Zepu Zhang

CISES, 5734 South Ellis Avenue, Chicago, IL 60637
Tel: (773) 834-9929 Fax: (773) 834-1045 Cell: (773) 551-3983 Email: zpzhang@uchicago.edu
Web: `http://home.uchicago.edu/~zpzhang` (reprints, preprints, etc.)

Updated April 26, 2007.

Employment History

Research Associate, Center for Integrating Statistical and Environmental Science, University of Chicago, since October 2004.

Education

PhD in Geological and Environmental Science, Stanford University, 2005.

Thesis: Continuous spatial-temporal rainfall models based on aggregated historical data. Advisor: Paul Switzer.

MS in Statistics, Stanford University, 2003.

MS in Environmental Science, Peking University, Beijing, 1999.

Thesis: An experimental study of the diffusion and transport of heavy metals in sediment-laden channel flows. Advisor: Jinren Ni.

BS in Environmental Science, Peking University, Beijing, 1996.

Thesis: Two-dimensional spatial patterns of heavy metal pollution in soils. Advisor: Xuejun Wang.

Research and Professional Experiences

Data assimilation for hydrodynamic models (2004–present)

In this ongoing project conducted with statisticians from the University of Chicago and oceanographers from NOAA, we have developed a method for assimilating sparse observations into simulations of velocity fields in Lake Michigan. The method uses relationships between stream functions and non-divergent vector fields to ensure mass conservation in the assimilation, and incorporates pseudo coastal data into spatial interpolation so that the need to construct complex covariance models is eliminated.

Stochastic modeling of rainfall (2000–present)

This is the topic of my PhD thesis finished in 2004 and is being pursued further. I developed an event-based spatio-temporal model that randomly generates statistically realistic, continuous-scale ground surface rain storm scenarios. The model is adapted to widely available historical rain gauge data, and is useful for investigations of rainfall-sensitive processes.

Impact of suspended sediments on the open-channel transport of heavy metals (1997–1999)

This was an experimental study for my Master's thesis finished at Peking University in 1999. I formulated the question and approach, devised and assembled a physical model, designed and conducted experiments, analyzed and interpreted results.

Ecological dynamics and environmental pollution (1996–1999)

Explored mathematical modeling and computer simulation of ecological dynamics; developed a cellular automata simulator for the expansion of urban areas and recession of natural forests; led or participated in consulting projects to assess the potential air pollution, water pollution, noise, and ecological risks of proposed engineering constructions; quantified the connection between a tree's mortality and its competition with neighbors for resources, all at Peking University.

Statistical methodologies (1995–present)

Practises and applied major statistical methods, spatial statistics, geostatistics, stochastic modeling, and visualization in all my research. Took graduate-level courses at Stanford University, 2000–2002: Statistical Inference, Applied Statistical Methods, Resampling and Bootstrap, Stochastic Process, Time Series Analysis, Multivariate Analysis, Analysis of Discrete Data, Regression Models and Analysis of Variance, Nonparametric Statistics, and Geostatistics.

Interned in the Statistical Sciences Group of the Los Alamos National Laboratory, summer 2002. Conducted research on Bayesian inference and Markov Chain Monte Carlo (MCMC) computations.

Bachelor's thesis on spatial analysis of heavy metal pollution in soil, finished at Peking University, 1996. Explored geostatistical interpolation and conditional simulation techniques.

Computer programming and scientific computation (1995–present)

Major projects on short-term or part-time appointments: (1) Developed an image analysis and pattern recognition software package, with a statistical perspective, that greatly helped the automation of crystallographic experiments (Stanford Linear Accelerator Center, 2001–2004); (2) Developed a database-driven website for membership management for the International Society of Computational Biology (Stanford University Medical School, 2000); (3) Participated in developing a database system for real-estate evaluation and management (Peking University, 1997); (4) Participated in developing commercial multimedia educational software (Bilingual Educational Multimedia Software Co., Beijing, 1995–1996).

