

Alex Sun

Professional Summary

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Professional Preparation

Academic Background

Ph.D. Environmental Water Resources, University of California at Berkeley, May 2000

M.S. Civil and Environmental Engineering, University of California at Berkeley, May 1996

B.S. Civil and Environmental Engineering, University of California at Los Angeles, June 1995

Professional Appointments

Senior Research Scientist, The University of Texas at Austin, Bureau of Economic Geology (September 2017-Present)

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.

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.

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.

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.

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.

Lab Assistant, Environmental Research Lab, UCLA, Los Angeles, California (September 1993 - September 1994). Conducted experiments to test the performance of reverse-osmosis membranes.

Professional Registrations and Certificates

Engineer-in-Training (State of California)

Texas Board of Professional Engineers # 117339

Theses

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

Dissertations

Stochastic Analysis of Mass Transport in Unsaturated Porous Media

Areas of Expertise

Areas of Expertise

Application of Big Data and machine learning in geosciences

Development and application of high-performance numerical codes and data assimilation techniques for sustainable water resources management, reservoir characterization, and CO₂ sequestration

Development of decision support systems

Modeling of multiphase flow and multicomponent transport in porous media

Quantification of model uncertainty using Characterization of subsurface and surface water interactions through real-time monitoring and modeling

Quantification of model uncertainty using statistical and stochastic techniques

Awards

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

Service

External Committees Participation

Associate Editor, Water Resources Research, January 1, 2017-Present

Member, Editorial Board, Advances in Water Resources, July 1, 2016-Present

Session Convener, H44E Transforming Hydrologic Prediction and Decision Making: Intelligent Decision Making V, 2016 AGU Fall Meeting, San Francisco, Calif.

Teaching and Advising

Student Committee Supervision

Reader, Master's thesis committee, Behnaz Bolhassani, Model-based cost analysis for pressure and geochemical-based monitoring methods in CO₂-EOR fields: application to field A, The University of Texas at Austin, Austin, Tex., 2016

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

Presentations

Presentations

Novel Five-Day GRACE/GRACE-FO Satellite Solutions for Improved Flood Detection and Predictability, AGU23: presented to AGU, presented at AGU Annual Meeting, San Francisco, Calif., December 11-15, 2023.

Dependency of GRACE Total Water Storage Flood Detectability on Antecedent Soil Moisture Conditions: presented at AGU Fall Meeting, New Orleans, La., December 9-13, 2021.

Inferencing the GRACE/GRACE-Follow On Data Gap Using Bayesian Modeling: presented at AGU Fall Meeting, New Orleans, La., December 9-13, 2021.

Combining Physics-Based Modeling and Machine Learning for GRACE Satellite Data Fusion and Reconstruction: presented at American Geophysical Union meeting, December 1-17, 2020.

Global Analysis of Daily and Monthly GRACE Data for Flood Prediction: presented at American Geophysical Union meeting, online, December 1-17, 2020.

Preliminary Results from GRACE/GRACE-FO 5-Day Mascon Solutions from CSR: presented at American Geophysical Union meeting, virtual, December 1-17, 2020.

Reconstruction of GRACE Total Water Storage Through Automated Machine Learning (AutoML): presented at American Geophysical Union meeting, virtual, December 1-17, 2020.

Relative Impacts of Climate Extremes and Irrigation Water Use on Water Storage in Major Aquifers Based on GRACE Satellite Data: presented at American Geophysical Union meeting, virtual, December 1-17, 2020.

Assessing Impacts of Climate Extremes and Human Water Use on GRACE Total Water Storage Trends in Major US Aquifers.: presented at GRACE/GRACE-FO Science Team Meeting, virtual, October 26-29, 2020.

Reconstruction of GRACE Total Water Storage Through Automated Machine Learning: presented at GRACE/GRACE-FO Science Team Meeting, October 26-29, 2020.

Assessing Detectability of Global Flood Occurrences using Daily and Monthly GRACE/GRACE-FO: presented at GRACE/GRACE-FO Science Team Meeting 2020, virtual, October 2020.

Assessing the Reliability of GRACE-Derived Groundwater Storage Using Ground-Based Monitoring and Regional and Global Modeling in Major U.S. Aquifers: presented at American Geophysical Union meeting, San Francisco, Calif., December 9-13, 2019.

