Tao Wen

Assistant Professor, Department of Earth and Environmental Sciences
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RESEARCH INTERESTS

Studying the water cycle within coupled human (e.g., energy extraction and urbanization) and natural systems at varying temporal and spatial scales using both data mining (big data) and case study (small data) approaches

EDUCATION

University of Michigan Ann Arbor, Michigan
Ph.D., Earth and Environmental Sciences Department *April 2017*
M.S., Earth and Environmental Sciences Department *April 2014*

University of Science and Technology of China (USTC) Hefei, China
B.S., School of Earth and Space Science *July 2011*

POSITIONS HELD

- Assistant Professor, Department of Earth Sciences, Syracuse University, Syracuse, NY (August 2020 – Present)
- Distinguished Postdoctoral Scholar, College of Earth and Mineral Sciences at Penn State University (May 2019 – July 2020)
- Postdoctoral Scholar, EESI at Penn State University (February 2017 – April 2019)
- Graduate Student Researcher, Noble Gas Laboratory at University of Michigan (2011 – 2017)
- Undergraduate Researcher, Institute of Polar Environment at USTC (2009 – 2011)
- Undergraduate Researcher, Advanced Laboratory for Environmental Research and Technology at Suzhou, China (2009 Summer)

GRANTS AND AWARDS

NSF HydroLearn Fellowship, 2020 **$3,000**
Intelligent Earth Computational and Data Science Methods for Research

Penn State EMS Dean's Fund for Postdoc-Facilitated Innovation, 2019 **$75,000**
Data-Driven Models to Assess Spatio-temporal Variability of Surface Water Quality in Coupled Human and Natural Systems at the Continental Scale

USGS Pennsylvania Water Resources Research Grant 104b, 2018 **$66,000**
Data-Driven Models to Assess Water Quality in the Region of Marcellus Shale (***senior personnel – co-written***)

Office of Postdoctoral Affairs Travel Award **$300**
Penn State University, 2019

Rackham Conference Travel Grant **Each $800-$1,300**
University of Michigan, Fall 2012, 2013, 2014, 2015, 2016

Best Student Poster Presentation
American Institute of Professional Geologists Michigan Section, December 2016

Scott Turner Research Awards
University of Michigan, Department of Earth and Environmental Sciences, Fall 2015, 2016

Stewart R. Wallace Fellowship
University of Michigan, Department of Earth and Environmental Sciences, Fall 2012

Excellent Undergraduate Researcher Award
University of Science and Technology of China, 2011

Guanghua Education Scholarship
University of Science and Technology of China, 2010

Outstanding Student Scholarship
University of Science and Technology of China, 2008, 2009

PUBLICATIONS

(* = Equal Contributions/Co-Lead Author; ** = Student First Author)

Journal Articles

26. **Wen, T.** and Zheng, G., Targeted Source Detection for Environmental Data. *In progress*.
25. Brantley, S.L., **Wen, T.**, Agarwal, D., Catalano, J., Schroeder, P.A., Lehnert, K., Varadharajan, C., Pett-Ridge, J., Engle, M., Castronova, A.M. and Hooper, R., A Vision for the Future Low-Temperature Geochemical Data-scape. *In progress*.
24. Zheng, G., Liu, C., Wei, H., Jenkins, P., Chen, C., **Wen, T.** and Li, Z., Knowledge-based Residual Learning. *Submitted*.
23. Niu, X., **Wen, T.** and Brantley, S.L., Stream sulfate concentrations decrease as U.S. power plants shift from coal to gas. *Submitted*.
22. **Wen, T.** and Liu, R., The Dichotomy in Noble Gas Signatures Linked to Tectonic Deformation in Wufeng-Longmaxi Shale, Sichuan Basin. *Submitted*.
21. **Wen, T.**, Liu, M., Woda, J., Zheng, G. and Brantley, S.L., Detecting Anomalous Methane into Groundwater within Hydrocarbon Production Areas across the United States. *Submitted*.
20. Shaughnessy, A., Gu, X., **Wen, T.** and Brantley, S.L., Machine Learning Deciphers CO_2 Sequestration and Subsurface Flowpaths from Stream Chemistry. *Submitted*.
19. Agarwal, A.*, **Wen, T.***, Chen, A., Zhang, A.Y., Niu, X., Zhan, X., Xue, L., Brantley, S.L., 2020. Assessing Contamination of Stream Networks Near Shale Gas Development Using a New Geospatial Tool. *Environmental Science & Technology*. https://doi.org/10.1021/acs.est.9b06761.
18. Woda, J., **Wen, T.**, Lemon, J., Marcon, V., Keeports, C.M., Zelt, F., Steffy, L.Y. and Brantley, S.L., 2020. Methane concentrations in streams reveal gas leak discharges in regions of oil, gas, and coal development. *Science of The Total Environment.* https://doi.org/10.1016/j.scitotenv.2020.140105.
17. Hammond, P.A., **Wen, T.**, Brantley, S.L. and Engelder, T., 2020. Gas well integrity and