Took intensive computer science courses at Stanford University, 2000–2001: Computer Architecture, Design and Analysis of Algorithms, Scientific Computing, Computer Networks, Database Theory, Automata and Complexity Theory, Programming Methodology and Abstraction (in C).

Proficient in Fortran 90/95, C/C++, R, Matlab, and LaTeX. Familiar with software development and scientific computing tools such as UNIX shell scripting, LAPACK, HDF5, and Subversion. Previous experience with Visual Basic and VBA, MS Excel, MS Access, SQL, database design, and OpenGL.

Teaching Experience

Teaching Assistant, introductory statistics for earth and environmental sciences, 2000, 2001; introductory geostatistics, 2003, 2004; and introductory geology, 2000, all at Stanford University.

Tutor for a college student on introductory seismology at Stanford University, 2003.

Tutor for high school students on various courses in Beijing, 1993–1996.

Citizenship

Chinese citizen. On H1B visa.

Professional Membership

Member, American Geophysical Union.
Member, American Statistical Association.

Professional Service

Reviewer, *Environmental Pollution*, *IEEE Signal Processing Letters*.

Session organizer and session chair, Joint Statistical Meeting, Salt Lake City, July 2007.

Session chair, Conference on Hydrological Sciences for Managing Water Resources in the Asian Developing World, Guangzhou, June 2006.

Peer-reviewed Journal Articles

—— in preparation ——

2007 Zhang Z., and P. Switzer, Reconstructing continuous storm events from tipping-bucket gauge data for use in space-time rainfall modeling.

—— submitted ——

2006 **Zhang Z.**, D. Beletsky, D. J. Schwab, and M. L. Stein, Assimilation of current measurements into a circulation model of Lake Michigan, *Water Resources Research* (in revision).

—— published ——

2007 **Zhang Z.**, and P. Switzer, Stochastic space-time regional rainfall modeling adapted to historical rain gauge data, *Water Resources Research, 43*(3), W03441, doi:10.1029/2005wr004654.

2006 **Zhang Z.**, and J. Ni, Diffusion and transport of heavy metal pollutants in sediment-laden flow, *Advances in Sediment Research,* in press.

2006 **Zhang Z.**, N. K. Sauter, H. van den Bedem, G. P. Snell, and A. M. Deacon, Automated diffraction image analysis and spot searching for high throughput crystal screening, *Journal of Applied Crystallography, 39,* 112–119, doi:10.1107/S0021889805040677.

2000 **Zhang Z.**, J. Fang, and M. Kan, Effects of competition on growth rate and probability of death of plant individuals: a study based on nursery experiments of Larix leptolepis populations, *Acta Phytoecologica Sinica, 24*(3), 340–345.

1999 Wang X., and **Z. Zhang**, A comparison of conditional simulation, kriging and trend surface analysis for soil heavy metal pollution pattern analysis, *Journal of Environmental Science and Health Part A—Toxic/Hazardous Substances & Environmental Engineering, 34*(1), 73–89.

1999 Guo Q., H. Yu, Y. Cao, and **Z. Zhang**, Remote sensing study on the characteristics of forest-steppe ecotone, *Acta Scientiarum Naturalium, Universitatis Pekinensis, 35*(4):550–557.

1998 **Zhang Z.**, and X. Wang, Conditional simulation of spatial distribution of trace elements in soil, *Acta Pedologica Sinica, 35*(3), 423–429.

1997 Wang, X., B. Deng, and **Z. Zhang**, Spatial structures of trace element contents in sewage irrigated soil at the eastern suburb of Beijing, *Acta Scientiae Circumstantiae, 17*(4), 412-416.

Talks

"Demonstrating hydrodynamic data assimilation with OpenGL animations," Geoinformatics, San Diego, May 2007.

"Assimilation of current measurements into a circulation model of Lake Michigan," University of South Florida, St. Petersburg, March 2007; IAGLR's 50th Annual Conference on Great Lakes Research, University Park, Penn, June 2007; Joint Statistical Meeting, Salt Lake City, July 2007.

"Continuous spatio-temporal stochastic rainfall models," University of Texas, San Antonio, April 2004; University of Chicago, November 2004; Purdue University, November 2004; UC Berkeley, June 2006; Peking University, Beijing, June 2006.