How Reliable is GRACE-Derived Groundwater Storage Changes?: presented to GRACE science team, presented at GRACE/GRACE-FO Science Team Meeting 2019, Pasadena, Calif., October 8-10, 2019.

Quantifying rainfall and soil moisture patterns using a network approach: presented at 2017 Texas Weather Conference, Austin, Tex., March 3-4, 2017.

Interpreting detailed brine chemistry changes during early periods of in-zone CO₂ storage at Cranfield site, Mississippi, USA: presented at Fall meeting of American Geophysical Union, San Francisco, December 14-19, 2015.

Development of a binational geospatial decision support system to protect water quality in the Lower Rio Grande: An innovative use of open source geographic information system software: presented to Texas GIS Forum, Austin, Texas, October 26-29, 2015.

Pressure-based inversion and data assimilation system for CO₂ leakage detection: presented to DOE/NETL, presented at National Energy Technology Laboratory Carbon Storage R&D Project Review Meeting, Pittsburgh, Pa., August 18-20, 2015.

Application of harmonic pulse testing for leakage detection in carbon storage formations: presented at American Geophysical Union Fall Meeting, San Francisco, California, December 15-19, 2014.

A frequency-domain diagnosis tool for early leakage detection at geologic carbon sequestration sites: presented at Greenhouse Gas Control Technologies (GHGT-12), Austin, Texas, October 5-9, 2014.

Streamflow forecasting: a data driven approach using Gaussian process regression: presented at the 6th International Workshop on Catchment Hydrological Modeling and Data Assimilation, Austin, Texas, September 8-12, 2014.

PIDAS: pressure-based inversion and data assimilation system for CO₂ leakage detection: presented to U.S. Department of Energy National Energy Technology Laboratory, presented at Carbon Storage R&D Project Review Meeting, Pittsburgh, Pennsylvania, August 12-14, 2014.

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.

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

Activities of a Professional Nature

Professional Societies

American Geophysical Union

National Ground Water Association

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)

Session Convener, Adopting Cloud Computing for Environmental Decision Support Systems, Fall Meeting of American Geophysical Union, San Francisco, CA

Session Convener, Uncertainty in Water Management: Quantification, Sensitivity Analysis and Experimental Design. Fall Meeting of American Geophysical Union, San Francisco, CA

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

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

Funding

Research Support

PI: GRACE-enhanced flood monitoring and forecasting, NASA (April 1, 2020-March 31, 2024).

UT PI: Exasheds, DOE-BER (October 1, 2020-September 30, 2023).

Co-PI: Integration of seismic-pressure-petrophysics inversion of continuous active-source seismic monitoring data for monitoring and quantifying CO₂ plume, DOE (October 1, 2019-June 30, 2022).

Principal Investigator: Development of a framework data integration, assimilation, and learning for geologic carbon sequestration projects, DOE-NETL (October 1, 2015-September 30, 2018).

Co-Investigator: Minimum data set requirement for leakage detection, Canada Petroleum Technology Research Centre (June 1, 2015-September 30, 2016).

Principal Investigator: Pressure-Based Inversion and Data Assimilation System (PIDAS) for CO₂ Leakage Detection, U.S. Department of Energy (October 1, 2013-September 30, 2016).

Principal Investigator: Development of a Computer-based Decision Support System for the Lower Rio Grande/Río Bravo Water Quality Initiative, Texas Commission on Environmental Quality (July 15, 2013-August 31, 2016).

PI: Development of Web-based decision support system for the Texas Source Water Assessment program, TCEQ.

Publications

Peer Reviewed Journal Articles

Lee, W., Sun, A. Y., Scanlon, B. R., and Dawson, C., 2024, Hindcasting compound pluvial, fluvial and coastal flooding during Hurricane Harvey (2017) using Delft3D-FM: Natural Hazards, v. 120, no. 1, p. 851-880, <http://doi.org/10.1007/s11069-023-06247-9>.

Lee, W., Sun, A. Y., Scanlon, B. R., and Dawson, C., 2024, Hindcasting compound pluvial, fluvial and coastal flooding during Hurricane Harvey (2017) using Delft3D-FM: Natural Hazards, v. 120, p. 851-880, <http://doi.org/10.1007/s11069-023-06247-9>.