methane migration: evaluation of published evidence during shale-gas development in the USA. *Hydrogeology Journal*. https://doi.org/10.1007/s10040-020-02116-y.

16. Shaughnessy, A., **Wen, T.**, Niu, X. and Brantley, S.L., 2019. Three Principles to Use in Streamlining Water Quality Research through Data Uniformity. *Environmental Science & Technology*. https://doi.org/10.1021/acs.est.9b06406.
15. **Wen, T.**, Woda, J., Marcon, V., Niu, X., Li, Z. and Brantley, S.L., 2019. Exploring How to Use Groundwater Chemistry to Identify Migration of Methane near Shale Gas Wells in the Appalachian Basin. *Environmental Science & Technology*. https://doi.org/10.1021/acs.est.9b02290.
14. Liu, R., Heinemann, N., Liu, J., Zhu, W., Wilkinson, M., Xie, Y., Wang, Z., **Wen, T.**, Hao, F., Haszeldine, S.R., 2019. CO_2 Sequestration by Mineral Trapping in Natural Analogues in the Yinggehai Basin, South China Sea. *Marine and Petroleum Geology*. https://doi.org/10.1016/j.marpetgeo.2019.03.018.
13. **Wen, T.***, Agarwal, A.*, Xue, L., Chen, A., Herman, A., Li, Z. and Brantley, S.L., 2019. Assessing Changes in Groundwater Chemistry in Landscapes with More than 100 Years of Oil and Gas Development. *Environmental Science: Processes & Impacts*. http://doi.org/10.1039/C8EM00385H.
12. Woda, J., **Wen, T.**, Oakley, D., Yoxtheimer, D., Engelder, T., Castro, M.C. and Brantley, S.L., 2018. Detecting and Explaining Why Aquifers Occasionally Become Degraded Near Hydraulically Fractured Shale Gas Wells. *Proceedings of the National Academy of Sciences*, 115(49), pp.12349-12358. http://doi.org/10.1073/pnas.1809013115.
11. Larson, T.E., Nicot, J.P., Mickler, P., Castro, M.C., Darvari, R., **Wen, T.** and Hall, C.M., 2018. Monitoring Stray Natural Gas in Groundwater with Dissolved Nitrogen. An Example from Parker County, Texas. *Water Resources Research*, 54(9), pp.6024-6041. http://doi.org/10.1029/2018WR022612.
10. **Wen, T.**, Niu, X., Gonzales, M., Zheng, G., Li, Z. and Brantley, S.L., 2018. Big Groundwater Data Sets Reveal Possible Rare Contamination Amid Otherwise Improved Water Quality for Some Analytes in a Region of Marcellus Shale Development. *Environmental Science & Technology*, 52(12), pp.7149-7159. http://doi.org/10.1021/acs.est.8b01123.
9. Niu, X., **Wen, T.**, Li, Z. and Brantley, S.L., 2018. One Step toward Developing Knowledge from Numbers in Regional Analysis of Water Quality. *Environmental Science & Technology*, 52(6), pp.3342-3343. http://doi.org/10.1021/acs.est.8b01035.
8. **Wen, T.**, Pinti, D.L., Castro, M.C., López-Hernández, A., Hall, C.M., Shouakar-Stash, O. and Sandoval-Medina, F., 2018. A Noble Gas and $^{87}Sr/^{86}Sr$ Study in Fluids of the Los Azufres Geothermal Field, Mexico – Assessing Impact of Exploitation and Constraining Heat Sources. *Chemical Geology*, 483, pp.426-441. http://doi.org/10.1016/j.chemgeo.2018.03.010.
7. Brantley, S.L., Vidic, R.D., Brasier, K., Yoxtheimer, D., Pollak, J., Wilderman, C. and **Wen, T.**, 2018. Engaging over data on fracking and water quality. *Science*, *359*(6374), pp.395-397. http://doi.org/10.1126/science.aan6520.
6. **Wen, T.**, Castro, M.C., Nicot, J.P., Hall, C.M., Pinti, D.L., Mickler, P., Darvari, R. and