"Applications of ordinary differential equations in ecology," Peking University, Beijing, 1998.

"Simulation and visualization of spatio-temporal dynamics of ecological systems," Peking University, Beijing, 1998.

Conference proceedings and abstracts

Zhang Z., D. Beletsky, D. J. Schwab, M. L. Stein, Assimilation of current measurements into a circulation model of Lake Michigan, Data Assimilation in Support of Coastal Ocean Observing Systems, Corvallis, Oregon, April 2007.

Zhang Z., and P. Switzer, Stochastic space-time regional rainfall modeling adapted to historical rain gauge data, AGU Joint Assembly, Montreal, May 2004; AGU Fall Meeting, San Francisco, December 2005, 2006; Joint Statistical Meeting, Salt Lake City, July 2007.

Xu Q., Z. Zhang, N. K. Sauter, H. van den Bedem, A. Gonzalez, C. Smith, and A. M. Deacon, Crystal ranking: automatic analysis of screening images, American Crystallographic Association Annual Meeting, Orlando, May 2005.

Deacon A. M., A. E. Cohen, P. J. Ellis, S. E. McPhillips, T. M. McPhillips, M. D. Miller, R. P. Phizackerley, J. Song, S. M. Soltis, I. Tsyba, H. van den Bedem, G. Wolf, and Z. Zhang, Automated crystal screening for high-throughput X-ray crystallography at Stanford Synchrotron Radiation Laboratory, 22nd European Crystallographic Meeting, ECM22, Budapest, August 2004.

Miller M. D., L. S. Brinen, A. Cohen, A. M. Deacon, P. Ellis, S. E. McPhillips, T. M. McPhillips, R. P. Phizackerley, S. M. Soltis, H. van den Bedem, G. Wolf, Q. Xu, and Z. Zhang(2004), Automation of high-throughput crystal screening and data collection at SSRL, Proceedings of the International Synchrotron Radiation Instrumentation Conference SRI2003 in San Francisco, August 2003, *AIP Conference Proceedings,* 705, 1233–1236, Melville, New York.

Miller M., L. Brinen, A. Deacon, P. Kuhn, T. McPhillips, H. van den Bedem, G. Wolf, Z. Zhang, and J. Zhong, High-throughput crystal screening at Stanford Synchrotron Radiation Laboratory, Annual Meeting, American Crystallographic Association, San Antonio, May 2002.

Short courses and workshops attended

"Data Assimilation in Support of Coastal Ocean Observing Systems", Oregon State University, Corvallis, April 2007.

"Multivariate Spatial Process Modeling" by Alan E. Gelfand, Chicago, October 2006.

"Morphology, Morphodynamics and Ecology of Mountain Rivers" by Bill Dietrich, Gary Parker, Mary Power, and Peter Wilcock, Berkeley, December 2005.

"Fusing Geophysical Models with Data", SAMSI Summer School, Boulder, June 2005.

"Computational Statistics" by Geof H. Givens and Jennifer A. Hoeting, Chicago, October 2004.

Professional References

Michael Stein

(advisor of my postdoctoral work)

Department of Statistics
5734 S. University Avenue
Chicago, IL 60637

Phone 773.702.8326
Fax 773.702.9810
Email stein@galton.uchicago.edu

Paul Switzer

(advisor of my PhD thesis)

Department of Statistics
Sequoia Hall, 390 Serra Mall
Stanford, CA 94305-4065

Phone 650.723.2879
Fax 650.725.8977
Email switzer@stanford.edu

Keith Loague

Dept of Geol. & Environ. Sci.
Braun Hall, 450 Serra Mall
Stanford, CA 94305-2115

Phone 650.723.3090
Fax 650.725.0979
Email keith@pangea.stanford.edu

David Freyberg

Dept of Civil & Environ. Engr.
Terman Building, Room M-13
380 Panama Mall
Stanford, CA 94305-4020

Phone 650.723.3234
Fax 650.725.9720
Email freyberg@stanford.edu