Ardeshir Ebtehaj

Associate Professor · Civil and Environmental Engineering

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Education

University of Minnesota *Twin-Cities*

Ph.D. Civil and Environmental *2008 - 2013*

- Advisor: Prof. Efi Foufoula-Georgiou
- Thesis: Passive Microwave Remote Sensing of Precipitation

University of Minnesota *Twin-Cities*

M.Sc. Mathematics *2008 - 2013*

- Advisor: Prof. Gilad Lerman
- Thesis: Data Assimilation via Sparse Approximation

Iran University of Science and Technology *Tehran – Iran*

M.Sc. Environmental Engineering *1999 - 2001*

- Advisor: Prof. Abbas Afshar
- Thesis: Neuro-fuzzy systems for Assessing Groundwater Vulnerabilities

Iran University of Science and Technology *Tehran – Iran*

B.Sc. Civil Engineering *1994 - 1999*

Professional Experience

2021-	**Associate Professor**, University of Minnesota Twin-Cities
2016-2021	**Assistant Professor**, University of Minnesota Twin-Cities
2015-2016	**Assistant Professor**, Utah State University
2013-2015	**Postdoctoral Fellow**, Georgia Institute of Technology (Supervisor: Prof. Rafael L. Bras)
2008-2013	**Research Assistant**, University of Minnesota Twin-Cities
2012-2013	**NASA Earth and Space Science Fellow**, University of Minnesota Twin-Cities
2001-2008	**Professional Engineer**, Private Sector

Publications

1. Prodhan M., A. Ebtehaj, D. Kumawat, S. Kumar, A. Colliander, Y. Zhou, M. Schwank, R. Bindlish, and J.P. Wigneron, Learning Lake Ice Phenology and Freeze-Thaw Dynamics using L-band Radiometry: Insights from SMAP Satellite Observations, ***IEEE Trans. on Geosci. and Remote Sens.***, under review.

2. Garshasbi M., B. Subedi, A. Ebtehaj, L. Milani, J. Turk, and G. Huffman (2026), Incremental Learning for Passive Microwave Precipitation Retrievals Using Advanced Technology Microwave Sounder, ***IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens.***, DOI: 10.1109/JSTARS.2026.3691675.

3. Karunakaran D., A. Ebtehaj, L. Burnette, M. Hondzo, L. Olmanson (2026), Initial Assessment of the Detectability of Cyanotoxin Occurrence Using PACE Satellite Observations, ***Geophys. Res. Lett.***, https://doi.org/10.1029/2026GL122098.

4. Yiwen Zhou et al., (2026), Satellite Microwave Radiometry at L-Band for Monitoring Earth's Essential Climate Variables: From Fundamental Physics to Sixteen Years of Global Climate Observations and Beyond, ***IEEE Geoscience and Remote Sensing Magazine***. DOI: 10.1109/MGRS.2026.3665669.

5. Dahal S., A. Ebtehaj, M. Hondzo, M. Azhar, V. Kumar (2026), Structural Similarity Assessment of Precipitation and Temperature in NEX-GDDP-CMIP6 Simulations over the Contiguous United States, ***J. Hydrometeor.*** https://doi.org/10.1175/JHM-D-25-0163.1

6. Kumawat D, MD Zuber, A. Ebtehaj, V. Kumar; M. Steinbach (2025), Seasonal Ice Phenology of High-Latitude Lakes through Spaceborne L-Band Radiometry, ***IEEE International Geoscience and Remote Sensing Symposium***, DOI: 10.1109/IGARSS55030.2025.11244036

7. Kumawat D, A. Ebtehaj (2025), Can Deep Transformers Learn Global Peak Snow Water Equivalent From L-Band Surface Emissions?, ***IEEE International Geoscience and Remote Sensing Symposium***, DOI: 10.1109/IGARSS55030.2025.11242584

8. Helili. P., X. Li, J.P. Wigneron, G. De Lannoy, J. Peng, F. Frappart, J. Zeng, Y. Xiao, L. Karthikeyan, P. Rosnay, Z. Xing, A. Ebtehaj, A. Colliander, P. Konkath, K. Zhang, L. Fan (2025), Assessment and intercomparison of 23 global satellite and model-based soil moisture products using cosmic ray neutron sensing observations over Europe, ***Remote Sensing of Environ.***, https://doi.org/10.1016/j.rse.2025.115207

9. Kumawat D.*, A. Ebtehaj, S. Kumar, A. Colliander (2025), Deep learning of seasonal Peak Snow Water Content of Global Boreal Forest and Arctic using Spaceborne L-band Radiometry, ***Remote Sensing of Environ.***, https://doi.org/10.1016/j.rse.2025.114963

10. Azhar. M.*, A. Ebtehaj, J., Cohen, E. Foufoula-Georgiou (2025), On Risk of Rain on Snow over High-latitude Coastal Areas in North America, ***Geophys. Res. Lett.***, https://doi.org/10.1029/2025GL114775.

