

Ardeshir Ebtehaj

Assistant Professor of Hydrologic Sciences and Engineering
Department of Civil, Environmental & Geo- Engineering, Saint Anthony Falls Laboratory
University of Minnesota, Minneapolis, MN 55455
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website: <http://umn.edu/home/ebtehaj>

Education

Ph.D., Civil Engineering, Aug-2013

Thesis: Advanced Frameworks for Precipitation Estimation from Space
University of Minnesota

M.Sc., Mathematics, Sep-2013

Thesis: Leveraging Sparsity in Variational Data Assimilation
University of Minnesota

M.Sc., Environmental Engineering, Jun-2001

Thesis: Vulnerability Assessment of Groundwater Pollution via Fuzzy Systems **Iran University of Science and Technology**

B.Sc., Civil Engineering, 1999

Iran University of Science and Technology

Appointments

Assistant Professor of Engineering

Department of Civil, Environmental and Geo-Engineering, University of Minnesota, USA 2016-Present

Assistant Professor of Engineering

Department of Civil and Environmental Engineering, Utah State University, USA 2015-2016

Postdoctoral Research Fellow

Georgia Institute of Technology, USA 2013-2015

Research Assistant

University of Minnesota, USA 2008-2013

Research Engineer

Private Sectors , Iran 2001-2008

Awards

Editor Award, American Meteorological Society 2020

NASA New (Early Career) Investigator Program (NIP) Award in Earth Science 2018-2021

NASA Earth and Space Science Fellowship 2012-2014

Doctoral Dissertation Fellowship (DDF), University of Minnesota 2012

Edward Silberman Fellowship, SAFL, University of Minnesota 2012

Outstanding Student Paper Award, American Geophysical Union 2011

Interdisciplinary Doctoral Fellowship (IDF), CEGE & Minnesota Center for Industrial Math 2011

Publications

1. Gao L., M. Sadeghi, A. Ebtehaj, J. P. Wigneron (2020), A Temporal Polarization Ratio Algorithm for Calibration-free Retrieval of Soil Moisture at L-band, Remote Sensing of Environment, <https://doi.org/10.1016/j.rse.2020.112019>.
2. Gao L., M. Sadeghi, A. F. Feldman, **A. Ebtehaj** (2020), A Spatially Constrained Multi-Channel Algorithm for Inversion of a First-Order Microwave Emission Model at L-Band, IEEE Trans. on Geosci. and Remote Sens., doi:10.1109/TGRS.2020.2987490.