Larson, T., 2017. Characterizing the noble gas isotopic composition of the Barnett Shale and Strawn group and constraining the source of stray gas in the Trinity Aquifer, north-central Texas. *Environmental Science & Technology*, *51*(11), pp.6533-6541. http://doi.org/10.1021/acs.est.6b06447.

5. **Wen, T.**, Castro, M.C., Nicot, J.P., Hall, C.M., Larson, T., Mickler, P. and Darvari, R., 2016. Methane Sources and Migration Mechanisms in Shallow Groundwaters in Parker and Hood Counties, Texas - A Heavy Noble Gas Analysis. *Environmental Science & Technology*, *50*(21), pp.12012-12021. http://doi.org/10.1021/acs.est.6b01494.
4. **Wen, T.**, Castro, M.C., Ellis, B.R., Hall, C.M. and Lohmann, K.C., 2015. Assessing compositional variability and migration of natural gas in the Antrim Shale in the Michigan Basin using noble gas geochemistry. *Chemical Geology*, *417*, pp.356-370. http://doi.org/10.1016/j.chemgeo.2015.10.029.
3. **Wen, T.**, Castro, M.C., Hall, C.M., Pinti, D.L. and Lohmann, K.C., 2016. Constraining groundwater flow in the Glacial Drift and Saginaw aquifers in the Michigan Basin through helium concentrations and isotopic ratios. *Geofluids*, *16*(1), pp.3-25. http://doi.org/10.1111/gfl.12133.
2. Boucher, C., Pinti, D.L., Roy, M., Castro, M.C., Cloutier, V., Blanchette, D., Larocque, M., Hall, C.M., **Wen, T.** and Sano, Y., 2015. Groundwater age investigation of eskers in the Amos region, Quebec, Canada. *Journal of Hydrology*, *524*, pp.1-14. http://doi.org/10.1016/j.jhydrol.2015.01.072.
1. Nie, Y., Liu, X., **Wen, T.**, Sun, L. and Emslie, S.D., 2014. Environmental implication of nitrogen isotopic composition in ornithogenic sediments from the Ross Sea region, East Antarctica: $\Delta^{15}N$ as a new proxy for avian influence. *Chemical Geology*, *363*, pp.91-100. http://doi.org/10.1016/j.chemgeo.2013.10.031.

