Lele Shu

PhD of Water Resources Engineering and Computational Science

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About Me Dr. Shu is an associate professor at Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences (NIEER, CAS). His major interests are computational hydrologic model, coupled Atmosphere-Landsurface-Hydrology modeling and hydrologic data mining.

Research Interests

Numerical methods on geosciences

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

Advance deep learning 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 system modeling.

Professional Preparation

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

Appointments

2020 - Present	Associate Professor	Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences
2017 - 2020	Postdoctoral Researcher	University of California, Davis (Davis, CA)
2012 - 2017	Research Assistant	Pennsylvania State University (University Park, PA)

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 (2020), Geosci. Model Dev., 13, 2743–2762, https://doi.org/10.5194/gmd-13-2743-2020

Zhang, B., Yuan, Y., **Shu, L.**, Grosholz, E., Guo, Y., Hastings, A., Cuda, J.P., Zhang, J., Zhai, L. and Qiu, J. (2021), Scaling up experimental stress responses of grass invasion to predictions of continental-level range suitability. Ecology. 2021. https://doi.org/10.1002/ecy.3417.

Yu, X., Xu, Z., Moraetis D., Nikolaidis N., Schwartz F., Zhang Y., **Shu L.**, Duffy C., Liu B., Capturing hotspots of fresh submarine groundwater discharge using a coupled surface–subsurface model. Journal of Hydrology. 598, 2021, https://doi.org/10.1016/j.jhydrol.2021.126356

Ladwig, R., Hanson P., Dugan H., Carey C., Zhang Y., **Shu, L**, Duffy C., Cobourn, K.(2020). Disentangling the drivers of inter-annual variability in summer hypolimnetic anoxia in a eutrophic lake. Hydrology and Earth System Sciences. https://doi.org/10.5194/hess-2020-349

Duan, S., Ullrich, P., **Shu, L**.(2020). Using Convolutional Neural Networks for Streamflow Projection in California. Frontiers in Water. https://10.3389/frwa.2020.00028

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.

Non peer-reviewed

Shu, L., & Xu, Z. (2020). China's different shades of greening. **Nature**, 577(7788), 29–29.

Shu, L. Careless virus names stoke sinophobia. **Nature** 578, 363 (2020).

Publishing

- Shu, L., Ullrich, P., Duffy, C.. rSHUD v1.0: an R package to support Unstructured Domain Modeling in hydrology. Geoscientific Model Development.
- Gil, Y., Garijo, D., Khider, D., …, Shu, L.. Artificial Intelligence for Modeling Complex Systems: 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

Journal Review

Environmental Modeling and Software

Journal of Geophysical Research - Atmospheres

Journal of Advances in Modeling Earth Systems

Elementa: Science of the Anthropocene

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