

Gene-Hua Crystal Ng

U.S. Geological Survey
345 Middlefield Rd, MS 973
Menlo Park, CA 94040

Phone: (650) 329-4940
Email: gng@usgs.gov

Education:

Ph.D. Massachusetts Institute of Technology, Cambridge, MA

Civil and Environmental Engineering (Hydrology), *September 2008*

Title: Probabilistic Estimation and Prediction of Groundwater Recharge in a Semi-Arid Environment

Advisors: Dennis McLaughlin and Dara Entekhabi

B.A. Harvard University, Cambridge, MA

Applied Mathematics, *June 2003*

Honors: *magna cum laude*

Senior Thesis Title: Determining U.S. Black Carbon Emissions Using an Inverse Method

Thesis Advisor: Daniel Jacob

Research and Technical Experience:

Mendenhall Postdoctoral Research Fellow, U.S. Geological Survey

January 2010-present

Menlo Park, CA

Supervisors: David Bedford and David Miller

Assessing ecohydrological controls on vegetation dynamics in the Mojave Desert. Developing a numerical model that describes the coupled soil moisture and vegetation conditions in the Mojave Desert. Model uncertainty will be reduced by assimilating soil and vegetation observations. Model results will help predict how desert ecosystems may be affected by changes in climate and land-use.

Postdoctoral Research Associate, Ralph M. Parsons Laboratory, MIT

September 2008 – December 2009

Cambridge, MA

Supervisors: Dennis McLaughlin and Dara Entekhabi

Investigated data assimilation applications to chaotic geophysical systems such as the atmosphere and ocean. Demonstrated the role of model dynamics on the performance of ensemble Kalman-based estimation filters. Identified interactions between sampling errors and dynamical behavior that are relevant for large dimensional systems.

Graduate Research Assistant, Ralph M. Parsons Laboratory, MIT

September 2003 – September 2008

Cambridge, MA

Supervisors: Dennis McLaughlin and Dara Entekhabi

Developed statistical approach (using data assimilation/ inverse method) to combine unsaturated zone chemical and physical data and model simulations for groundwater recharge estimation. Demonstrated approach using data from the semi-arid Southern High Plains region in Texas. Used results to identify vegetation, soil, and meteorological controls on episodic recharge. Incorporated general circulation model climate predictions with recharge model to examine recharge impacts under possible climate change scenarios. Investigated data assimilation methods appropriate for large-scale non-linear problems.

Field Sampler, Soil Moisture Experiment 2005 (SMEX05)

June 2005

Ames, IA

Assisted with ground sampling, collected theta probe and volumetric soil moisture measurements.

Undergraduate Research Assistant, Atmospheric Chemistry Research Group, Harvard

April 2002 – May 2003

Cambridge, MA

Supervisor: Daniel Jacob

Used an inverse model to estimate black carbon emissions in the U.S. from observed atmospheric concentrations.

Intern, EcoBolivia (local environmental non-governmental organization)

Summer 2000

La Paz, Bolivia

Researched local environmental problems in the Amazonian region of Bolivia. Helped local school officials create environmental science curricula covering relevant issues.

Teaching Experience:

English as a Second Language Teacher, Somerville ESL Program

January 2008 – June 2009

Somerville, MA

Taught beginner's English class as part of a community ESL program for adults and young adults.

Teaching Assistant, Department of Civil and Environmental Engineering, MIT

Fall 2006

Cambridge, MA

1.070: Introduction to Hydrology, Professor Dara Entekhabi. Assisted with a primarily undergraduate hydrology course covering surface processes, groundwater, unsaturated zone, contaminant transport, and probabilistic risk analysis. Taught weekly review sessions and held office hours for students. Designed and graded bi-weekly assignments including conceptual and computational (MATLAB) problems. Assisted with additional lab component for course and graded lab reports on transport processes.

Math and Science Tutor

Fall 2000 – Spring 2001

Cambridge, MA

Tutored high school students in calculus and physics.

