

# RYAN SMITH

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## EDUCATION

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**Stanford University, Stanford, CA**

*August 2018*

Ph.D. in Geophysics

Thesis title: The relationship of surface deformation to groundwater storage and quality in the San Joaquin Valley, California

**Brigham Young University, Provo, Utah**

*June 2014*

B.S. in Geology, Cum laude

## RESEARCH INTERESTS

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I study groundwater resources by combining satellite (primarily InSAR) and airborne/ground-based geophysical datasets (primarily time-domain EM) with hydrologic time series. By integrating these datasets into groundwater models, and analyzing spatial relationships with machine learning methods, I quantify changes in groundwater storage and quality.

## EMPLOYMENT

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**2018-present** Assistant Professor, Department of Geosciences and Geological and Petroleum Engineering, Missouri University of Science and Technology, Rolla, MO

**2017** Environmental Geoinformatics Intern, Climate Corporation, St. Louis, MO

**2015-2018** National Science Foundation Graduate Research Fellow, Stanford University, Stanford, CA

**2015** Geophysics Intern, SM Energy, Denver, CO

**2014-2015** Graduate Research Fellow, Stanford University, Stanford, CA

**2013-2014** Hydrogeology Intern, Rio Tinto/Kennecott, Salt Lake City, UT

## GRANTS AND FELLOWSHIPS

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**2019-2020** NSF, Geobiology and Low-temperature Geochemistry  
*RAPID: Assessing the fate of flood-born contaminants.* PI: Marek Locmellis, co-I: Ryan Smith, Jonathan Obrist-Farner  
Missouri S&T share: \$44,888

**2018-2021** NASA, Program of Earth Science Applications: Water Resources  
*Integration of InSAR with Airborne Geophysical Data for the Development of Groundwater Models.* PI: Rosemary Knight, Institutional PI: Ryan Smith  
Total award: \$940,998, Missouri S&T share: \$76,871

**2015-2018** National Science Foundation Graduate Research Fellowship  
*Predicting hydraulic properties using InSAR and geologic models*  
\$138,000

**2018** Carlsberg Foundation Grant  
\$1,000

2018 Shell Travel Grant  
\$1,100

## PEER-REVIEWED PUBLICATIONS

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*Citations on Google Scholar since 2017 (link to profile):*

2017	2018	2019
5	17	31

- Smith, R.**, Campbell, C., Hansen, N., Hopkins, B., Svedin, J., Woolley, A., Remote Sensing of Sub-field Water Stress using NDWI and ET data, *in prep for Agronomy Journal*.
- Smith, R.**, Groundwater Storage Loss Associated with Land Subsidence in Western US Mapped Using Machine Learning. *Submitted to Water Resources Research*.
6. **Smith, R.**, Knight, R., 2019, Modeling land subsidence using InSAR and airborne electromagnetic data. *Water Resources Research*, 55. <https://doi.org/10.1029/2018WR024185>.
  5. **Smith, R.G.**, T. Mukerji, 2019, *Geophysics*, Correlating Geological and Seismic Data with Unconventional Resource Production Curves Using Machine Learning.
  4. **Smith, R.G.**, R. Knight, S. Fendorf, 2018, *Nature Communications*, Over-Pumping Leads to California Groundwater Arsenic Threat.
  3. Knight, R., **Smith, R.G.**, Asch, T., Abraham, J., Cannia, J., Viezzoli, A., Fogg, G., 2018, *Groundwater*, Mapping Aquifer Systems with Airborne Electromagnetics in the Central Valley of California.
  2. **Smith, R.G.**, R. Knight, J. Chen, J.A. Reeves, H.A. Zebker, T. Farr, and Z. Liu, 2017, *Water Resources Research*, Estimating the permanent loss of groundwater storage in the southern San Joaquin Valley, California.
  1. Nordin, M., **Smith, R.G.**, Knight, R., 2016, *The Leading Edge*, The use of color wheels to communicate uncertainty in the interpretation of geophysical data.

## CONFERENCE PAPERS

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5. **Smith, R.G.**, Knight, R., 2020, Towards Sustainable Groundwater Management: Predicting Deformation Scenarios with Coupled Hydrogeophysical Models, Tenth International Symposium on Land Subsidence, The Netherlands.
4. **Smith, R.G.**, Mukerji, T., Lupo, T., 2018, Correlating geological and seismic data with unconventional resource production curves using machine learning, Society of Exploration Geophysicists Annual Meeting, Anaheim, California.
3. **Smith, R.G.**, R. Knight, 2018, Modeling subsidence through the joint inversion of AEM and InSAR data, Airborne Electromagnetics Conference, Kolding, Denmark.
2. Dewar, N., Gottschalk, I., Knight, R., **Smith, R.G.**, Silvestri, S., Viezzoli, A., Anshari, G., Behroozmand, A., Comas, X., Effers, F., Faber, I., Flanagan, N., Parsekian, A., Richardson, C., Wright, W., 2018, Estimation of peat thickness in Indonesia from airborne time domain EM data through machine learning, Airborne Electromagnetics Conference, Kolding, Denmark.
1. Knight, R., **Smith, R.G. (presented)**, Asch, T., Cannia, J., Abraham, J., Viezzoli, A., 2016, Subsurface mapping with airborne electromagnetics in the Central Valley of California, SEG Technical Program Extended Abstracts.

