

Alex Y. Sun

Professional Summary

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Academic Background

B.S. Civil and Environmental Engineering, University of California at Los Angeles, June 1995
M.S. Civil and Environmental Engineering, University of California at Berkeley, May 1996
Ph.D. Environmental Water Resources, University of California at Berkeley, May 2000

Areas of Expertise

- A. Modeling of multiphase flow and multicomponent transport in porous media.
- B. Quantification of model uncertainty using statistical and stochastic techniques.
- C. Quantification of model uncertainty using Characterization of subsurface and surface water interactions through real-time monitoring and modeling.
- D. Development of decision support systems.
- E. Development and application of high-performance numerical codes and data assimilation techniques for sustainable water resources management, reservoir characterization, and CO₂ sequestration.

Professional Work Experience

- A. Present Position: Research Scientist, Bureau of Economic Geology, The University of Texas at Austin (March 2011 - Present).

Developing theoretical and analytical tools for predicting CO₂ leakage into groundwater aquifers; conducting performance assessment of a proposed low-level radioactive waste repository in Texas.

- B. Principal Research Engineer, Senior Research Engineer, Research Engineer, Southwest Research Institute, San Antonio, Texas (September 2003 - March 2011).

Developed a decision support system for surface water quality management; conducted environmental impact assessment of in-situ uranium recovery operations; developed an integrated framework for calibrating regional groundwater models; conducted researches related to a potential high-level nuclear waste repository project; responsible for assessing DOE's modeling of surface and subsurface hydrologic processes through independent process-level modeling and uncertainty analyses; developed robust contaminant source identification methodologies for identifying source locations and release histories under model and data uncertainty; developed a novel grid-based ensemble Kalman filter method for continuous reduction of model and parameter uncertainty in multimodal, non-Gaussian random fields; implemented a dual-conductivity module in MODFLOW and applied it to modeling karst aquifers in Texas and Florida; modeled coupled, non-isothermal, hydrological and geochemical processes in unsaturated fractured volcanic aquifers using high-performance computing tools; led a wireless

sensor project for developing miniature acoustic sensors for monitoring underwater environments; simulated a seawater intrusion scenario for a Swedish nuclear repository project.

- C. Co-founder (part-time), SUNDA Environmental Technology, LLC, Santa Monica, California (May 2000 - March 2004).

Provided litigation support for a Superfund site located in Riverside County, California; developed a three-dimensional contaminant transport model for the site and successfully reconstructed contaminant plume migration history; designed and maintained large-scale sample databases.

- D. Environmental Engineer, Tetra Tech Inc., R&D Division, Lafayette, California (August 1999 - May 2000).

Conducted feasibility study and site characterization projects for several Superfund sites in California; developed in-house tools for environmental risk assessment, geostatistical modeling, and contaminant transport modeling.

- E. Research Fellow, Los Alamos National Laboratory, Los Alamos, New Mexico (June 1998 - August 1999).

Derived and implemented particle tracking algorithms for predicting uncertainties associated with mass transport in porous media; developed codes for solving stochastic partial differential equations for solute transport in unsaturated nonstationary random porous media.

- F. Lab Assistant, Environmental Research Lab, UCLA, Los Angeles, California (September 1993 - September 1994).

Conducted experiments to test the performance of reverse-osmosis membranes.

Professional Societies

American Geophysical Union
National Ground Water Association

Professional Registrations

Engineer-in-Training (State of California)

Awards and Honorary Societies

Center for Nonlinear Studies Research Fellowship, Los Alamos National Laboratory, 1998 - 1999
Dean's Fellowship, Department of Civil and Environmental Engineering, UC Berkeley, 1997 - 1998
Jane Lewis Fellowship, Department of Material Science and Engineering, UC Berkeley, 1995 - 1996

Publications

Chapters/Sections

Sun, N.-Z., and Sun, A. Y., 2005, Inverse methods for parameter estimation, *in* Anderson, M. G., and McDonnell, J. J., eds., Encyclopedia of hydrological sciences: United Kingdom, John Wiley and Sons, v. 4,

Sun, N.-Z., and Sun, A. Y., 2002, Chapter 8. Parameter identification of environmental systems, *in* Shen, H., et al., *Environmental fluid mechanics: American Society of Civil Engineers*,