Rateb, A., Save, H., Sun, A. Y., and Scanlon, B. R., 2024, Rapid mapping of global flood precursors and impacts using novel five-day GRACE solutions: Scientific Reports, v. 14, no. 13841, 15 p., <http://doi.org/10.1038/s41598-024-64491-w>.

Sun, A. Y., Save, H., Rateb, A., Jiang, P., and Scanlon, B. R., 2024, Deciphering the role of total water storage anomalies in mediating regional flooding: Geophysical Research Letters, v. 51, no. 16, article no. e2023GL108126, <http://doi.org/10.1029/2023GL108126>.

Zheng, S., Zhang, Z., Scanlon, B. R., Yan, H., Sun, A. Y., Rateb, A., and Li, Y., 2024, High spatial resolution in total water storage variations inferred from GPS: case study in the Great Lakes Watershed, US: Water Resources Research, v. 60, no. e2023WR035213, 17 p., <http://doi.org/10.1029/2023WR035213>.

Jiang, P., Shuai, P., Sun, A., Mudunuru, M. K., and Chen, X., 2023, Knowledge-informed deep learning for hydrological model calibration: an application to Coal Creek Watershed in Colorado:

Hydrology and Earth System Sciences, v. 27, no. 14, p. 2621-2644, <http://doi.org/10.5194/hess-27-2621-2023>.

Liu, M., Sun, A. Y., Lin, K., Luo, W., Tu, X., and Chen, X., 2023, Estimating dynamic non-water-limited canopy resistance over the globe: changes, contributors, and implications: Water Resources Research, v. 59, no. 9, article no. e2022WR034209, 21 p., <http://doi.org/10.1029/2022WR034209>.

Scanlon, B. R., Fakhreddine, S., Rateb, A., de Graaf, I., Famiglietti, J., Gleeson, T., Grafton, R. Q., Jobbagy, E., Kebede, S., Kolusu, S. R., Konikow, L. F., Long, D., Mekonnen, M., Schmied, H. M., Mukherjee, A., MacDonald, A., Reedy, R. C., Shamsudduha, M., Simmons, C. T., Sun, A., Taylor, R. G., Villholth, K. G., Vörösmarty, C. J., and Zheng, C., 2023, Global water resources and the role of groundwater in a resilient water future: Nature Reviews: Earth & Environment, v. 4, p. 87-101, <http://doi.org/10.1038/s43017-022-00378-6>.

Topp, S. N., Barclay, J., Diaz, J., Sun, A. Y., Jia, X., Lu, D., Sadler, J. M., and Appling, A. P., 2023, Stream temperature prediction in a shifting environment: explaining the influence of deep learning architecture: Water Resources Research, v. 59, no. 4, article no. e2022WR033880, 19 p., <http://doi.org/10.1029/2022WR033880>.

Kaur, H., Zhong, Z., Sun, A., and Fomel, S., 2022, Time-lapse seismic data inversion for estimating reservoir parameters using deep learning: Interpretation, v. 10, no. 1, p. T167-T179, <http://doi.org/10.1190/INT-2020-0205.1>.

Lin, L., Zhong, Z., Cai, Z., Sun, A. Y., and Li, C., 2022, Automatic geologic fault identification from seismic data using 2.5D channel attention U-net: Geophysics, v. 87, no. 4, p. IM111-IM124, <http://doi.org/10.1190/geo2021-0805.1>.

Rateb, A., Sun, A., Scanlon, B. R., Save, H., and Hasan, E., 2022, Reconstruction of GRACE mass change time series using a Bayesian framework: Earth and Space Science, v. 9, no. e2021EA002162, 13 p., <http://doi.org/10.1029/2021EA002162>.

Scanlon, B. R., Rateb, A., Anyamba, A., Kebede, S., MacDonald, A. M., Shamsudduha, M., Small, J., Sun, A., Taylor, R. G., and Xie, H., 2022, Linkages between GRACE water storage, hydrologic extremes, and climate teleconnections in major African aquifers: Environmental Research Letters, v. 17, no. 1, article no. 014046, 15 p., <http://doi.org/10.1088/1748-9326/ac3bfc>.

Sun, A. Y., Jiang, P., Yang, Z.-L., Xie, Y., and Chen, X., 2022, A graph neural network (GNN) approach to basin-scale river network learning: the role of physics-based connectivity and data fusion: Hydrology and Earth System Sciences, v. 26, no. 19, p. 5163-5184, <http://doi.org/10.5194/hess-26-5163-2022>.