11. Rahimi R.*, A. Ebtehaj, L. Milani (2025), Advancing Passive Microwave Retrievals of Precipitation using CloudSat and GPM Coincidences: Integration of Machine Learning with a Bayesian Algorithm, ***J. Hydrometeor.*** https://doi.org/10.1175/JHM-D-24-0040.1

12. Kang H.*, A. Ebtehaj (2025), Machine Learning for Explanation of Sub-grid Convective Precipitation: A Case Study over CONUS using a Convection-allowing Model, ***Artificial Intelligence for the Earth Systems***, https://doi.org/10.1175/AIES-D-24-0062.1

13. Olyaei M.*, A. Ebtehaj, A Hyperspectral Reflectance Database of Plastic Debris with Different Fractional Abundance in River Systems (2024), ***Scientific Data, Nature***, 11, 1253.

14. Kumawat D.*, A. Ebtehaj, X. Xu, A. Colliander, V. Kumar (2024), An Autoencoder Architecture for L-band Passive Microwave Retrieval of Landscape Freeze-Thaw Cycle, ***IEEE Trans. on Geosci. and Remote Sens.***, under revision, https://arxiv.org/abs/2407.04119.

15. Kumawat D.*, A. Ebtehaj (2024), Deep Learning of the Soil Freeze-Thaw Cycle Using Satellite L-Band Radiometry, IGARSS, ***IEEE International Geoscience and Remote Sensing Symposium***, DOI: 10.1109/IGARSS53475.2024.10641878.

16. Yao X., X. Li, L. Fan, G.D. Lannoy, J. Peng, F. Frappart, A. Ebtehaj, P. Rosnay, Z. Xing, L. Yu, G. Dong, S. H. Yueh, A. Colliander, J.P. Wigneron (2024), Optimal model-based temperature inputs for global soil moisture and vegetation optical depth retrievals from SMAP, ***Remote Sens. Environ.***, Vol 311, 114240, https://doi.org/10.1016/j.rse.2024.114240.

17. M. Olyaei*, A. Ebtehaj (2023), Uncovering Plastic Litter Spectral Signatures: A Comparative Study of Hyperspectral Band Selection Algorithms, ***Remote Sens.*** 2024, 16(1), 172; https://doi.org/10.3390/rs16010172.

18. Kumawat D*, A. Ebtehaj, M. Schwank, J.P. Wigneron, X. Li (2023), Global Estimates of L-band Vegetation Optical Depth and Soil Permittivity over Snow-covered Boreal Forests and Permafrost using SMAP Satellite Data, ***Remote Sens. Environ.***, Vol 306, 114145, https://doi.org/10.1016/j.rse.2024.114145

19. Rahimi R*, P. Ravirathinam, A. Ebtehaj, A. Behrangi, J. Tan, and V. Kumar (2024), Global Precipitation Nowcasting of Integrated Multi-satellite Retrievals for GPM: A U-Net Convolutional LSTM Architecture, ***J. of Hydrometeor.***, https://doi.org/10.1175/JHM-D-23-0119.1.

20. You Y., G. Huffman, V. Petkovic, L. Milani, J. X Yang, A. Ebtehaj, S. Vahedizade*, G. Gu (2023), Evaluation of Snowfall Retrieval Performance of GPM Constellation Radiometers Relative to Spaceborne Radars, ***J. of Hydrometeor.***, https://doi.org/10.1175/JHM-D-22-0052.1.

21. M. Olyaei*, A. Ebtehaj, and J. Hong (2022), Optical Detection of Marine Debris using Deep Knock-off, ***IEEE Trans. on Geosci. and Remote Sens.***, 10.1109/TGRS.2022.3228638.

22. Kumawat D*., M. Olyaei*, L. Gao, A. Ebtehaj (2022), Passive Microwave Retrieval of Soil Moisture below Snowpack at L-band using SMAP Observations, ***IEEE Trans. on Geosci. and Remote Sens.***, 10.1109/TGRS.2022.3216324.

23. Vahedizade S.*, A. Ebtehaj, S. Tamang, Y. You, G. Panegrossi, S. Ringerud, F. J. Turk (2022), On the Effects of Cloud Water Content on Passive Microwave Snowfall Retrievals, ***Remote Sens. Environ.***, https://doi.org/10.1016/j.rse.2022.113187.