3. Tamang S.K., **A. Ebtehaj**, D. Zou, G. Lerman (2020), Regularized Variational Data Assimilation for Bias Treatment using the Wasserstein Metric, *Quarterly Journal of the Royal Meteorological Society*, <https://doi.org/10.1002/qj.3794>. arXiv:2003.02421
4. Sadeghi M., L. Gao, **A. Ebtehaj**, J.P. Wigneron. W.T. Crow. J.T. Reager. A.W. Warricke (2020), Retrieving Global Surface Soil Moisture from GRACE Satellite Gravity Data, *J. of Hydrology*, <https://doi.org/10.1016/j.jhydrol.2020.124717>
5. Lun G., M. Sadeghi M., **A.M., Ebtehaj** (2020), Microwave Retrievals of Soil Moisture and Vegetation Optical Depth with Improved Resolution using a Combined Constrained Inversion Algorithm: Application for SMAP Satellite, *J. of Remote Sens. Environ.*, <https://doi.org/10.1016/j.rse.2020.111662>.
6. Sadeghi M., **A.M. Ebtehaj**, W. Crow, L. Gao, A. Purdy, J. Fisher, S. Jones, and M. Tuller, Global Estimates of Land Surface Net Water Flux from SMOS and SMAP Satellite Soil Moisture Data (2019), *J. of Hydrometeorol*, <https://doi.org/10.1175/JHM-D-19-0150.1>.
7. **Ebtehaj. A.M.** , C. D. Kummerow, F. J. Turk (2019), Metric Learning for Approximation of Microwave Channel Error Covariance: Application for Satellite Retrieval of Drizzle and Light Snowfall, *IEEE Trans. on Geosci. and Remote Sens.*, doi:10.1109/TGRS.2019.2941682.
8. Tamang S.K., **A.M. Ebtehaj**, A. F. Prein, A. J. Heymsfield (2019), On Changes of Global Wet-bulb Temperature and Snowfall Regimes, *J. of Climate*, <https://doi.org/10.1175/JCLI-D-19-0254.1>.
9. **Ebtehaj, A.M.**, R. L. Bras (2019), A Physically Constrained Inversion for Super-resolved Passive Microwave Retrieval of Soil Moisture and Vegetation Water Content in L-band, *Remote Sens. Environ.*, <https://doi.org/10.1016/j.rse.2019.111346>, arxiv 1806.03298.
10. Takkiri Z., **A.M. Ebtehaj**, E Foufoula-Georgiou, P. E. Kirstetter, J. Turk (2018), A Prognostic Retrieval Approach for Microwave Precipitation Phase Detection over Snow Cover, *J. of Hydrometeorol*, <https://doi.org/10.1175/JHM-D-18-0021.1>.
11. Hassan-Esfahani L., **A.M. Ebtehaj**, A. Torres-Rua and M. McKee (2017), Spatial Scale Gap Filling Using an Unmanned Aerial System: A Statistical Downscaling Method for Applications in Precision Agriculture, *Sensor*, <http://www.mdpi.com/424-8220/17/9/2106>.
12. **Ebtehaj A.M.**, C. D. Kummerow (2017), Microwave Retrievals of Terrestrial Precipitation over Snow Covered Surfaces: A Lesson from the GPM Satellite, *J. Geophys. Res. Lett.*, doi: 10.1002/2017GL073451.
13. Lin L., **A.M. Ebtehaj**, L. Flores, S. Bastola, and R. L. Bras (2017), Joint Variational Data Assimilation of Satellite Precipitation and Soil Moisture: A Case Study Using TRMM and SMOS Data, *Mon. Weather Rev.*, <https://doi.org/10.1175/MWR-D-17-0125.1>
14. Takkiri Z., **A.M. Ebtehaj**, and E. Foufoula-Georgiou (2017), A Multi-sensor Data-driven methodology for all-sky Passive Microwave Inundation Retrieval, *Hydrol. Earth Syst. Sci.*, 21, 2685-2700, <https://doi.org/10.5194/hess-21-2685-2017>.
15. Lin L., **A.M. Ebtehaj**, J. Wang, R. L. Bras (2017), Soil Moisture Background Error Covariance and Data Assimilation in a Coupled Land-Atmosphere Model, *Water Resour. Res.*, doi: 10.1002/2015WR017548.
16. Moghim S., S McKnight, K Zhang, **A.M. Ebtehaj**, R. Knox, R. Bras, M. Paul, J. Wang (2016), A Bias-corrected Data set of Climate Model Outputs at Uniform Space-Time Resolution for Land Surface Modeling over Amazonia, *Intern. J. Climat.*, doi: 10.1002/joc.4728.
17. **Ebtehaj A.M.**, R. L. Bras, E. Foufoula-Georgiou (2016), Evaluation of ShARP passive rainfall retrievals over snow-covered land surfaces and coastal zones, *J. Hydrometeorology*, 17, 10131029.doi: <http://dx.doi.org/10.1175/JHM-D-15-0164.1>
18. **Ebtehaj A.M.**, E. Foufoula-Georgiou, G. Lerman, R. L. Bras (2015), Compressive Earth Observatory: An Insight from AIRS/AMSU Retrievals, *Geophys. Res. Lett.*, 42, doi:10.1002/2014GL062711. [\[CODE\]](#)
19. **Ebtehaj A.M.**, R. L. Bras, E. Foufoula-Georgiou, (2015), Shrunk Locally Linear Embedding for Passive Microwave Retrieval of Precipitation, *IEEE Trans. on Geosci. and Remote Sens.*, issue 99, doi: 10.1109/TGRS.2014.2382436. [\[CODE\]](#)