Liu, M., Xu, X., Scanlon, B. R., Sun, A. Y., and Wang, K., 2021, A modified evaporation model indicates that the effects of air warming on global drying trends have been overestimated: Journal of Geophysical Research: Atmospheres, v. 126, no. e2021JD035153, 17 p., <http://doi.org/10.1029/2021JD035153>.

Scanlon, B. R., Rateb, A., Pool, D. R., Sanford, W., Save, H., Sun, A., Long, D., and Fuchs, B., 2021, Effects of climate and irrigation on GRACE-based estimates of water storage changes in major US aquifers: Environmental Research Letters, v. 16, no. 9, 14 p., <http://doi.org/10.1088/1748-9326/ac16ff>.

Sun, A. Y., Jiang, P., Mudunuru, M. K., and Chen, X., 2021, Explore spatio-temporal learning of large sample hydrology using graph neural networks: Water Resources Research, v. 57, no. e2021WR030394, 23 p., <http://doi.org/10.1029/2021WR030394>.

Sun, A. Y., Scanlon, B. R., Save, H., and Rateb, A., 2021, Reconstruction of GRACE total water storage through automated machine learning: Water Resources Research, v. 57, no. 2, article no. e2020WR028666, 20 p., <http://doi.org/10.1029/2020WR028666>.

Zhang, Y., Zhou, D., Wei, W., Frame, J. M., Sun, H., Sun, A. Y., and Chen, X., 2021, Hierarchical fractional advection-dispersion equation (FADE) to quantify anomalous transport in river corridor over a broad spectrum of scales: theory and applications: *Mathematics*, v. 9, no. 7, article no. 790, 15 p., <http://doi.org/10.3390/math9070790>.

Zhong, Z., Sun, A. Y., Ren, B., and Wang, Y., 2021, A deep-learning-based approach for reservoir production forecast under uncertainty: *Society of Petroleum Engineers Journal*, v. 26, no. 3, p. 1314-1340, <http://doi.org/10.2118/205000-PA>.

Jeong, H., Sun, A. Y., Jeon, J., Min, B., and Jeong, D., 2020, Efficient Ensemble-Based Stochastic Gradient Methods for Optimization Under Geological Uncertainty: *Frontiers in Earth Science*, v. 8, no. 108, 14 p., <http://doi.org/10.3389/feart.2020.00108>.

Liu, M., and Sun, A. Y., 2020, A physical agricultural drought index based on root zone water availability: model development and application: *Geophysical Research Letters*, v. 47, no. e2020GL088553, 11 p., <http://doi.org/10.1029/2020GL088553>.

Pierre, J. P., Andrews, J. R., Young, M. H., Sun, A. Y., and Wolaver, B. D., 2020, Projected landscape impacts from oil and gas development scenarios in the Permian Basin, USA: *Environmental Management*, v. 66, no. 3, p. 348-363, <http://doi.org/10.1007/s00267-020-01308-2>.

Rateb, A., Scanlon, B. R., Pool, D. R., Sun, A., Zhang, Z., Chen, J., Clark, B., Faunt, C. C., Haugh, C. J., Hill, M., and nine others, 2020, Comparison of groundwater storage changes from GRACE satellites with monitoring and modeling of major U.S. aquifers: *Water Resources Research*, v. 56, no. 12, article no. e2020WR027556, 19 p., <http://doi.org/10.1029/2020WR027556>.

Sinha, S., Pires de Lima, R., Lin, Y., Sun, A. Y., Symons, N., Pawar, R., and Guthrie, G., 2020, Normal or abnormal? Machine learning for the leakage detection in carbon sequestration projects using pressure field data: *International Journal of Greenhouse Gas Control*, v. 103, no. 103189, 12 p., <http://doi.org/10.1016/j.ijggc.2020.103189>.

Sun, A. Y., 2020, Optimal carbon storage reservoir management through deep reinforcement learning: *Applied Energy*, v. 278, no. 115660, 15 p., <http://doi.org/10.1016/j.apenergy.2020.115660>.

Sun, A. Y., and Tang, G., 2020, Downscaling satellite and reanalysis precipitation products using attention-based deep convolutional neural nets: *Frontiers in Water*, v. 2, no. 536743, 22 p., <http://doi.org/10.3389/frwa.2020.536743>.