Chapters in Books

3. **Wen, T.**, Data Mining. In: Daya Sagar, B.S., Cheng, Q., McKinley, J., Agterberg, F. (eds) *Encyclopedia of Mathematical Geosciences*. Springer, Cham, Switzerland. *Submitted*.
2. **Wen, T.**, 2020. Data Sharing. In: Schintler, L., McNeely, C. (eds) *Encyclopedia of Big Data*. Springer, Cham, Switzerland. 3pp. http://doi.org/10.1007/978-3-319-32001-4_322-1.
1. **Wen, T.**, 2020. Data Aggregation. In: Schintler, L., McNeely, C. (eds) *Encyclopedia of Big Data*. Springer, Cham, Switzerland. 4pp. http://doi.org/10.1007/978-3-319-32001-4_296-1.

Reports and Theses

4. **Wen, T.**, 2017. *Development of Noble Gas Techniques to Fingerprint Shale Gas and to Trace Sources of Hydrocarbons in Groundwater* (Doctoral dissertation, University of Michigan).
3. Nicot, JP., et al., 2015. *Understanding and Managing Environmental Roadblocks to Shale Gas Development: An Analysis of Shallow Gas, NORM, and Trace Metals* (Technical Report, http://www.rpsea.org/projects/11122-56/).
2. **Wen, T.**, 2014. *Constraining groundwater flow in the Glacial Drift and Saginaw Aquifers in the Michigan Basin through helium concentrations and isotopic ratios* (Master thesis,

University of Michigan).

1. **Wen, T.**, 2011. *Analysis on nitrogen species and isotopic composition of the ornithogenic sediments from Cape Bird, Ross Island, East Antarctica* (Bachelor thesis, University of Science and Technology of China).

Preprints and Postprints

4. Brantley, S.L., **Wen, T.**, Agarwal, D., Catalano, J., Schroeder, P.A., Lehnert, K., Varadharajan, C., Pett-Ridge, J., Engle, M., Castronova, A.M. and Hooper, R., A Vision for the Future Low-Temperature Geochemical Data-scape. *EarthArXiv. https://eartharxiv.org/repository/view/1839/*
3. Shaughnessy, A.R., Gu, X., **Wen, T.** and Brantley, S.L., 2020. Machine Learning Deciphers CO_2 Sequestration and Subsurface Flowpaths from Stream Chemistry. *Hydrology and Earth System Sciences Discussions. https://doi.org/10.5194/hess-2020-537.*
2. Woda, J., **Wen, T.**, Lemon, J., Marcon, V., Keeports, C.M., Zelt, F., Steffy, L.Y. and Brantley, S.L., 2020. Methane concentrations in streams reveal gas leak discharges in regions of oil, gas, and coal development. *EarthArXiv. https://doi.org/10.31223/osf.io/qka7d*.
1. Zheng, G., Liu, M., **Wen, T.**, Wang, H., Yao, H., Brantley, S.L. and Li, Z., 2019. Targeted Source Detection for Environmental Data. *arXiv preprint arXiv:1908.11056*.

Open Access Datasets

4. **Wen, T.**, Woda, J., Marcon, V., Gonzales, M., Niu, X., Herman, A., Guarnieri, M., Li, Z., Brantley, S.L., 2019. Shale Network – Statewide Groundwater in Pennsylvania as of January 2019, Data Commons, Penn State University. https://doi.org/10.26208/8ag3-b743.
3. **Wen, T.**, Gonzales, M., Niu, X., Herman, A., Guarnieri, M., Li, Z., Brantley, S.L., 2018. Shale Network – Mercer County Groundwater as of August 2018, Data Commons, Penn State University. https://doi.org/10.18113/D3967X.
2. **Wen, T.**, Woda, J., Gonzales, M., Herman, A., Brantley, S.L., 2018. Shale Network – Lycoming County Groundwater as of October 2018, Data Commons, Penn State University. https://doi.org/10.18113/D35M2X.
1. **Wen, T.**, Gonzales, M., Niu, X., Herman, A., Guarnieri, M., Li, Z., Brantley, S.L., 2018. Shale Network – Bradford County Groundwater as of May 2018, Data Commons, Penn State University. https://doi.org/10.26208/rj0h-qf52.