20. Lin L., **A.M. Ebtehaj**, R. L. Bras, A. Flores, J. Wang (2014), Dynamical Downscaling of GPM Precipitation Observations for Hydrologic Applications via WRF 4D-Var Assimilation of Precipitation, *J. Hydrometeorol.* 16, 811829, doi: <http://dx.doi.org/10.1175/JHM-D-14-0042.1>.
21. Lipeng N., F. P. Carli, **A.M. Ebtehaj**, E. Foufoula-Georgiou, T.T. Georgiou (2014), Coping with Model error in Data Assimilation Using Optimal Mass Transport, *Water Resour. Res.*, doi: 10.1002/2013WR014966.
22. **Ebtehaj, A.M.**, M. Zupanski, G. Lerman, E. Foufoula-Georgiou (2013), Variational Data Assimilation via Sparse Regularization, *Tellus A*, 2014, 66, 21789.
23. Foufoula-Georgiou E., **A.M. Ebtehaj**, S.Q Zhang, A.Y. Hou (2013), Downscaling Satellite Precipitation with Emphasis on Extremes: A Variational ℓ_1 -norm Regularization in the Derivative Domain, *Surv. in Geophys.*, doi:10.1007/s10712-013-9264-9.
24. **Ebtehaj, A.M.**, E. Foufoula-Georgiou (2013), Variational Downscaling, Fusion and Assimilation of Hydro-meteorological States via Regularized Estimation, *Water Resour. Res.*, vol. 49, 120, doi:10.1002/wrcr.20424, 2013.
25. **Ebtehaj, A.M.**, E. Foufoula-Georgiou, G. Lerman (2012), Sparse Regularization for Precipitation Downscaling *J. Geophys. Res.*, 117, D08107, doi:10.1029/2011JD017057. [\[CODE\]](#)
26. **Ebtehaj, A.M.**, E. Foufoula-Georgiou (2011), Adaptive Fusion of Multi-sensor Precipitation using Gaussian Scale Mixtures in the Wavelet Domain, *J. Geophys. Res.*, 116, D22110, doi:10.1029/2011JD016219 [\[CODE\]](#)
27. **Ebtehaj, A.M.**, and E. Foufoula-Georgiou (2011), Statistics of Precipitation Reflectivity Images and Cascade of Gaussian-scale Mixtures in the Wavelet Domain: A Formalism for Reproducing Extremes and Coherent Multi-scale Structures, *J. Geophys. Res.*, 116, D14110, doi:10.1029/2010JD015177.
28. **Ebtehaj, A.M.**, and E. Foufoula-Georgiou (2010), Orographic Signature on Multi-scale Statistics of Extreme Rainfall: A Storm-scale Study, *J. Geophys. Res.*, 115, D23112, doi:10.1029/2010JD014093.
29. **Ebtehaj, A.M.**, H. Moradkhani, and H. V. Gupta (2010), Improving Robustness of Hydrologic Parameter Estimation by the Use of Moving Block Bootstrap Resampling, *Water Resour. Res.*, 46, W07515, doi:10.1029/2009WR007981.
30. Afshar, A., M.A. Marino, **A.M. Ebtehaj** (2007), A Rule-based Fuzzy System for Assessing Groundwater Vulnerability, ASCE, *Journal of Environment Engineering* 133(5), 532-540.

Book Chapters

1. Sadeghi, M., E. Babaeian, **A.M. Ebtehaj**, S.B. Jones, M. Tuller (2018), Remote Sensing of Environmental Variables and Fluxes, In: Handbook of Environmental Engineering, edited by Myer Kutz. John Wiley & Sons, Inc., Hoboken, New Jersey.

Conference Presentations

1. American Geophysical Union (2009), Orographic Signature on Multiscale Statistics of Extreme Rainfall: The Rapidan Storm of June 1995, San Francisco, CA.
2. NASA Precipitation Measurement Missions (PMM) Science Team Meeting (2010), Multi-sensor Precipitation Data Fusion with Emphasis on Extremes, Seattle, WA.
3. American Geophysical Union (2010), Multi-sensor Precipitation Data Fusion with Emphasis on Extremes, San Francisco, CA.
4. NASA Precipitation Measurement Missions (PMM) Science Team Meeting (2010), Sparse Precipitation Downscaling and Multisensor Retrieval, Denver, CO.
5. American Geophysical Union (2011), Adaptive Fusion and Sparse Estimation of Multi-sensor Precipitation ([oral presentation](#)), San Francisco, CA.
6. Goddard Space Flight Center–ESSIC (2012), On Estimation of Hydrometeorological Signals with Sparse Priors ([invited talk](#)), Greenbelt, MD.

