Wenlong Liu, Ph.D.

Biological and Agricultural Engineering
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CONTACT:

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EDUCATION

Ph.D.	2019	Agricultural Engineering in North Carolina State University, Raleigh, NC
M.S.	2013	Hydrology and Water Resources in Xi'an Univ. of Technology, Xi'an, China
B.S.	2010	Hydrology and Water Resources Engr. in the Heilongjiang Univ., Harbin, China

BIOGRAPHY

Wenlong Liu obtained his Ph.D. in 2019 majoring in Agricultural Engineering. Wenlong conducts field experiments and data mining in high-frequency measurements to obtain a better understanding of hydrological and biogeochemical processes controlling nitrate dynamics from drained agricultural landscape. In addition, Wenlong believes reproducible research output is critical for rapidly updating research processes. Therefore, Wenlong employs programming languages, including R and Python, to generate research output coupled with data, visualization and results.

RESEARCH EXPERIENCES

- Data mining in high-frequency water quality datasets：
  - Inferring the effects of Best Management Practices, artificially drainage, and climate change on processes controlling fate and transport of nitrate in agricultural landscape;
  - Quantitative analysis of the relationship between flow and nitrate concentration (C-Q relationship) in both hourly field dataset and sub-daily watershed data (~42 years);
  - Statistical analysis and meta-analysis of existing publication to identify the key processes and mechanisms at play.
- Statistical analysis skills and tools:
  - Proficient with hypothesis testing, Generalized Linear Regression (GLM), correlation analysis, Analysis of Variance (ANOVA), and post hoc test;
  - Applied tempo-spatial modeling techniques in a course project.
- Process-based models that describe hydrology, plant growth, nutrient dynamics and environmental impacts from agricultural watersheds:
  - DRAINMOD, SWAT, HYDRUS (Ranked by the proficient level);
  - Proficient with model calibration, validation and deployment;
  - Familiar with Geographic Information System (GIS), e.g. ArcGIS, ArcSWAT.

- Hands-on experiences in agricultural fieldwork and experimental investigation:
  - ~4 years of experiences in experimental design, equipment installation, regular maintenance and service, data downloading, processing and compilation;
  - Familiar with pros and cons of common field monitoring device and techniques.

CODING EXPERIENCES

- Programing languages:
  - R (>3 years) and Python (~1 years).
- Reproducible research output:
  - Release publications with related data, codes, results and visualization using R (*Rmarkdown*) and Python (Jupyter Notebook);
  - Host reproducible output in a remote server powered by DigitalOcean.
- Develop R packages to retrieve, summarize and visualize the fertilizer data in USA:
  - Consistent coding style and user-friendly APIs;
  - Employ version control, unit test and continuous integration;
  - Detailed technical documentation and tutorials.
- Related links and materials:
  - *usfertilizer*: https://wenlong-liu.github.io/usfertilizer/
  - *ggfertilizer:* https://wenlong-liu.github.io/ggfertilizer/
  - Host *Rmarkdown* in cloud: http://206.189.187.14/shiny/ggfertilizer/
  - Host interactive shiny apps in cloud: http://206.189.187.14/shiny/food_security/
  - Contribution to a wiki page in an R package, *gganimate*: https://github.com/thomasp85/gganimate/wiki/Tracking-of-hurricanes-and-typhoons

EQUIPPED KNOWLEDGE AND SKILLS

Proficient with:

- **Hydrology, soil physics, soil chemistry, and carbon & nitrogen cycle**
- **Statistical analysis and visualization:** R (>3 years) & Python (~1 year)
- **Reproducible Research Output:** *Rmarkdown*, Knitr, Jupyter Notebook
- **Geographic Information System (GIS)**

Experienced in:

- **Data cleaning & manipulation**
- **Tempo-spatial analysis**
- **Software development (R):** Version control (Git), unit test, continuous integration (Travis CI) & technical documentation
- **Numerical modeling:** DRAINMOD, SWAT and statistical modeling

HONORS AND AWARDS

William and Glenda Johnson Graduate Engineering Fellowship Award at NCSU, 2018
Agricultural Leadership Learning Institute for Graduate Students at NCSU, 2018
Excellent Graduate award in Xi'an University of Technology, 2013
Outstanding Student Scholarship, 2012