Online Educational Modules

2020 **Wen, T.**, Bandaragoda, C. and Harris, L. Data Science in Earth and Environmental Sciences. https://edx.hydrolearn.org/courses/course-v1:SyracuseUniversity+EAR601+2020_Fall/about

2018 **Wen, T.**, Brazil, L., Brantley, S. L., Pelepko, S. and Beattie, S. Bromide in the Allegheny River System. https://serc.carleton.edu/hydromodules/steps/191853.html

2018 **Wen, T.**, Brazil, L., Brantley, S. L., Pelepko, S. and Beattie, S. Earthquakes in

Pennsylvania. https://serc.carleton.edu/hydromodules/steps/191859.html

2018 **Wen, T.**, Brazil, L., Brantley, S. L., Pelepko, S. and Beattie, S. How Pennsylvania Disposes of Brines Safely. https://serc.carleton.edu/hydromodules/steps/191889.html

2018 **Wen, T.**, Brazil, L., Brantley, S. L., Pelepko, S. and Beattie, S. Environmental Issues Related to Brine Disposal from Oil and Gas Development in Pennsylvania. https://serc.carleton.edu/hydromodules/units/191769.html

TEACHING

EAR 401/601 – Hydrogeology, Syracuse University *Fall 2020*

- This course covers the fundamentals of groundwater hydrology and hydraulics.

GEOSC/GEOG 497 – Data Mining in Environ. Sci., Penn State University *Fall 2019*

- Applying both conventional and emerging data analytics tools to studying problems in the environmental sciences through mini-lectures and hands-on projects

Co-teaching GEOSC 560 – Kinetics, Penn State University *Spring 2019*

- Using data-driven models to assess the impact of natural and anthropogenic features on weathering rate on a watershed scale

Workshop Instructor in Shale Network Workshop, Penn State University *May 2018*

- Computer module demonstration and hands-on exercise: Created and prepared learning material; taught water chemistry about Marcellus-related spills for over 40 participants.
- Field trip to mock spill event: Assisted in organizing the field trip to mock spill.

Interim Instructor, Penn State University *April 2017*

- GEOSC 560 – Kinetics of Geological Processes: Taught basics of isotope geochemistry.

Teaching Assistant, University of Michigan *September 2013 – December 2016*

- EARTH 100s – Multiple introduction classes of earth sciences.
- EARTH 477 – Hydrogeology: Guided 50+ students to understand the fate and transport of contaminants from Underground Storage Tanks via hands-on hydrogeological lab work and the interpretation of stratigraphic information.
- EARTH 408 – Introduction to GIS in the Earth Sciences: Taught 24 students to implement 2D & 3D spatial analysis in ArcGIS; received positive teaching evaluation (**rated at 4.5-5.0 out of 5.0**) from students and teachers.

STUDENT MENTORSHIP

Syracuse University

- M.Sc. student: Favour Epuna

Penn State University

- Graduate student mentorship: Sam Shaheen (geospatial analysis and machine learning); Josh Woda (isotope geochemistry); Callum Wayman (GIS); Mengqi Li (geoscience)
- Undergraduate thesis supervision: Marcus Guarnieri (2018; groundwater geochemistry in Pennsylvania)

University of Michigan

- Undergraduate student mentorship: Guolei Han (noble gas geochemistry)

PROFESSIONAL AND FIELD EXPERIENCE

Public Service

Manuscript reviewer for *Nature Communications*, *Geochimica et Cosmochimica Acta*, *Environmental Science & Technology*, *Science of the Total Environment*, *Chemical Geology*, *Journal of Environmental Informatics*, *Water*, *Geological Society of America Today*, *Applied Geochemistry*, *Environmental Science: Processes & Impacts*, *Current Opinion in Environmental Science & Health*, *Journal of Great Lakes Research*, *Advances in Polar Science*, *Geosciences, Geoscience Data Journal, Hydrogeology Journal*