7. American Geophysical Union (2012), Regularized Data Assimilation and Fusion of non-Gaussian States Exhibiting Sparse Prior in Transform Domains, San Francisco, CA.
8. American Geophysical Union (2012), Variational Rainfall Fusion and Downscaling via ℓ_1 -Regularization in the Wavelet Domain (oral presentation), San Francisco, CA.
9. American Geophysical Union (2012), On Adapting Data Assimilation Framework to Data Fusion of Multi-scale Precipitation Observations, San Francisco, CA.
10. Society of Applied and Industrial Mathematics (AN13), Variational Data Assimilation via Sparse Regularization (oral presentation), San Diego, CA.
11. European Geophysical Union (2013), Precipitation: From Measurement to Modelling and Application in Catchment Hydrology, Vienna, Austria.
12. European Geophysical Union (2013), Variational Data Assimilation via Sparse Regularization, Vienna, Austria.
13. American Geophysical Union (2013), Coping with Model Uncertainty in Data Assimilation using Optimal Mass Transport (oral presentation), San Francisco, CA.
14. American Geophysical Union (2013), Passive Microwave Rainfall Retrieval: A Mathematical Approach via Sparse Learning, San Francisco, CA.
15. European Geophysical Union (2014), From Rainfall Downscaling to Rainfall Retrieval: Inverse Problems of Similar Nature, Vienna, Austria.
16. NASA Precipitation Measurement Mission (2014), A New Algorithm for GPM Passive Microwave Rainfall Retrieval: Extremes, Discontinuities and Spatial Structure (oral presentation), Baltimore, MD.
17. NASA Precipitation Measurement Mission (2014), Shrunk Locally Linear Embedding Algorithm for Passive Retrieval of Precipitation (ShARP), Baltimore, MD.
18. American Geophysical Union (2014), A New Framework for Robust Retrieval and Fusion of Active/Passive Multi-Sensor Precipitation (oral presentation), San Francisco, CA.
19. NASA Precipitation Measurement Mission (2015), Rainfall Microwave Atoms: A New Variational Approach for Combined Passive Retrievals, Baltimore, MD.
20. American Geophysical Union (2015), Rainfall Microwave Spectral Atoms: A New Class of Bayesian Algorithms for Passive Retrieval (oral presentation), San Francisco, CA.
21. Society of Industrial Mathematics, Conference on Applied Mathematics Education (ED16), Mathematical Advances in Hydrology: Non-stationarity and Data Assimilation - Part I of II, Ebtehaj A.M., (Invited Talk), Improved Passive Microwave Retrievals of Precipitation from Space Using Sparse Approximation, Philadelphia 2016.
22. American Geophysical Union (2016), Application of Unmanned Aerial Systems in Spatial Downscaling of Landsat VIR imageries of Agricultural Fields, in collaboration with Esfahani L., A. Torres, M McKee, San Francisco, CA.
23. American Geophysical Union (2016), Assimilation of Satellite Precipitation and Soil Moisture Data into a Coupled Land-Atmosphere Model (oral presentation), in collaboration with Lin L., A.M. Ebtehaj, A. Flores, S. Bastola, R. L. Bras, San Francisco, CA.
24. American Geophysical Union (2016), Towards better understanding of high-mountain cryosphere changes using GPM data: A Joint Snowfall and Snow-cover Passive Microwave Retrieval Algorithm, in collaboration with E. Foufoula-Georgiou, San Francisco, CA.
25. American Geophysical Union (2016), Inundation Retrieval Using Passive Microwave Observations, in collaboration with Takbiri Z., E. Foufoula-Georgiou, San Francisco, CA.
26. Minnesota Institute of Mathematics and its Applications (2017), Data Science and Geophysical Remote Sensing: Applications for Rainfall Remote Sensing from Space (Invited Talk), Minneapolis, MN.

