

Lele Shu

PhD of Water Resources Engineering
Minor: Computational Science

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About Me I am a postdoctoral researcher in Department of Land, Air and Water Resources, University of California, Davis. My research interest is in computational hydrologic model, hydrologic data mining, and integrated Coupled Nature-Human System modeling.

Research Interests

Hydrological response under stress of climate and landuse change from watershed to continental scale.

Advance data mining and statistical downscaling modeling in hydrology.

Spatial heterogeneity and homogeneity in runoff, evaporation, subsurface fluxes and in their sensitivity to their controls (e.g. snow fall regime, aridity, reaction coefficients).

High-performance/parallel computing in hydrologic models.

Coupled Nature-Human watershed modeling.

Professional Preparation

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|---|--------------------------------------|------------|
| Pennsylvania State University | Water Resource Engineering | Ph.D. 2017 |
| | Computational Science (minor degree) | |
| University of Chinese Academy of Sciences | Remote Sensing | M.S. 2009 |
| Lanzhou University (Lanzhou, China) | Geography Information System | B.S. 2005 |

Appointments

2017 - Present Postdoctoral Researcher University of California, Davis (Davis, CA)

Hydrologic modeling on water availability (groundwater and snowpack) in the Central Valley in California history and future.

SHUD Model. *Integrated hydrological modeling, parallel computing, lake modeling, calibration.* (<https://www.shud.xyz>)

R package (rSHUD), for GIS data process, sensitivity and hydrologic analysis. (<https://github.com/SHUD-System/rSHUD>)

2012 - 2017 Research Assistant Pennsylvania State University (University Park, PA)

Development of Penn State Integrated Hydrologic Model (PIHM)

Development of Cellular Automation Landuse Change Model (CALUC) – Top-down Cellular landuse change model

Hydrologic analysis tool (R and Matlab) – Read, write, parameterize, analysis (time series, spatial and uncertainty analysis) and visualize (plot, 3D/3D and animation).

Talks and Posters

2019.12, Quick and reproducible automated watershed modeling with the SHUD: Essential data, simulation, applications and visualization, AGU, San Francisco, California, USA

2018.12 Model simulated spatial distribution and the variation of ground water level in Sacramento Watershed, California from 1985 to 2017, AGU, Washington, DC, USA

2018.04 Groundwater and Snow Storage Simulation with PIHM, California Water & Environmental Modeling Forum, Sacramento, California, USA

2017.12 Coupling Cellular Automata Land Use Change with Distributed Hydrologic models, AGU, New Orleans, Louisiana, USA

2015.12 Catchment hydrological change from soil degradation — A model study for assessing urbanization on the terrestrial water cycle AGU, San Francisco, California, USA

2014.12 Reconstructing the role of land use change on water yield at the Maya urban center Tikal, Guatemala [700-800 AD], AGU, San Francisco, California, USA

2013.12 Center for Green Infrastructure and Stormwater Management: Urbanization-driven hydrological process change in Lancaster of Pennsylvania, AGU, San Francisco, California, USA

Publications

Shu, L., Ullrich, P. A., and Duffy, C. J.: Simulator for Hydrologic Unstructured Domains (SHUD v1.0): numerical modeling of watershed hydrology with the finite volume method, *Geosci. Model Dev.*, 13, 2743–2762, <https://doi.org/10.5194/gmd-13-2743-2020>, 2020.

Garijo, D., Khider, D., Ratnakar, V., Gil, Y., ..., Shu, L., ... et al. (2019). An Intelligent Interface for Integrating Climate, Hydrology, Agriculture, and Socioeconomic Models. In *Proceedings of the 24th International Conference on Intelligent User Interfaces: Companion* (pp. 111–112). New York, NY, USA: Association for Computing Machinery. <https://doi.org/10.1145/3308557.3308711>

Yu, X., Lamačová, A., Shu, L., Duffy, C., Krám, P., Hruška, J., ... Lin, K. (2019). Data rescue in manuscripts: a hydrological modelling study example. *Hydrological Sciences Journal*, 1–7. <https://doi.org/10.1080/02626667.2019.1614593>

Ward, N. K., Fitchett, L., Hart, J. A., Shu, L., Stachelek, J., Weng, W., ... Weathers, K. C. (2019). Integrating fast and slow processes is essential for simulating human–freshwater interactions. *Ambio*, 48(10), 1169–1182. <https://doi.org/10.1007/s13280-018-1136-6>

Cobourn, K. M., Carey, C. C., Boyle, K. J., Duffy, C., Dugan, H. A., Farrell, K. J., Shu, L., ... Zhang, Y. (2018). From concept to practice to policy: modeling coupled natural and human systems in lake catchments. *Ecosphere*, 9(5), e02209. <https://doi.org/10.1002/ecs2.2209>

Shu, L., Nan, Z. (2010). A novel system for near real-time field observation based on Twitter-like services and GSM/SMS network. *Journal of Glaciology and Geocryology* [J], 32(5).