Proposal reviewer for *the U.S. Department of Energy, CHIST-ERA of European Union*

2020	Session conveners and chairs at Goldschmidt 2020: 1) Application of novel gas geochemical tools to future GeoEnergy resources Crustal Fluid Geochemistry in Energy-Related Systems: Empirical, Experimental, and Modelling Advances, and 2) Development of Big Data Geochemical Networks and new Analysis and Visualization tools: Innovative approaches for 21st Century Multidimensional and Transdisciplinary Science
2020	Steering committee for the NSF Geobiology and Low-Temperature Geochemistry Data Workshop: Mapping a Future for Management of Low-Temperature Geochemical Data
2019	AGU fall meeting OSPA (outstanding student presentation award) coordinators in the section of ESSI (Earth and Space Science Informatics)
2019	Reviewer for AGU fall meeting student travel grant
2018	Session convener and chair at Goldschmidt 2018: Using Geochemistry and Big Data to Understand the Biological-Geological Co-evolution of the Critical Zone - Including Human Impacts
2018	Session convener and chair at AGU 2018: (V017) Data Science and Geochemistry: Applying a Data-driven Approach in Geochemistry-centric Studies
2018	Judge for PSU Geosciences Graduate Student Colloquium
2018	Judge for 11th Annual Postdoctoral Research Exhibition
2018	Judge for AGU fall meeting outstanding student presentation award (OSPA)
2018	Committee and instructor for Shale Network Workshop at Penn State University

2013-2015 President of USTC Alumni Association in Greater Detroit area
2015-2016 Co-founder and vice-president of AAPG student chapter at University of Michigan

Professional Development

2020 NSF Geobiology and Low-Temperature Geochemistry Data Workshop: Mapping a Future for Management of Low-Temperature Geochemical Data, Atlanta, GA
2019 CUAHSI DIY Water Monitoring, Data Portals, and Watershed Modeling Workshop, Stroud Water Research Center, Avondale, PA
2018 83rd Annual Field Conference of Pennsylvania Geologists: the Triassic-Jurassic rift system of eastern North America, Center Valley, PA
2018 GeoDeepDive workshop 2018, UW-Madison, Madison, WI
2018 Data Science in Geochemistry workshop attendee, Goldschmidt, Boston, MA
2015 Sequence Stratigraphy short course attendee, AAPG, Denver, CO

Field Work

2017-2020 Groundwater, surface water, stray gas, and sediment sampling within the Marcellus Shale footprint (monthly)
2013-2014 Natural gas sampling in the Antrim Shale area (Gas & Oil Wells), MI (1 week)
2012 Groundwater sampling in the Glacial Drift aquifer in Michigan Basin (3 days)
2010 Mountain Huangshan in Anhui, China (4 days)
2008-2009 Tai Lake, Chao Lake, Yancheng National Natural Reserve, China (1 month)

Professional Affiliations

- American Geophysical Union (AGU) 2012 – Present
- Geological Society of America (GSA) 2014 – Present
- American Association of Petroleum Geologists (AAPG) 2014 – Present
- International Association for Mathematical Geosciences (IAMG) 2020 – Present

CONFERENCE PRESENTATIONS AND SEMINAR

43. Shaughnessy, A.R., Forgeng, M., Xin, G., **Wen, T.**, Shaheen, S. and Brantley, S.L., Water Flowpath and Bedrock Geology Control Pyrite Weathering Across Spatiotemporal Scales. AGU Fall Meeting, San Francisco, CA, 12/2020. [Virtual]
42. Brantley, S.L., **Wen, T.**, Shaheen, S. and Shaughnessy, A.R., Exploring Societal Problems with Data: Assessing Impacts on Water Quality with the Shale Network Database. AGU Fall Meeting, San Francisco, CA, 12/2020. [Virtual]
41. Shaheen, S., **Wen, T.**, Herman, A. and Brantley, S.L., Investigating the sources and extent of groundwater contamination in areas of extensive oil, gas, and coal extraction using data mining. AGU Fall Meeting, San Francisco, CA, 12/2020. [Virtual]
40. **Wen, T.**, Using Small Data and Big Data to Assess the Impact of Shale Gas Drilling on Water Quality. Zhejiang University, Hangzhou, China, 09/2020. [**Invited Talk**] [Virtual]
39. Liu, R., **Wen, T.**, Zheng, J. and Hao, F., Noble Gas Geochemistry in the Wufeng-Longmaxi