27. NASA Precipitation Measurement Missions (PMM) Science Team Meeting (2017), Passive Retrieval of Snowfall over Snow Cover: Lessons from GPM and Algorithms in collaboration with Z. Takbiri, E Foufoula-Georgiou, P. Kirstetter, J. Turk.
28. American Geophysical Union (2017), Enhancing SMAP Soil Moisture Retrievals via Superresolution Techniques, in collaboration with Beale K., Romberg J., Bras R. L.
29. American Geophysical Union (2017), Parametrizing Evaporative Resistance for Heterogeneous Sparse Canopies through Novel Wind Tunnel Experimentation, in collaboration with Sloan B., Guala M.
30. American Geophysical Union (2017), A Prognostic Methodology for Precipitation Phase Detection using GPM Microwave Observations With Focus on Snow Cover, in collaboration with Takbiri Z., E. Foufoula-Georgiou, Kirstetter P., Turk J.
31. American Geophysical Union (2018), On Radiometric Interactions of Snowfall and Snow Cover: An Experimental Approach Using GPM Satellite Data, in collaboration with Takbiri Z. and E. Foufoula-Georgiou, Washington DC.
32. American Geophysical Union (2018), A Combined Dynamically Constrained Inversion for Super-resolved L-band Soil Moisture, in collaboration with Gao L., Washington DC.
33. American Geophysical Union (2018), Contrasting changes in Snowfall Dominant Regimes at hemispherical scale, in collaboration with Tamang S., Washington DC.
34. American Geophysical Union (2018), A Physically Constrained Inversion for Super-resolved Passive Microwave Retrieval of Soil Moisture and Vegetation Water Content in L-band, with Bars R., Washington DC.
35. American Geophysical Union (2019), Estimation of Surface Water Flux from SMAP/SMOS Soil Moisture Retrievals, with Sadeghi, M., W.T. Crow, S.B., Jones and M. Tuller, San Francisco, CA, Dec. 9-13, 2019.
36. Soil Science Society of America (2019), An Analytical Model Linking Satellite Retrievals of Surface Soil Moisture and Water Fluxes, with M. Sadeghi, S.B. Jones, M. Tuller, San Antonio, TX.
37. The National Soil Moisture Workshop (2019), Global Mapping of Land Surface Net Water Flux Using Satellite Soil Moisture Data with M. Sadeghi, W.T. Crow, L. Gao, A.J. Purdy, J.B. Fisher, S.B. Jones, M. Tuller, Manhattan, KS.
38. American Geophysical Union (2019), Metric Learning for approximation of Microwave Channel Error Covariance: Application for Satellite Retrieval of Drizzle and Light Snowfall, San Francisco, CA.
39. American Geophysical Union (2019), Formal Treatment of Bias under Chaotic Dynamics using Optimal Mass Transport, with Sagar Tamang, San Francisco, CA.
40. American Geophysical Union (2019), Physically Constrained Inversion of Radiative Transfer Models in L-band for High-resolution Retrievals of Soil Moisture and Vegetation Optical Depth from Space, with L. Gao, M. Sadeghi, San Francisco, CA.
41. Soil Science Society of America (2020), A New Analytical Relationship between Sensible and Ground Heat Flux. with Sadeghi, M. and J. Wang. Phoenix, AZ.

Invited Talks

- A. Ebtehaj, Physically-guided High-resolution Retrieval of Soil Moisture and Vegetation Optical Depth from Space, NASA's Jet Propulsion Laboratory, Aug 2019, Pasadena, CA
- A. Ebtehaj, Bras, R.L., Physically Constrained Inversion for Super-resolved Passive Microwave Retrieval of Soil Moisture & Vegetation Water Content, SMAP Science Utilization Meeting, November 27-28, 2018 (Arcadia, CA)
- A. Ebtehaj, A Physically Bounded Inversion Model for Improved Microwave Retrievals of Soil Moisture and Vegetation Water Content in L-band. A.M. Ebtehaj, A Physically Bounded Inversion for Improved Microwave Retrievals of Soil Moisture and Vegetation Water Content in L-band, Institute for Research in Statistics and its Applications, University of Minnesota, April 2018.

- A. Ebtehaj, Data Science and Geophysical Remote Sensing: Applications for Rainfall Remote Sensing from Space, Minnesota Institute of Mathematics and its Applications, Minneapolis, MN., 2017.
 - A. Ebtehaj, Improved Passive Microwave Retrievals of Precipitation from Space Using Sparse Approximation, Philadelphia. Society of Industrial Mathematics, Conference on Applied Mathematics Education (ED16), Mathematical Advances in Hydrology: Non-stationarity and Data Assimilation - Part I of II, 2016.
 - A. Ebtehaj, and E. Foufoula-Georgiou, Society of Applied and Industrial Mathematics (AN13), Variational Data Assimilation via Sparse Regularization (oral presentation), San Diego, CA, 2013.
 - A. Ebtehaj, Goddard Space Flight Center, ESSIC, On Estimation of Hydrometeorological Signals with Sparse Priors, Greenbelt, MD, 2012.
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Software Development

- Combined Constrained Multi-Channel Algorithm (C-CMCA) for passive microwave retrievals of soil moisture and vegetation water content in L-band https://ebtehaj.saf1.umn.edu/Codes/C_CMCA/
 - Constrained Multi-Channel Algorithm (CMCA) for passive microwave retrievals of soil moisture and vegetation water content in L-band <https://ebtehaj.saf1.umn.edu/Codes/CMCA/>
 - Sparse regularization for precipitation downscaling <https://ebtehaj.saf1.umn.edu/Codes/SPaD/>
 - Shrunk locally linear embedding for passive microwave retrieval of precipitation https://ebtehaj.saf1.umn.edu/Codes/ShARP_Demo/
 - Adaptive Fusion of Multi-sensor Precipitation using Gaussian Scale Mixtures in the Wavelet Domain https://ebtehaj.saf1.umn.edu/Codes/GSM_Precip_Fusion/
 - Compressive Earth Observatory <https://ebtehaj.saf1.umn.edu/Codes/CEO/>
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Professional Activities

Panel Services

- Panelist in NASA's Cryospheric Sciences.
- Panelist in NASA's GRACE-FO science team.