Nan, Z., Shu, L., Zhao, Y., Li, X., & Ding, Y. (2011). Integrated modeling environment and a preliminary application on the Heihe River Basin, China. *Science China Technological Sciences*, 54(8), 2145–2156.

Feng, K., Nan, Z., Shu, L., Zhao, Y. (2008) Prototype Development for an Integrated Modeling Environment Based on Plugins. *Remote Sensing Technology and Application*. 23(5).

Non peer-reviewed

Shu, L., & Xu, Z. (2020). China's different shades of greening. **Nature**, 577(7788), 29–29. <https://doi.org/10.1038/d41586-019-03940-3>

Shu, L. Careless virus names stoke sinophobia. **Nature** 578, 363 (2020). <https://doi.org/10.1038/d41586-020-00458-x>

Journal Review

Environmental Modeling and Software

Journal of Geophysical Research - Atmospheres

Under Review

- Shu, L., Ullrich, P., Duffy, C.. rSHUD v1.0: an R package to support Unstructured Domain Modeling in hydrology. Geoscientific Model Development.
- Zhang, B., Yuan, Y., Shu, L., Grosholz, E., Guo, Y., Zhai, L., Hastings, A., Cuda, J., Qiu, J.. Scaling up from plant stress response in greenhouse to landscape scale suitability for the distribution of an invasive species, Ecology.
- X. Yu, Z. Xu, D. Moraetis, N. Nikolaidis, Shu, L., et al. Coupled surface-subsurface modeling of fresh submarine groundwater discharge of an island in the Mediterranean Sea. Journal of Hydrology.
- Ladwig, R., Hanson P., Dugan H., Carey C., Zhang Y., Shu, L, Duffy C., Cobourn, K.. Disentangling the drivers of inter-annual variability in summer hypolimnetic anoxia in a eutrophic lake. Environmental Modelling & Software.
- Gil, Y., Garijo, D., Khider, D., ..., Shu, L.. Taming the Complexity of Expert Models to Improve Decision Making, ACM Transactions on Interactive Intelligent Systems.
- Shu, L., Ullrich, P., Duffy, C.. Quick automated watershed modeling with the Simulator for Hydrologic Unstructured Domains (SHUD): Essential data, simulation, applications and visualization
- Shu, L., Duffy, C.. Land, water & change: A case study in the Conestoga watershed PA.
- Shu, L., Duffy, C., French, K., Martha T. D.. Land, water & change at Tikal: Modeling an Ancient Urban Watershed from Empirical Data
- Shu, L., Duffy, C., Garijo, D., Khider, D., Gil, Y., Automation of Physics-Based, Distributed Hydrologic Models in Developing Countries: From Qualitative Data to Quantitative Decision Making
- Khandelwal, A., Shu, L., Duffy C., Kumar, V.. Calibration of Physics-Based Hydrologic Models From Remote Sensing
- Shu, L., Duffy, C., Hydroclimatic Evaluation of Intervention Infrastructure in Developing Countries
- Shu, L., Duffy, C., Khandelwal, A., Kumar, V.. Meta-models as support for distributed modeling in ungauged catchments

Research Projects

2019 Knowledge-Guided Machine Learning: A Framework to Accelerate Scientific Discovery

2018 Model Integration through Knowledge-Rich Data and Process Composition

2017 An Integrated Evaluation of the Simulated Hydroclimate System of the Continental US

2017 Advanced Statistical-Dynamical Downscaling Methods and Products for California Electrical System Climate Planning

2015 CNH-L: Linking Landuse Decision Making, Water Quality, and Lake Associations to Understand Human-Natural Feedbacks in Lake Catchments

2013 Land, Water, and Territory: A 3,000-Year Study of Niche Construction and Cultural Evolution in the Tikal National Park, Guatemala

2012 NSF Hydrologic and Water Quality Modeling for Green Infrastructure

2008 Simultaneous Remote Sensing and Ground-based Experiment in the Heihe River Basin: Scientific Objectives and Experiment Design

2008 Heihe Watershed Allied Telemetry Experimental Research (HiWATER)

2006 Land and Water Resources in Heihe River Basin Decision Support System for Sustainable Development Based on Scientific Models and Three-dimensional Gaming Experience

2006 GIS-based Hydrology and Water Resources Integrated Modeling Environment Research in Heihe River Basin

Courses Prepared To Teach

Numerical methods in geosciences

Geographic Information System

Data Mining in R

Data structure and algorithm

Advance C/C++ programming