Jicai Zeng

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Education

1/2019-present: University of Arizona, Postdoc Subsurface Flow Physics.

9/2014 - 11/2018: Wuhan University, Ph.D. Subsurface Hydrology.

9/2012 - 6/2014: Wuhan University, M.S. Agricultural Subsurface Hydrology.

9/2008 - 6/2012: Wuhan University, B.S. in Water Resource & Hydrological Engineering.

Research Interests

- Flow and transport in porous media.

- Soil remediation.

- Numerical modeling.

- Subsurface hydrology.

Research Experiences

❖ **1/2019- Present: Postdoctoral Research Associate, University of Arizona**

- Development and application of compositional two-phase flow modeling coupled with geomechanics in fractured subsurface porous media.

- Development and application of a column-scale soil-water flow and surfactant transport model.

- Successfully assisted with funding applications from NSF, DoD, and local government.

❖ **7/2014-10/2018: Research Assistant Ph.D, Wuhan University**

- Developed a novel method for multi-scale simulation of the soil-water and groundwater flow processes.

- Performed numerical modeling of solute transport in a semi-arid agricultural basin.

- Developed high-efficiency numerical approaches for flow and mass transfer in the subsurface.

❖ **9/2012-6/2014: Research Assistant, M.S, Wuhan University**

- Modeled the basin-scale groundwater recharge influenced by human activity & climate change using a distributed hydrological model for water balance in the shallow critical zone.

- Conducted a 4-year field tracer experiment to study the impacts of crop evapotranspiration and irrigation on the groundwater recharge.

- Proficiency in operating experimental instruments for monitoring the soil physical properties, such as oven dryer, hydro-extractor (centrifuge), TDR, GPR, and etc.

Skills

- Sufficient training in programming skills (FORTRAN, R, C++, MATLAB, and etc.).
- Successful implementation of MRST for object-oriented coding for multi-component, multi-phase flow and mass transport.
- Experience with developing and maintaining large codes, such as INFIL3.0, HYDRUS, MODFLOW, MT3D, WOFOST, SUTRA, SWMS2D/3D, SWAP, SWAT, and etc.
- Skilled coding with numerical methods.
- Familiar with the Python-based toolkit development based on ArcGIS interface; skilled with the GIS-based & RS-based modeling in the subsurface.
- Skilled graphic design software including R, SketchUp, AutoCAD, Photoshop, Tecplot, Surfer, OriginPro, CorelDraw, Adobe Dimension, and etc.
- Good knowledge working on PFLOTRAN reactive transport model.

Software/Codes Developed

➢ **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang, Liangsheng Shi. 2019. MT-HT v1: A new HYDRUS package for MT3D and MODFLOW for large-scale groundwater and solute transport modeling. Wuhan University: China.

➢ **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang, Liangsheng Shi. 2018. MH v1: A new HYDRUS package for MODFLOW based on multi-scale two-way feedback coupling. Wuhan University: China.

➢ **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang, Liangsheng Shi. 2018. M(H)~MH v1: Multi-scale unsaturated-saturated flow model for large-scale simulations based on MODFLOW-2005 and a new HYDRUS package. Wuhan University: China.

➢ **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang. 2018. HYDRUSwitch: A new HYDRUS package based on switching the Richards' equation. Wuhan University: China.

➢ **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang, Liangsheng Shi. 2017. M~M v1: A generalized one-way coupling model for multi-scale groundwater simulation based on MODFLOW. Wuhan University: China.

➢ Wenzhi Zeng, **Jicai Zeng**, Yuanyuan Zha. 2016. HYDROFOST v1: A coupled model for soil-water flow and crop-growth modeling based on HYDRUS and WOFOST. University of Bonn, Germany.

Selected Publications

1. **Jicai Zeng**, Bo Guo (2021), Multidimensional modeling of PFAS transport in the vadose zone: impact of surfactant-induced flow and soil heterogeneities, Submitted to Advances in Water Resources.

2. **Jicai Zeng**, Mark L. Brusseau, Bo Guo (2021), Modeling the long-term retention of PFAS in the vadose zone, Science of the Total Environment, in revision.