Editorial Services

- Associate Editor, *Journal of Hydrometeorology*, AMS 2016 – present

Reviewer

- Journal of Geophysical Research-Atmosphere
- Journal of Water Resources Research
- Journal of Geophysical Research Letter
- Journal of Hydrometeorology
- Journal of Advances in Water Resources, and Journal of Hydrology

Membership

- American Society of Civil Engineers 2007 – present
- American Geophysical Union 2007 – present
- Society of Industrial and Applied Mathematics 2011 – present
- Registered Professional Engineer (P.E.), Tehran, Iran 2002 – present

Technical Committee

- AGU hydrology section-precipitation technical committee member 2013–present
- U of M representative in University Corporation for Atmospheric Research 2017–present

Meeting Organization

- Sparse and Low-rank Modeling in the Geophysical Sciences, SIAM-AN13

- Novel Approaches in Stochastic Modeling of Precipitation, AGU-2019

Attended Workshops

- Interdisciplinary Summer School on Data Assimilation in Geosciences, Center for Scientific Computation and Mathematical Modeling, University of Maryland, June 3-14, 2013
- Applied Statistics and Machine Learning, Institute of Mathematics and its Applications, University of Minnesota, June 17-28, 2013

Projects

- Remote Sensing and Super-Resolution Imaging of Microplastics (ENRTF ID: 2021-223), Legislative-Citizen Commission on Minnesota Resources (LCCMR), Methods to Protect, Restore, and Enhance Land, Water, and Habitat 2021-2024 (PI) – \$309,000.
- Metric Learning for Joint Inversion of Land-atmosphere Radiative Transfer Equations: Improved Microwave Remote Sensing of Cryosphere and Atmosphere, National Aeronautics and Space Administration (NASA), Remote Sensing Theory (RST) program 2020-2023 (PI) – \$325,665.
- Improving Passive Microwave Retrieval of Snowfall and Snowpack on Ice-covered Surfaces, National Aeronautics and Space Administration (NASA), Interdisciplinary Science (IDS) program 2020-2023(PI) – \$369,658.
- Physically Constrained Inversion of the First-order Radiative Transfer Equations for High-resolution Retrievals of Soil Moisture and Vegetation Water Content using SMAP Data, National Aeronautics and Space Administration (NASA), Future Investigators in NASA Earth and Space Science, 2019-2022(PI) – \$134,736
- Reducing Uncertainties in GPM Snowfall Retrievals: Applications for Improved Prediction of Snowstorms, National Aeronautics and Space Administration (NASA), New Investigator Early Career Program (NIP), 2018-2021(PI) – \$262,478.
- Robust Variational Data Assimilation under Incomplete and Inaccurate Data: Extremes, Biases, and Observability in Joint Assimilation of Satellite Precipitation and Soil Moisture, National Aeronautics and Space Administration (NASA), Terrestrial Hydrology (THP) program, 2018-2021(PI) – \$299,469.
- Soil Moisture Super-resolution and Regularized Data Assimilation: Algorithms and Hydro-agronomic Application in SMAP Era, National Aeronautics and Space Administration (NASA), 2016-2019 (Co-PI) – \$150,000.
- Advanced Inversion Algorithms for GPM Passive Microwave Retrievals and Multi-sensor Merging, National Aeronautics and Space Administration (NASA), 2016-2019 (Co-PI), \$150,000.

Advisers

- Rafael L. Bras (Post-Doctorate in Hydrology)
- Efi Foufoula-Georgiou (Ph.D. in Hydrology and Water Resources)
- Gilad Lerman (M.Sc. in Mathematics)
- Abbas Afshar (M.Sc in Environmental Engineering)

Advisees

- Zeinab Takbiri (Ph.D., co-advising with Efi Foufoula-Georgiou, 2012-2018)
- Sagar Tamang (Ph.D., 2017-present)
- Lun Gao (Ph.D., 2017-present)
- Sajad Vahedizadeh (Ph.D., 2019-present)
- Morteza Sadeghi (Research Scientist, 2018-present)