Zhong, Z., Sun, A. Y., and Wu, X., 2020, Inversion of time-lapse seismic reservoir monitoring data using CycleGAN: a deep learning-based approach for estimating dynamic reservoir property changes: *Journal of Geophysical Research: Solid Earth*, v. 125, no. e2019JB018408, 27 p., <http://doi.org/10.1029/2019JB018408>.

Zhong, Z., Sun, A. Y., Wang, Y., and Ren, B., 2020, Predicting field production rates for waterflooding using a machine learning-based proxy model: *Journal of Petroleum Science and Engineering*, v. 194, no. 107574, 14 p., <http://doi.org/10.1016/j.petrol.2020.107574>.

Lashgari, H. R., Sun, A. Y., Zhang, T., Pope, G. A., and Lake, L. W., 2019, Evaluation of carbon dioxide storage and miscible gas EOR in shale oil reservoirs: *Fuel*, v. 241, p. 1223-1235, <http://doi.org/10.1016/j.fuel.2018.11.076>.

Scanlon, B. R., Zhang, Z., Rateb, A., Sun, A. Y., Wiese, D., Save, H., Beaudoin, H., Lo, M. H., Muller-Schmied, H., Doll, P., van Beek, R., Swenson, S., Lawrence, D., Croteau, M., and Reedy, R. C., 2019, Tracking seasonal fluctuations in land water storage using global models and GRACE satellites: *Geophysical Research Letters*, v. 46, p. 5254-5264, <http://doi.org/10.1029/2018GL081836>.

Sun, A. Y., and Scanlon, B. R., 2019, How can Big Data and machine learning benefit

environment and water management: a survey of methods, applications, and future directions: *Environmental Research Letters*, v. 14, no. 7, article no. 073001, 28 p., <http://doi.org/10.1088/1748-9326/ab1b7d>.

Sun, A. Y., Scanlon, B. R., Zhang, Z., Walling, D., Bhanja, S. N., Mukherjee, A., and Zhong, Z., 2019, Combining physically-based modeling and deep learning for fusing GRACE satellite data: can we learn from mismatch?: *Water Resources Research*, v. 55, p. 1179-1195, <http://doi.org/10.1029/2018WR023333>.

Sun, A. Y., Zhong, Z., Jeong, H., and Yang, Q., 2019, Building complex event processing capability for intelligent environmental monitoring: *Environmental Modelling & Software*, v. 116, p. 1-6, <http://doi.org/10.1016/j.envsoft.2019.02.015>.

Zhong, Z., Sun, A. Y., and Jeong, H., 2019, Predicting CO₂ plume migration in heterogeneous formations using conditional deep convolutional generative adversarial network: *Water Resources Research*, v. 55, no. 7, p. 5830--5851, <http://doi.org/10.1029/2018WR024592>.

Zhong, Z., Sun, A. Y., Yang, Q., and Ouyang, Q., 2019, A deep learning approach to anomaly detection in geological carbon sequestration sites using pressure measurements: *Journal of Hydrology*, v. 573, p. 885-894, <http://doi.org/10.1016/j.jhydrol.2019.04.015>.

Jeong, H., Sun, A. Y., and Zhang, X., 2018, Cost-optimal design of pressure-based monitoring networks for carbon sequestration projects, with consideration of geological uncertainty: *International Journal of Greenhouse Gas Control*, v. 71, p. 278-292, <http://doi.org/10.1016/j.ijggc.2018.02.014>.

Jeong, H., Sun, A. Y., Lee, J., and Min, B., 2018, A learning-based data-driven forecast approach for predicting future reservoir performance: *Advances in Water Resources*, v. 118, p. 95-109, <http://doi.org/10.1016/j.advwatres.2018.05.015>.

Liu, M., Xu, X., and Sun, A. Y., 2018, New drought index indicates that land surface changes might have enhanced drying tendencies over the Loess Plateau: *Ecological Indicators*, v. 89, p. 716-724, <http://doi.org/10.1016/j.ecolind.2018.02.003>.

Liu, M., Xu, X., Sun, A. Y., Luo, W., and Wang, K., 2018, Why do karst catchments exhibit higher sensitivity to climate change? Evidence from a modified Budyko model: *Advances in Water Resources*, v. 122, p. 238-250, <http://doi.org/10.1016/j.advwatres.2018.10.013>.