3. Ian White, Tingbao Xu, **Jicai Zeng**, Jian Yu, Xin Ma, Jinzhong Yang, Zailin Huo, Hang Chen (2020), Changing climate and implications for water use in the Hetao Basin, Yellow River, China, Proceedings of the International Association of Hydrological Sciences. https://doi.org/10.5194/piahs-383-51-2020.

4. Bo Guo, **Jicai Zeng**, Mark L. Brusseau (2020), A Mathematical Model for the Release, Transport, and Retention of Per- and Polyfluoroalkyl Substances (PFAS) in the Vadose Zone, **Water Resources Research**, https://doi.org/10.1029/2019WR026667.

5. Yuanyuan Zha, Jinzhong Yang, **Jicai Zeng**, Chak-Hau M. Tso, Wenzhi Zeng, Liangsheng Shi (2019), Review of numerical solution of Richardson–Richards equation for variably saturated flow in soils, **WIREs Water**, https://doi.org/10.1002/wat2.1364.

6. **Jicai Zeng**, Jinzhong Yang, Yuanyuan Zha, Liangsheng Shi (2019), Capturing soil-water and groundwater interactions with an iterative feedback coupling scheme: New HYDRUS package for MODFLOW. **Hydrology and Earth System Sciences**, https://doi.org/10.5194/hess-2018-365.

7. **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang (2018), Switching the Richards' equation for modeling soil water movement under unfavorable conditions, **Journal of Hydrology**, 563C p942-949. https://doi.org/10.1016/j.jhydrol.2018.06.069.

8. **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang (2018), Numerical modeling of soil water flow and solute transport based on Richards' equation switching, **Journal of Hydraulic Engineering**, https://doi.org/10.13243/j.cnki.slxb.20180288.

9. **Jicai Zeng**, Yuanyuan Zha, Yonggen Zhang, Liangsheng Shi, Yan Zhu, Jinzhong Yang (2017), On the sub-model errors of a generalized one-way coupling scheme for linking models at different scales, **Advances in Water Resources**, 109C p69-83. https://doi.org/10.1016/j.advwatres.2017.09.005.

10. **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang (2017), Multi-scale simulation of the local-scale complex flow processes in a large-scale groundwater system, **Journal of Hydraulic Engineering**. https://doi.org/10.13243/j.cnki.slxb.20161167.

11. Xueling Yang, **Jicai Zeng**, Wei Mao, Guanfang Sun, Yuxue Zhang, Jinzhong Yang (2017), Estimating the root-zone salt leaching amount with the applied tracer experiment in Hetao Irrigation District, **Journal of Irrigation and Drainage**. https://doi.org/10.13522/j.cnki.ggps.2017.0415 (In Chinese with English abstract)

12. Xiaolong Hu, Liangsheng Shi, **Jicai Zeng**, Jinzhong Yang, Yuanyuan Zha, Yunjun Yao, Guoliang Cao (2016), Estimation of actual irrigation amount and its impact on groundwater depletion: A case study in the Hebei Plain, China, **Journal of Hydrology**, 543B, p433-449, https://doi.org/10.1016/j.jhydrol.2016.10.020.

13. Ge Song, **Jicai Zeng**, Yan Wang, Jinzhong Yang (2013), Estimation of winter wheat water requirement based on NDVI in the North China Plain, **Journal of Irrigation and Drainage,** 33(6): 1-5, https://doi.org/10.13522/j.cnki.ggps.2014.06.001. (In Chinese with English Abstract).

