, California Institute of Technology	2001 to 2006
Participant in the IARC/MBL “Arctic climate and terrestrial ecosystems” Summer school at University of Alaska, Fairbanks and Toolik Lake Research Center	8/2004
REU summer student at Harvard Forest, Harvard University	2000
Bilsa Biological Reserve, Jatun Satcha Foundation, Ecuador	1999

Teaching Experience

Supervisor to undergraduate research assistant at Harvard University	2007
Supervisor to high-school summer research assistant at Caltech	2004 & 2005
TA: Global Change Biology (Alex Sessions, Caltech)	2005
TA: Global Climate Change (Paul Wennberg, Caltech)	2005
TA: Biometrics (Ken Yasukawa, Beloit College)	2001
TA: Genetics (John Junck, Beloit College)	2001