24. Rahimi R.*, A. Ebtehaj, G. Panegrossi, L. Milani, S. E. Ringerud, F. J. Turk (2022), Vulnerability of Passive Microwave Snowfall Retrievals to Physical Properties of Snowpack: A Perspective from Dense Media Radiative Transfer Theory, ***IEEE Trans. on Geosci. and Remote Sens.***, doi: 10.1109/TGRS.2022.3184530.

25. Gao L.*, Q. Gao, H. Zhange, X. Lif, M. Julian Chaubellg, A. Ebtehaj, L. Shen, J.P. Wigneron (2022), A Deep Neural Network Based SMAP Soil Moisture Product, ***Remote Sens. Environ.***, 277, 13059, https://doi.org/10.1016/j.rse.2022.113059.

26. Gao L.*, A. Ebtehaj, J. Cohen, J. P. Wigneron (2022), Variability and Changes of Unfrozen Soils below Snowpack, ***Geophys. Res. Lett.*** doi: 10.1029/2021GL095354.

27. Lia X., J.P Wigneron, L. Fan, F. Frappart, S. H. Yueh, A. Colliander, A. Ebtehaj, L. Gao*, R. Fernandez-Morane, X. Liu, M. Wang, H. Ma, C. Moisy, P. Ciaish (2022), A new SMAP soil moisture and vegetation optical depth product (SMAP-IB): algorithm, assessment and intercomparison, Vol 271, 112921, ***Remote Sens. Environ.***, https://doi.org/10.1016/j.rse.2022.112921.

28. Tamang S. K.*, A. Ebtehaj, P. J. Van Leeuwen, G. Lerman, E Foufoula-Georgiou (2022), Ensemble Riemannian Data Assimilation: Towards High-dimensional Implementation, ***Nonlin. Processes Geophys.***, 29, 77–92, 2022, https://doi.org/10.5194/npg-29-77-2022.

29. Ebtehaj A., M. Durand, M. Tedesco (2021), Constrained Inversion of a Microwave Snowpack Emission Model using Dictionary Matching: Applications for GPM Satellite, ***IEEE Trans. on Geosci. and Remote Sens.***, 10.1109/TGRS.2021.3115663.

30. Gao L.*, A. Ebtehaj, M.J. Chaubell, M. Sadeghi*, X. Li, J. P. Wigneron (2021), Reappraisal of SMAP Inversion Algorithms for Soil Moisture and Vegetation Optical Depth, ***Remote Sens. Environ.***, 264, 112627, https://doi.org/10.1016/j.rse.2021.112627.

31. Sadeghi M.*, A. Ebtehaj, M. Guala., J. Wang (2021), Physical Connection of Sensible and Ground Heat Flux, ***J. Hydrol.***, 602, 126687, https://doi.org/10.1016/j.jhydrol.2021.126687.

32. Turk F.J., S. E Ringerud, A. Camplani, D. Casella, R. J. Chase, A. Ebtehaj, J. Gong, M. Kulie, G. Liu, L. Milani, G. Panegrossi, R. Padulles, J. Rysman, P. Sano, S.Vahedizade, N. Wood (2021), Applications of a CloudSat-TRMM and CloudSat-GPM Satellite Coincidence Dataset, ***Remote Sensing***, 13, 2264. https://doi.org/ 10.3390/rs13122264.

33. Turk F.J., S. E. Ringerud, Y. You, A. Camplani, D. Casella, G. Panegrossi, P. Sanò, A. Ebtehaj, C. Guilloteau, N. Utsumi, C. Prigent, C. Peters-Lidard (2021), Adapting Passive Microwave-Based Precipitation Algorithms to Variable Microwave Land Surface Emissivity to Improve Precipitation Estimation from the GPM Constellation, ***J. of Hydrometeor***, https://doi.org/10.1175/JHM-D-20-0296.1.

34. Vahedizadeh S.*, A. Ebtehaj, Y. You, S. E. Ringerud, and F. J. Turk (2021), Passive Microwave Signatures and Retrieval of High-latitude Snowfall over Open Oceans and Sea Ice: Insights from Coincidences of GPM and CloudSat Satellites, ***IEEE Trans. on Geosci. and Remote Sens.***, doi: 10.1109/TGRS.2021.3071709.

35. Tamang S. K.*, A. Ebtehaj, P. J. Van Leeuwen, D. Zou, G. Lerman (2021), Ensemble Riemannian Data Assimilation over the Wasserstein Space, ***Nonlin. Processes Geophys.***, 28, 295–309, 2021, https://doi.org/10.5194/npg-28-295-2021.