Presentation on Conference

1. **Jicai Zeng**, Bo Guo, Mark L. Brusseau, Modeling the long-term retention of PFAS in the vadose zone, AGU fall meeting: Dec. 2020 (**Oral Presentation**)

2. **Jicai Zeng**, Jiamin Jiang, Bo Guo, Modeling the fate of hydraulic fracturing fluids and injection of CO2 in shale formations: Coupling geomechanics and two-phase flow in fractured media, AGU fall meeting: Dec. 2019 (**Poster**)

3. **Jicai Zeng**, Jiamin Jiang, Bo Guo, Coupled flow and geomechanical modeling framework for hydrocarbon recovery and CO_2 injection in fractured shale formations, GSA 2019, Phoenix. **(Oral Presentation)**

4. **Jicai Zeng**, Ian White, Yuanyuan Zha, Liangsheng Shi, Jinzhong Yang, Parsimonious choice making for a large-scale, complex subsurface flow and solute transport system. AGU fall meeting: Washington DC, Dec. 2018. (**Poster)**

5. Ian White, **Jicai Zeng**, Jian Yu, Jinzhong Yang, Salinity Accumulation in Groundwater, Hetao Basin, Yellow River, Inner Mongolia, 45th IAH Congress in Daejeon, Korea 9-14, Sep. 2018. **(Poster, Corresponding Author)**

6. Ian White, **Jicai Zeng**, Jinzhong Yang, Jian Yu, Xin Ma, Challenges to water security Hetao Irrigation District, Yellow River, Inner Mongolia, UNESCO-JASTIP Joint Symposium Manila 15-16, Nov. 2017. **(Poster)**

7. **Jicai Zeng**, Yuanyuan Zha, Jinzhong Yang, Multi-scale modeling of the unsaturated-saturated flow in a shallow aquifer system, ECCOMAS: Computational Modeling of Multi-Uncertainty and Multi-Scale Problems, Porto, Portugal, 2017. **(Oral Presentation)**

Awards

❖ "**Young Researchers Award**" certified by the European Community on Computational Methods in Applied Sciences (ECCOMAS): Thematic Conference, Portugal, Sep. 2017.

❖ **Scholarship of Innovation** in Wuhan University, 2018 and 2019.

Academic Services

❖ Manuscript reviewer
   - Journal of Hydrology
   - Water Resources Research
   - Transport in Porous Media
   - Vadose Zone Journal

Contact Information of Referees

❖ **Prof. Dr. Ian White FTSE**

Emeritus Professor Water Resources, Australian National University

Fenner School of Environment & Society,

Fenner Building 141, Canberra ACT 0200, Australia

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❖ **Prof. Dr. Jinzhong Yang**

Professor in Groundwater Resources and Environment

Department of Water Resources and Hydropower Engineering, Wuhan University

State Key Laboratory of Water Resources and Hydropower Engineering Sciences, Wuhan University, Wuhan, Hubei Province, China

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❖ **Dr. Bo Guo**

Assistant Professor Subsurface Hydrology

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Dear Dr. Painter,

I am writing to apply for the postdoctoral research associate position for Surface/Subsurface Reactive Transport Modeling. I am excited to see this opportunity because I have been planning for a new stage working on large-scale modeling of flow and reactive transport. According to my research experience and continuous training process, I believe that I am qualified for this position. And I am happy to get any chance to work with you soon. The following are my respondence to the requisition and responsibility of this position.

1. Duties and responsibilities:
   - I have a two-year experience working on watershed distributed hydrological model for water movement and this experience can be extended to biogeochemistry modeling. The model is related to the surface runoff, atmospheric boundaries, hydrobiological processes, water infiltration, and deep percolation. I applied this model to study the impact of human activities and climate change on the groundwater depletion in a semi-arid basin.
   - I work on HPC to do large-scale modeling, especially for flow and transport in the subsurface, which includes the PFLOTRAN model, and our own MATLAB and FORTRAN codes.
   - I am proficient with data analysis and visualization.

2. Basic qualifications:
   - I have received my PhD in subsurface hydrology in Dec 2018. My PhD research is on the large-scale numerical modeling of flow and mass transport. Up to now, I have been continuously working in this field for another 2 more years as a postdoctoral research associate in the University of Arizona.

3. Preferred qualifications:
   - Good experience developing models with C++ and FORTRAN 95, and other programming languages.
   - My master's research is closely based on a watershed distributed hydrological model, which helps me have good understanding of watershed hydrology.
   - My recent work is about reactive transport modeling regarding some urgent contaminants.
   - I work independently and collaborate with colleagues from different groups.

For more information, please email me at your convenience. (jczeng2016@gmail.com)
All the best wishes,

Jicai

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