Articles

Peer Reviewed

- Sun, A. Y., Green, R., Swenson, S., and Rodell, M., 2012, Toward calibration of regional groundwater models using GRACE data: *Journal of Hydrology*, v. 422–423, p. 1–9.
- Sun, A. Y., and Nicot, J. -P., 2012, Inversion of pressure anomaly data for detecting leakage at geologic carbon sequestration sites: *Advances in Water Resources*, v. 44, p. 20–29.
- Liu, Y., Sun, A. Y., Nelson, K., and Hipke, W. E., 2012, Cloud computing for integrated stochastic groundwater uncertainty analysis: *International Journal of Digital Earth*, v. 5, no. 5, p. 1–25. DOI:10.1080/17538947.2012.687778.
- Sun, A. Y., 2011, Identification of geologic fault network geometry by using a grid-based ensemble Kalman filter: *Journal of Hazardous, Toxic, and Radioactive Waste*, v. 15, no. 4, p. 228–233.
- Sun, A. Y., Green, R., Rodell, M., and Swenson, S., 2010, Inferring aquifer storage parameters using satellite and in situ measurements: estimation under uncertainty: *Geophysical Research Letters*, v. 37, L10401.
- Sun, A. Y., Morris, A., and Mohanty, S., 2009, Sequential updating of multimodal hydrogeologic parameter fields using localization and clustering techniques: *Water Resources Research*, v. 45, W07424.
- Sun, A. Y., Morris, A., and Mohanty, S., 2009, Comparison of deterministic ensemble Kalman filters for assimilating hydrogeologic data: *Advances in Water Resources*, v. 32, no. 2, p. 280–292.
- Sun, A. Y., Ritzi, R., and Sims, D., 2008, Characterizing and modeling a complex alluvial aquifer: implication on solute transport: *Water Resources Research*, v. 44, W04402.
- Sun, A. Y., 2008, CONSID@: A toolbox for contaminant source identification: *Ground Water*, v. 46, no. 4, p. 638–641.
- Sun, A. Y., 2007, A robust maximum likelihood approach to contaminant source identification: *Water Resources Research*, v. 43, W02418.
- Sun, A. Y., Painter, S., and Wittmeyer, G., 2006, A robust approach for contaminant source location and release history recovery: *Journal of Contaminant Hydrology*, v. 88, p. 29–44.
- Sun, A. Y., Painter, S., and Wittmeyer, G., 2006, A constrained, robust least squares approach for contaminant source release history identification: *Water Resources Research*, v. 42, W04414.
- Green, R., Painter, S., Sun, A. Y., and Worthington, S., 2006, Groundwater contaminant in karst terrains: *Water, Air, and Soil Pollution*, v. 6, nos. 1–2, p. 157–170.
- Sun, A. Y., and Zhang, D., 2004, A solute flux approach to transport through bounded, unsaturated heterogeneous porous media: *Vadose Zone Journal*, v. 3, p. 513–526.
- Sun, A. Y., and Zhang, D., 2000, Prediction of solute spreading during vertical infiltration in unsaturated, bounded heterogeneous porous media: *Water Resources Research*, v. 36, no. 3, p. 715–723.
- Zhang, D., and Sun, A. Y., 2000, Stochastic analysis of transient saturated flow through heterogeneous fractured porous media: a double-permeability approach: *Water Resources Research*, v. 36, no. 4, p. 865–874.
- Zhang, D., Andricevic, R., Sun, A. Y., Hu, X., and He, G., 2000, Solute-flux approach to transport through spatially nonstationary flow in porous media: *Water Resources Research*, v. 36, no. 7, p. 2107–2120.
- Rubin, Y., Sun, A. Y., Maxwell, R., and Bellin, A., 1999, The concept of block effective macrodispersivity and a unified approach for grid-scale and plume-scale dependent transport: *Journal of Fluid Mechanics*, v. 395, p. 161–180.

Sun, A. Y., and Rubin, Y., 1998, Temporal moments of reactive and conservative solute transport in the unsaturated zone: *Journal of Hydraulic Research*, v. 36, no. 6.

Non-Peer-Reviewed

Porras, A., Yang, C., Tu, K., Broussard, B., and Sun, A. Y., 2012, Numerical modeling of groundwater flux through a low-level radioactive waste repository for performance assessment: *Gulf Coast Association of Geological Societies Transactions*, v. 62, p. 343–350.

Sun, A. Y., Painter, S., and Wittmeyer, G., 2006, A robust framework for contaminant source identification using MODFLOW/MT3DMS, *in* Poeter et al., eds., *Proceedings of MODFLOW and MORE*, Golden, Colorado.

Sun, A. Y., Painter, S., and Green, R., 2005, Modeling Barton Springs segment of the Edwards Aquifer using MODFLOW-DCM, *in* Schindel, G., ed., *Proceedings of the 10th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst*, San Antonio.

Zhang, D., and Sun, A. Y., 1999, Stochastic analysis of groundwater flow in fractured porous media, *in* Faybishenko, B., ed., *Proceedings of the International Symposium on Dynamics of Fluids in Fractured Rocks—Concepts and Recent Advances*.

Abstracts

Yang, Changbing, Tu, K., Porras, A., Broussard, B., Sun, A. Y., Nicot, J. -P., and Scanlon, B. R., 2012, Sensitivity analysis of radonucleide downward migration for a low-level radioactive waste repository: an analytical approach for performance assessment (abs.): *Gulf Coast Association of Geological Societies Transactions*, v. 62, p. 817.

Sun, A. Y., and Nicot, J. -P., 2012, Inversion of pressure anomaly data for CO₂ leakage detection at geologic carbon sequestration sites (abs.), *in* American Geophysical Union Fall Meeting, San Francisco, December 3–7, Abstract H44B-07.