36. 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 Sens. Environ.***, https://doi.org/10.1016/j.rse.2020.112019.

37. 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.

38. Tamang S.K.*, A. Ebtehaj, D. Zou, G. Lerman (2020), Regularized Variational Data Assimilation for Bias Treatment using the Wasserstein Metric, ***Q. J. R. Meteorol. Soc***, https://doi.org/10.1002/qj.3794. arXiv:2003.02421.

39. 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. Hydrol.***, https://doi.org/10.1016/j.jhydrol.2020.124717.

40. Gao L.*, M. Sadeghi*, A. Ebtehaj (2020), Microwave Retrievals of Soil Moisture and Vegetation Optical Depth with Improved Resolution using a Combined Constrained Inversion Algorithm: Application for SMAP Satellite, ***Remote Sens. Environ.***, https://doi.org/10.1016/j.rse.2020.111662.

41. Sadeghi M.*, A. Ebtehaj, W. T. Crow, L. Gao, A. J. Purdy, J. B. Fisher, S. B. Jones, E. Babaeian, and M. Tuller (2019), Global Estimates of Land Surface Water Fluxes from SMOS and SMAP Satellite Soil Moisture Data, ***J. of Hydrometeor***, https://doi.org/10.1175/JHM-D-19-0150.1.

42. Ebtehaj. A , 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.

43. Tamang S.K.*, A. Ebtehaj, A. F. Prein, A. J. Heymsfield (2019), Linking Global Changes of Snowfall and Wet-bulb Temperature, ***J. Clim.***, https://doi.org/10.1175/JCLI-D-19-0254.1., arxiv 1905.07776.

44. Ebtehaj, A., 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.

45. Takbiri Z.*, A. Ebtehaj, E Foufoula-Georgiou, P. E. Kirstetter, J. Turk (2018), A Prognostic Retrieval Approach for Microwave Precipitation Phase Detection over Snow Cover, ***J. of Hydrometeor***, https://doi.org/10.1175/JHM-D-18-0021.1.

46. Stefan H. Ellis. C., Gulliver J., Hondzo M., Paolo C., Marr J., Hill K., Guala, M., Ebtehaj A., Voller, V., Erickson. A., Kozarek, J., Hansen A., The St. Anthony Falls Laboratory: 80 Years of Progress Part 2A., Transition to Environmental Research, World Environmental and Water Resources Congress 2018, https://ascelibrary.org/doi/10.1061/9780784481394.016.

47. 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/1424-8220/17/9/2106.

48. Lin L., A. 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

49. Ebtehaj, A. and C. D. Kummerow (2017), Microwave Retrievals of Terrestrial Precipitation over Snow Covered Surfaces: A Lesson from the GPM Satellite, ***Geophys. Res. Lett.***, doi: 10.1002/2017GL073451

50. Takbiri Z., A. 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, 2017.

51. Lin L., A. Ebtehaj, R. L. Bras, and J. Wang (2017), Soil Moisture Background Error Covariance and Data Assimilation in a Coupled Land-Atmosphere Model, ***Water Resour. Res.***, doi: 10.1002/2015WR017548.

52. Moghim S., S McKnight, K Zhang, A. 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, ***Int. J. of Climatology***, doi -10.1002/joc.4728.

53. Ebtehaj, A, R.L. Bras, E. Foufoula-Georgiou (2016), Evaluation of ShARP passive rainfall retrievals over snow-covered land surfaces and coastal zones, ***J. Hydrometeor***, 17, 1013–1029.doi: http://dx.doi.org/10.1175/JHM-D-15-0164.1.

54. Ebtehaj, A, E. Foufoula-Georgiou, G. Lerman, R.L. Bras (2015), Compressive earth observatory: An insight from AIRS/AMSU retrievals, Geophys. Res. Lett., 42, 362-369, doi:10.1002/2014GL062711.

55. Ebtehaj, A., R.L. Bras, E. Foufoula-Georgiou (2015), Shrunken locally linear embedding for passive microwave retrieval of precipitation, ***IEEE Trans. on Geosci. and Remote Sens.***, vol 53(7), doi:10.1109/TGRS.2014.2382436.

56. Lin L., A. Ebtehaj, R. L. Bras, A. Flores, J. Wang (2015), Dynamical precipitation downscaling for hydrologic applications via WRF 4D-var data assimilation with Implication in GPM era, ***J. Hydrometeorl***, 16, 811-829.

57. Lipeng N., F. P. Carli, A. Ebtehaj, E. Foufoula-Georgiou, T.T. Georgiou (2014), Coping with the model error in data assimilation using optimal mass transport, ***Water Resour. Res.***, doi: 10.1002/2013WR014966.