Shale of the Southern Sichuan Basin, China. Goldschmidt, Honolulu, HI, 06/2020. [Virtual]

38. **Wen, T.**, Liu, M., Li, Z. and Brantley, S.L., Using Big Groundwater Data to Detect Methane Contamination in Water within Hydrocarbon Production Areas Across the United States. Goldschmidt, Honolulu, HI, 06/2020. [Virtual]
37. **Wen, T.**, Liu, M., Li, Z. and Brantley, S.L., A machine learning-based ensemble model to detect methane contamination in groundwater within hydrocarbon production areas across the United States. AGU Fall Meeting, San Francisco, CA, 12/2019. [Poster]
36. **Wen, T.**, Niu, X, Shaughnessy, A.R. and Brantley, S.L., Ensuring reusability of water quality data: what have we learned as both data users and providers? AGU Fall Meeting, San Francisco, CA, 12/2019. [**Invited Talk**]
35. Agarwal, A., **Wen, T.**, Chen, A., Xue, L. and Brantley, S.L., GeoNet: An automated geochemical network analysis with application to detecting stream water contamination. Annual Conference of the International Association for Mathematical Geosciences, State College, PA, 08/2019. [Oral]
34. **Wen, T.**, Using Small Data and Big Data to Assess the Impact of Shale Gas Drilling on Water Quality. Kansa Geological Survey of the University of Kansas, Lawrence, KS, 04/2019. [**Invited Talk**]
33. **Wen, T.**, Using Small Data and Big Data to Assess the Impact of Shale Gas Drilling on Water Quality. Syracuse University, Syracuse, NY, 04/2019. [**Invited Talk**]
32. **Wen, T.**, Using Small Data and Big Data to Assess the Impact of Shale Gas Drilling on Water Quality. Saint Francis University, Loretto, PA, 03/2019. [**Invited Talk**]
31. **Wen, T.**, Liu, M., Woda, J., Zheng, G., Niu, X., Gonzales, M., Hall, C., Nicot, J.-P., Castro., M.C., Li, Z. and Brantley, S.L., Using Big Data and Small Data (Noble Gases) to Assess the Impact of Shale Gas Drilling on Water Quality. National Groundwater Association Workshop: Groundwater and Oil and Gas Development, San Antonio, TX, 03/2019. [Oral]
30. **Wen, T.**, Liu, M., Woda, J., Zheng, G., Li, Z. and Brantley, S.L., Detecting anomalous methane in groundwater in shale gas production areas using big data. AGU Fall Meeting, Washington, D.C., 12/2018. [Poster]
29. Brantley, S.L., **Wen, T.**, Li, Z., Liu, M., Zheng, G., Herman, A., Gonzales, M., Woda, J. and Niu, X., Using Big Data (and Little Data) to Understand the Effects of Shale Gas Development on Water Quality. AGU Fall Meeting, Washington, D.C., 12/2018. [**Invited Talk**]
28. Woda, J., **Wen, T.**, Lemon, J., Keeports, C., Zelt, F.B. and Brantley, S.L., Using citizen science and stream methane to locate and understand hydrocarbon-related contaminant sources in Pennsylvania. AGU Fall Meeting, Washington, D.C., 12/2018. [Oral]
27. **Wen, T.**, Zheng, G., Niu, X., Liu, M., Li, Z. and Brantley, S.L., Using Geochemistry Data to Identify Groundwater Quality Issues in Shale Gas Production Area. Health Effects Institute Energy Research Program Workshop, Austin, TX, 09/2018. [**Invited Talk**]
26. **Wen, T.**, Liu, M., Zheng, G., Brantley, S.L. and Li, Z., Using Machine Learning to Detect Anomalous Methane in Groundwater within Shale Gas Production Areas. Goldschmidt, Boston, MA, 08/2018. [Poster]