Strassberg, Gil, Scanlon, B. R., Longuevergne, Laurent, Wilson, C. R., Sun, A. Y., and Long, D., 2011, Difficulties in assessing reliability of groundwater storage changes from GRACE satellite data (abs.), *in* American Geophysical Union Fall Meeting, San Francisco, Abstract H14B-05.

Wolaver, B. D., Sun, A. Y., Nicot, J. -P., Hovorka, S. D., Nuñez López, V., and Young, M., 2011, The effects of subsurface heterogeneity on detectability of CO₂ leakage to shallow groundwater aquifers (abs.), *in* AGU Meeting, San Francisco, December 5–9, Abstract #H33B-1110.

Sun, A. Y., Yang, C., Porras, A., Tu, K., Broussard, B., Scanlon, B. R., Nicot, J. -P., and Council, L., 2011, Performance assessment of a low-level radioactive waste disposal facility in Texas (abs.), *in* AGU Meeting, San Francisco, December 5–9, Abstract #H531-1528.

Contract Reports

Nuñez López, Vanessa, Hovorka, S. D., Wolaver, B. D., Zahid, K., Sun, A. Y., Hosseini, S. A., and Romanak, K. D., 2011, Phase 2A at West Hastings field: The University of Texas at Austin, Bureau of Economic Geology, Gulf Coast Carbon Center, final report for the MVA Design Phase prepared for Denbury Onshore, LLC, 126 p.

Sun, A. Y., 2008, Review of state-of-the-art multiscale approaches for modeling flow and transport in porous media: Southwest Research Institute, report prepared for Nuclear Regulatory Commission.

Sun, A. Y., and Bertetti, P. F., 2007, Evaluation of the effects of physical and chemical heterogeneities on flow and transport in the saturated alluvium of Fortymile Wash, Nevada: Southwest Research Institute, report prepared for Nuclear Regulatory Commission.

Painter, S., Sun, A. Y., and Green, R., 2006, Evaluation of the effects of physical and chemical heterogeneities on flow and transport in the saturated alluvium of Fortymile Wash, Nevada: Southwest Research Institute, report prepared for American Water Works Association.

- Sun, A. Y., Ritzi, R., and Sims, D. W., 2006, Characterization and modeling of alluvium beneath Fortymile Wash, Nevada: Southwest Research Institute, report prepared for Nuclear Regulatory Commission.
- Colton, S., Sun, A. Y., Stamatakos, J., and Sims, D. W., 2006, Three-dimensional structural model of the Amargosa Desert, Nevada, Version 2.0: Southwest Research Institute, report prepared for Nuclear Regulatory Commission.
- Painter, S., and Sun, A. Y., 2005, Representation of an open repository in groundwater flow models: Southwest Research Institute, report prepared for Swedish Nuclear Fuel and Waste Management Co..
- Manepally, C., Sun, A. Y., Fedors, R., and Farrell, D., 2004, Drift-scale thermohydrologic process modeling: in-drift heat transfer and drift degradation: Southwest Research Institute, report prepared for Nuclear Regulatory Commission.

Thesis

A Closed-Form Solution to a Multi-Rate Solute Transport Model.

Dissertation

Stochastic Analysis of Mass Transport in Unsaturated Porous Media.

Lecturing

Workshops

Contaminant source identification under model uncertainty: presented at Reservoir Characterization Workshop, The University of Texas at Austin, Austin, Texas, March 2008.

Lectures and Addresses

Estimating regional groundwater model parameters using GRACE and in situ observations: invited talk presented at Fall Meeting of AGU, San Francisco, California, December 2010.

A collaborative geospatial decision support system for managing coastal river basin water quality: presented at Hydrologic Science Conference, San Diego, California, October 2010.

Uncertainty quantification and parameter estimation in hydrogeology: presented at The University of Texas at San Antonio Environmental Seminar Series, San Antonio, Texas, April 2010.

Uncertainty quantification in surface and subsurface hydrology: presented at The University of Texas at Arlington Civil and Environmental Engineering Seminar, Arlington, Texas, March 2010.

Development of an ensemble Kalman filter and its application in geoscience applications: presented at Environmental Engineering Fall Seminar Series, Texas A&M, Kingsville, Texas, October 2009.

Toward an integrated framework for contaminant source identification: presented at California State University, Los Angeles, California, August 2008.

Miscellaneous Activities of a Professional Nature

Instructor for a short course on statistical methods for environmental monitoring and sample analyses, U. S. Nuclear Regulatory Commission (2010)

Mentor for Jason Frels, student employee, BS, Geology, Trinity University, San Antonio (2009)

Teaching assistant for a graduate course in hydrogeology, UC Berkeley (1998)

Teaching assistant for an undergraduate hydrology class, UC Berkeley (1997)

Graduate Student Committee Participation

Member, Ph.D. Dissertation Committee, Tony Perez, The University of Texas at San Antonio, 2010

Member, Ph.D. Dissertation Committee, Juliana Leung, The University of Texas at Austin, Completed, 2009