SELECTED PUBLICATIONS

1. **Liu, W.,** S. Tian, M. Youssef, F. Birgand, and G. Chescheir. Long-term variation of nitrate concentration - stream discharge (C-Q) relationship from an agricultural watershed in Midwest U.S., (Ready to submit).
2. **Liu, W.,** M. Youssef, F. Birgand, B. Maxwell, G. Chescheir, and S. Tian. Insights of processes and mechanisms controlling nitrate export from agricultural fields using high-frequency sampling (In preparation).
3. **Liu, W.,** B. Maxwell, F. Birgand, M. Youssef, G. Chescheir, and S. Tian. Multi-point high frequency sampling system to gain deeper insights on nitrate fate in artificially drained agricultural fields. J. of Irrigation and Drainage Engineering, (Submitted).
4. **Liu, W.,** W. Luo, Z. Jia, Y. Pan, Y. Yang, and F. Bu. 2013, Modeling the impact of subsurface drainage system layout on field hydrology in the Yellow River Delta. WIT Transactions on Engineering Sciences, 80: 617-627.
5. **Liu, W.**, W. Luo, Y. Yang, F. Bu. 2013, Simulation study on the effect of subsurface drainage system layout in the Yellow River Delta, Chinese journal of water resources and water engi. 24(1):30-34.
6. Jia, Z., Z. Wu, W. Luo, W. Xi, S. Tang, **W. Liu**, and S. Fang. 2013, The impact of improving irrigation efficiency on wetland distribution in an agricultural landscape in the upper reache s of the Yellow River in China. Agricultural Water Management, 121 (2013): 54–61.
7. Jia, Z., W. Luo, J. Xie, Y. Pan, Y. Chen, S. Tang, and **W. Liu.** 2011, Salinity dynamics of wetland ditches receiving drainage from irrigated agricultural land in arid and semi-arid regions, Agricultural Water Management, 100(1): 9-17.

A detailed list can be seen via my Google Scholar profile.

CONFERENCE PRECEEDINGS, PRESENTATIONS AND POSTERS

1. **Liu, W,** B Maxwell, F Birgand, M Youssef, GM Chescheir. "Insights from intensive water quality sampling in a drained agricultural field" Agricultural Drainage Management Systems Task Force/NCERA 217, Raleigh, April 11-12, 2018.
2. **Liu, W**, S Tian, M Youssef, F Birgand, GM Chescheir. "Long-term temporal variation of nitrate concentration-stream discharge (C-Q) relationship for an agricultural watershed in Midwest USA" Agricultural Drainage Management Systems Task Force/NCERA 217, Raleigh, April 11-12, 2018.
3. **Tian S,** W Liu, M. Youssef, G. Chescheir. "Historical changes of effluent soluble phosphorus (P) concentration and discharge (C~Q) relationship from an agricultural watershed in Lake Erie Basin". Agricultural Drainage Management Systems Task Force/NCERA 217, Raleigh, April 11-12, 2018.
4. Birgand, F, B Maxwell, S Tian, **W Liu**, L Negm, M Youssef, G Chescheir, L Schipper, L Christianson, M Helmers, D Williams. "Transforming denitrifying bioreactors research and application: unveiling the inside of the blackbox" USDA NIFA and NSF Water and Soils Meeting, Project Director Meeting, Jan. 29-31, 2018.
5. **Liu, W**, M Youssef, F Birgand, GM Chescheir, B Maxwell, S Tian. "Nitrate concentration-drainage flow (C-Q) relationship for a drained agricultural field in Eastern North Carolina Plain" AGU fall meeting, New Orleans, December 11-15, 2017.

6. **Liu, W**, Birgand, F., Youssef, M. and Chescheir, G., 2016. “A novel method to reveal the nitrate transport and fate in agricultural fields”. In 2016 10th International Drainage Symposium Conference, 6-9 September 2016, Minneapolis, Minnesota (pp. 1-3). American Society of Agricultural and Biological Engineers.

PROFESSIONAL MEMBERSHIPS

American Geophysical Union (AGU)

ONLINE SCIENTIFIC OUTREACH

Academic Twitter: 83 tweets & 80 followers;

Academic blog via my personal website: 255 unique visitors from 32 countries and regions;

Academic blog via zhihu.com (in Chinese): 80 posts & 12,744 followers.

Updated on Jan. 28th, 2019