Refereed Publications:

1. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and B. R. Scanlon (2010), Probabilistic Analysis of the Effects of Climate Change on Groundwater Recharge, *Water Resour. Res.*, 46, W07502, doi:10.1029/2009WR007904.
2. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and B. Scanlon (2009), Using data assimilation to identify diffuse recharge mechanisms from chemical and physical data in the unsaturated zone, *Water Resour. Res.*, 45, W09409, doi:10.1029/2009WR007831.
3. Y. Zhou, D. McLaughlin, D. Entekhabi, and G. C. Ng (2008), An ensemble multiscale filter for large nonlinear data assimilation problems, *Monthly Weather Review*, 136, 678-698.

Submitted or In Final Preparation:

4. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and A. Ahanin (2010), The role of model dynamics in EnKF performance for chaotic systems, submitted to *Tellus A*.

Contributed Presentations:

1. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and B. R. Scanlon, Identifying land-surface controls on diffuse recharge: What we can learn by integrating model simulations and unsaturated zone data (invited talk), *CUAHSI Biennial Science Meeting 2010*, Boulder, CO.
2. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and B. R. Scanlon, Probabilistic predictions of groundwater recharge under climate change scenarios in a dryland cotton region of the southern High Plains (poster), *Toward Sustainable Groundwater in Agriculture 2010*, San Francisco, CA.
3. Ng, G.-H. C., D. McLaughlin, and D. Entekhabi, The affect of nonlinear dynamics on Ensemble Kalman Filter divergence for atmospheric data assimilation (poster), *American Geophysical Union Fall Meeting 2009*, San Francisco, CA.
4. Ng, G.-H. C., D. McLaughlin, and D. Entekhabi, Causes of EnKF Divergence with Atmospheric Models (poster), World Meteorological Organization *The 5th WMO Symposium on Data Assimilation 2009*, Melbourne, Australia.
5. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and B. R. Scanlon, Probabilistic prediction of recharge under future climate change scenarios (poster), *American Meteorological Society Annual Meeting 2009*, Phoenix, AR.
6. McLaughlin, D., G.-H. C. Ng, D. Entekhabi, and B. R. Scanlon, Data-conditioned predictions of groundwater recharge under climate change scenarios (poster), *American Geophysical Union Fall Meeting 2008*, San Francisco, CA.
7. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and B. R. Scanlon, Inference of hydrologic and plant interactions from unsaturated zone chemical and physical data (poster), *American Geophysical Union Fall Meeting 2008*, San Francisco, CA.
8. Ng, G.-H. C., D. McLaughlin, D. Entekhabi, and B. R. Scanlon, Soil and vegetation parameter estimation using chemical and physical unsaturated zone data (poster), *American Geophysical Union Fall Meeting 2007*, San Francisco, CA.
9. Ng, G.-H.C., D. McLaughlin, D. Entekhabi, and B.R. Scanlon, Assimilation of chemical and physical measurements for estimation of recharge rates (oral presentation), *American Geophysical Union Fall Meeting 2006*, San Francisco, CA.

Awards and Honors:

Outstanding Student Paper Award, AGU Fall Meeting, 2006
Martin Family Society of Fellows for Sustainability, MIT, 2005
Clemens Herschel Award for excellence in hydraulics, Harvard University, 2003
John Harvard Scholarship, Harvard University, 1999-2003
Dean's Summer Research Award, Harvard University, 2002
Harvard College Research Program Grant, Harvard University, 2002
David Rockefeller Center for Latin American Studies Travel Grant, Harvard University, 2000
Bhumi Travel Grant, Harvard University, 2000

Skills:

Computer Skills: MATLAB, FORTRAN, C, UNIX/LINUX
Languages: Mandarin Chinese (proficient speaking), Spanish (proficient speaking and writing)

Professional Membership:

American Geophysical Union

Service:

Reviewer for:
Advances in Water Resources
Environmental Research Letters
Monthly Weather Review