Min, B., Sun, A. Y., Wheeler, M. F., and Jeong, H., 2018, Utilization of multiobjective optimization for pulse testing dataset from a CO₂-EOR/sequestration field: *Journal of Petroleum Science and Engineering*, v. 170, p. 244-266, <http://doi.org/10.1016/j.petrol.2018.06.035>.

Scanlon, B. R., Zhang, Z., Save, H., Sun, A. Y., Mueller Schmied, H., van Beek, L. P. H., Wiese, D. N., Wada, Y., Long, D., Reedy, R. C., Longuevergne, L., Doell, P., and Bierkens, M. F. P., 2018, Global models underestimate large decadal declining and rising water storage trends relative to GRACE satellite data: *Proceedings of the National Academy of Sciences*, v. 115, no. 6, p. E1080-E1089, <http://doi.org/10.1073/pnas.1704665115>.

Sun, A. Y., 2018, Discovering state-parameter mappings in subsurface models using generative adversarial networks: *Geophysical Research Letters*, v. 45, p. 11,137-11,146, <http://doi.org/10.1029/2018GL080404>.

Sun, A. Y., Jeong, H., Gonzalez-Nicolas, A., and Templeton, T. C., 2018, Metamodeling-based approach for risk assessment and cost estimation: application to geological carbon sequestration planning: *Computers and Geosciences*, v. 113, p. 70-80, <http://doi.org/10.1016/j.cageo.2018.01.006>.

Sun, A. Y., Xia, Y., Caldwell, T., and Hao, Z., 2018, Patterns of precipitation and soil moisture extremes in Texas, US: a complex network analysis: *Advances in Water Resources*, v. 112, p. 203-213, <http://doi.org/10.1016/j.advwatres.2017.12.019>.

Islam, A., and Sun, A. Y., 2017, A theory-based simple extension of Peng-Robinson equation of

state for nanopore confined fluids: *Journal of Petroleum Exploration and Production Technology*, v. 7, no. 4, p. 1197-1203, <http://doi.org/10.1007/s13202-016-0306-y>.

Islam, A., and Sun, A. Y., 2017, Detecting CO₂ leakage around the wellbore by monitoring temperature profiles: a scoping analysis: *International Journal of Thermal Sciences*, v. 118, p. 367-373, <http://doi.org/10.1016/j.ijthermalsci.2017.04.030>.

Liu, M. X., Xu, X. L., Xu, C. H., Sun, A. Y., Wang, K. L., Scanlon, B. R., and Zhang, L., 2017, A new drought index that considers the joint effects of climate and land surface change: *Water Resources Research*, v. 53, no. 3262-3278, p. 3262-3278, <http://doi.org/10.1002/2016WR020178>.

Soltanian, M. R., Sun, A. Y., and Dai, Z., 2017, Reactive transport in the complex heterogeneous alluvial aquifer of Fortymile Wash, Nevada: *Chemosphere*, v. 179, p. 379-386, <http://doi.org/10.1016/j.chemosphere.2017.03.136>.

Sun, A. Y., Lu, J., and Islam, A., 2017, A laboratory validation study of the time-lapse oscillatory pumping test for leakage detection in geological repositories: *Journal of Hydrology*, v. 548, p. 598-604, <http://doi.org/10.1016/j.jhydrol.2017.03.035>.

Sun, A. Y., Scanlon, B. R., AghaKouchak, A., and Zhang, Z., 2017, Using GRACE satellite gravimetry for assessing large-scale hydrologic extremes: *Remote Sensing*, v. 9, no. 1287, 25 p., <http://doi.org/10.3390/rs9121287>.

Sun, A. Y., Wheeler, M. F., and Islam, A., 2017, Identifying attributes of CO₂ leakage zones in shallow aquifers using a parametric level set method: *Greenhouse Gases: Science and Technology*, v. 7, no. 4, p. 649-664, <http://doi.org/10.1002/ghg.1665>.

Tang, Y., Hooshyar, M., Zhu, T., Ringler, C., Sun, A. Y., Long, D., and Wang, D., 2017, Reconstructing annual groundwater storage changes in a large-scale irrigation region using GRACE data and Budyko model: *Journal of Hydrology*, v. 551, p. 397-406, <http://doi.org/10.1016/j.jhydrol.2017.06.021>.

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