25. Brantley, S.L., **Wen, T.**, Niu, X., Zheng, G., Gonzales, M. and Li, Z., Using Big Groundwater Data to Understand Regional Water Chemistry. Goldschmidt, Boston, MA, 08/2018. [Poster]
24. Woda, J., **Wen, T.** and Brantley, S.L., Distinguishing Recent Methane Migration into Groundwater from Natural Methane Sources in the Marcellus Gas Play. Goldschmidt, Boston, MA, 08/2018. [Oral]
23. **Wen, T.**, Niu, X., Pollak, J., Brazil, L., Li, Z. and Brantley, S.L., Using Shale Network Database to Assess the Water Quality Data in Marcellus Shale Area. UCOWR-NIWR Annual Water Resources Conference, Pittsburgh, PA, 06/2018. [**Invited Talk**]
22. **Wen, T.**, A Multi-disciplinary and Multi-stakeholder Framework to Evaluate Environmental Impacts of Shale Gas Production. Energy Days Conference, University Park, PA, 05/2018. [Oral]
21. **Wen, T.**, Liu, M., Zheng, G., Niu, X., Gonzales, M., Woda, J., Li, Z. and Brantley, S.L., Applying machine learning in water quality data: implication for controlling factors and occurrence time of elevated methane in groundwater. Shale Network Workshop, University Park, PA, 05/2018. [Poster]
20. **Wen, T.**, Zheng, G., Liu, M., Niu, X., Gonzales, M., Woda, J., Li, Z. and Brantley, S.L., Applying Machine Learning to Detect Anomalous Methane in Groundwater. PA Groundwater Symposium, State College, PA, 05/2018. [Oral]
19. **Wen, T.**, Niu, X., Gonzales, M., Li, Z. and Brantley, S.L., Applying Data Mining Techniques to Chemical Analyses of Pre-drill Groundwater Samples within the Marcellus Formation Shale Play in Bradford County, Pennsylvania. AGU Fall Meeting, New Orleans, LA, 12/2017. [Poster]
18. Pinti, D.L., **Wen, T.**, Castro, M.C., López-Hernández, A., Hall, C.M., Shouakar-Stash, O. and Sandoval-Medina, Using noble gases and $^{87}Sr/^{86}Sr$ to constrain heat sources and fluid evolution at the Los Azufres Geothermal Field, Mexico. AGU Fall Meeting, New Orleans, LA, 12/2017. [Poster]
17. **Wen, T.**, Castro, M.C., Nicot, J.P., Hall, C.M., Pinti, D.L., Mickler, P., Darvari, R. and Larson, T., Barnett Shale or Strawn Group: Identifying the Source of Stray Gas through Noble Gases in the Trinity Aquifer, North-Central Texas. AGU Fall Meeting, New Orleans, LA, 12/2017. [Oral]
16. **Wen, T.**, Niu, X., Gonzales, M., Li, Z. and Brantley, S.L., Using Data Mining Techniques to Assess Water Quality within the Marcellus Shale Play. Geochemistry Forum, State College, PA, 12/2017. [Oral]
15. Brantley, S.L., Gonzales, M., Guarnieri, M., Niu, X., **Wen, T.** and Li, Z., Investigating Chemical Analyses of Ground Waters Sampled by Shale-gas Industry Consultants Before Gas-well Drilling in Pennsylvania. Pennsylvania Groundwater Symposium, State College, PA, 05/2017. [Oral]
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