## SELECTED CONFERENCE ABSTRACTS

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11. **Smith, R.G.**, 2019, Land Subsidence in Western US Mapped Using Machine Learning , American Geophysical Union, Fall Meeting 2019, San Francisco, California
10. **Smith, R.G.**, Behroozemand, A., 2018, The application of a new electromagnetic method for imaging karst, American Geophysical Union, Fall Meeting 2018, Washington, DC.
9. Campbell, C., Hopkins, B., Svedin, J., Hansen, N., **Smith, R.G.**, 2018, Integrating Remote Sensing and Spatiotemporal Data to Improve Variable Rate Irrigation Systems, Crop Science Society of America International Meeting, Baltimore, Maryland.
8. **Smith, R.G.**, R. Knight, 2018, Improved Modeling of Land Subsidence through the Integration of InSAR and Airborne EM Data, XIII Congress Land Subsidence Symposium, San Francisco, California.
7. **Smith, R.G.**, R. Knight, J. Chen, J.A. Reeves, H.A. Zebker, T. Farr, and Z. Liu, 2017, Estimating the permanent loss of groundwater storage in the southern San Joaquin Valley, California, SAGEEP, Denver, Colorado.
6. **Smith, R.G.**, R. Knight, S. Fendorf, 2016, Subsidence Serves as an Indicator of Groundwater Arsenic Risk in the San Joaquin Valley, California, American Geophysical Union, Fall Meeting 2016, San Francisco, California
5. **Smith, R.G.**, R. Knight, H.A. Zebker, T. Farr, Z. Liu, J. Chen, J. Crews and J. Reeves, 2016, Estimating Aquifer Properties in the San Joaquin Basin, California, through the Analysis of InSAR Data, American Geophysical Union, Fall Meeting 2015, San Francisco, California.
4. **Smith, R.G.**, 2013, Identifying High-Risk Flood Scenarios in the Bhutanese Himalayas. Utah Conference of Undergraduate Research, Utah State University.
3. **Smith, R.G.**, 2012, Glacier Retreat in the Bhutanese Himalayas, 1976-2010. Student Research Conference, Brigham Young University.
2. Rupper, S., Schaefer, J., Burgener, L., **Smith, R.G.**, 2012, Glaciers and climate, modern observations and glacier modeling. Goldschmidt Conference, Montreal.
1. Rupper, S., Maurer, J., Schaefer, J., Cook, E., Putnam, A., Krusic, P., **Smith, R.G.**, 2012, Glacier Sensitivity to Climate Change in the Monsoonal Himalaya: Past, Present, and Future. American Geophysical Union, San Francisco.

## INVITED TALKS

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Oklahoma State University Geoscience Department, 2019

Brigham Young University Geology Department, 2019

Missouri University of Science and Technology Geoscience Department, 2018

METER Group Science Division, 2018

## TEACHING

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### Courses Taught at Missouri University of Science and Technology

#### Remote Sensing Technology

Designed and taught a course introducing undergraduate and graduate students to general remote sensing concepts for both passive and active systems. Students learned the fundamentals of electromagnetic theory and how it applies to remote sensing, as well as common sources of satellite data and were introduced to satellite data processing and band math using ENVI, ArcMap and R.

#### Geographic Information Systems

Designed and taught a course covering the fundamentals of geographic information systems. Key

objectives are learning to load vector and raster data into a GIS interface and create a map, manipulate and create vector and raster data using geoprocessing and map algebra tools, interpolate point data to fill in the gaps, perform basic spatial analysis in R, an open-source coding platform, and apply the tools learned in a project of the students choosing.

### **Courses Taught as a Teacher's Aid at Stanford University**

#### **The Water Course**

Led labs and wrote homework assignments to help undergraduate students understand the water cycle and develop water balances for different areas of California. I also led lectures on multiple occasions.

#### **Near-surface Geophysics**

Taught lectures and labs on some of the popular geophysical methods for imaging the upper 50 meters of the ground surface, including ground-penetrating radar, seismic refraction and reflection, electromagnetics, nuclear magnetic resonance, electrical resistivity tomography, and synthetic aperture radar.

### **Additional Teaching Experience**

#### **Geological Communications Teacher's Aid– Brigham Young University**

Mentored undergraduate students with course assignments, which included using Excel, Illustrator and ArcGIS to analyze and present geologic data

#### **Icelandic Instructor– Provo, UT**

Taught several groups of students introductory Icelandic and aided in developing curriculum in a rigorous nine-week course.

## **PROFESSIONAL SOCIETIES, SERVICE AND HONORS**

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### **Synergistic Activities**

I believe participation in the scientific community is important for exchange of ideas, peer review and shaping the future directions of research. To this end, I strive to contribute to key discussions in the scientific community. As part of this, I have participated as a panelist for the National Academy of Sciences workshop on Groundwater Recharge and Flow in 2019, organized a session on remote sensing hydrology at GSA 2019, participated as a panel reviewer for NSF and NASA, served as a reviewer for many journals, as an OSPA judge at AGU, and shared my research with the broader community through media interviews and social media.

### **Service**

*Reviewer:* Geophysical Research Letters, Water Resources Research, Remote Sensing in Earth Systems Science, panelist for NSF Geosciences and NASA Earth Science Research Program.

*Outreach:* I have shared my research with local water management agencies, as well as with media outlets, including the San Francisco Chronicle, Business Insider and San Jose Mercury News

### **Professional Societies**

American Geophysical Union  
Geological Society of America  
Society of Exploration Geophysicists  
Association of Engineering Geologists

### **Honors**

National Science Foundation Graduate Research Fellowship, 2015-2018  
Outstanding Thesis Award, Stanford University Department of Geophysics, 2019