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59. Foufoula-Georgiou E., A.M. Ebtehaj, S.Q. Zhang, A.Y. Hou (2013), Downscaling satellite precipitation with emphasis on extremes: A variational l1-norm regularization in the derivative domain, ***Surv. in Geophysics***, 10.1007/s10712-013-9264-9.

60. Ebtehaj, A., E. Foufoula-Georgiou (2013), On variational downscaling, fusion, and assimilation of hydro-meteorological states: A unified framework via regularization, ***Water Resour. Res.***, vol. 49, 1–20, doi:10.1002/wrcr.20424.

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64. Ebtehaj, A., and E. Foufoula-Georgiou (2010), Orographic signature on multiscale statistics of extreme rainfall: A storm-scale study, ***J. Geophys. Res.***, 115, D23112, doi:10.1029/2010JD014093.

65. Ebtehaj, A., 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.

66. A. Afshar, M.A. Mariño, A. Ebtehaj, Moosavi J., (2007), Rule-based fuzzy systems for assessing groundwater vulnerability ASCE, ***J. of Environ. Eng.***, 133(5), 532-540.

Book Chapters

Sadeghi, M., E. Babaeian, A. 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.

Teaching Experience

2016–2024	**Hydrologic Science and Design**, https://github.com/aebtehaj/Intro_Hydrology_Lectures	*U of M*
2017	**Environmental Data Sciences**,	*U of M*
2020	**Stochastic Hydrology**,	*U of M*
2021-2024	**Remote Sensing of Water and Environment**, https://github.com/aebtehaj/Remote-Sensing-Lectures	*U of M*
2023-2024	**Science and Engineering Ethics**,	*U of M*

Awards and Fellowships

2024-2027 **Soil Moisture Measurement (SMAP) Science Team Member**, NASA
2021-2024 **Precipitation Measurement Mission (PMM) Science Team Member**, NASA
2020-2021 **Editor Award, Journal of hydrometeorology**, American Meteorological Society
2018-2021 **New (Early Career) Investigator Program (NIP) Award in Earth Science**, NASA
2011-2012 **Outstanding Student Paper Award**, American Geophysical Union

2012-2015 **Earth and Space Science Fellowship**, NASA
2012-2013 **Edward Silberman Fellowship**, Saint Anthony Falls Laboratory, University of Minnesota
2012-2013 **Doctoral Dissertation Fellowship**, University of Minnesota
2011-2012 **Interdisciplinary Doctoral Fellowship**, Minnesota Center for Industrial Mathematics

Presentations

1. Advancing Nowcasting and Retrievals of Precipitation using CloudSat and GPM Coincidences: Integration of Machine and Deep Learning, NASA's precipitation science team meeting, San Diego, CA. 2024.
2. Global Estimates of L-band Vegetation Optical Depth and Soil Permittivity over Snow-covered Boreal Forests and Permafrost using SMAP Satellite Data, with Divya Kumawat, CA., 2023.
3. American Geophysical Union, On Deep Learning of Convective Precipitation Processes., with Hyoungseok Kang, San Francisco, CA., 2023.
4. American Geophysical Union, Optical Signatures of Plastic Litter: A probabilistic approach using Sparse Representation., with Mohammadali Olyaei, San Francisco, CA., 2023.
5. American Geophysical Union, A Deep Learning Architecture for Passive Microwave Precipitation Retrievals using CloudSat and GPM Observations., with Reyhaneh Rahimi, Chicago, IL., 2022.
6. American Geophysical Union, Global Precipitation Nowcasting of IMERGE Precipitation using a Convolutional Deep Neural Network – Can we outperform the Global Forecast System Model?, with Reyhaneh Rahimi, IL., 2022.
7. American Geophysical Union, Passive Microwave Retrieval of Soil Moisture below Snowpack at L-band using SMAP Observations with Divya Kumawat, Chicago, IL., 2022.
8. American Geophysical Union, Snowfall over Sea Ice: Learning from coincidences of GPM and CloudSat Satellites, with Sajad Vahedizadeh, San Francisco, CA. 2020.
9. American Geophysical Union, A temporal polarization ratio algorithm for calibration-free retrieval of soil moisture at L-band, with Lun Gao, San Francisco, CA. 2020.
10. American Geophysical Union, Ensemble Riemannian Data Assimilation over the Wasserstein Space with Sagar Tamang, San Francisco, CA. 2020.
11. Soil Science Society of America, A New Analytical Relationship between Sensible and Ground Heat Flux, with Sadeghi, M. and J. Wang. Phoenix, AZ 2020.
12. American Geophysical Union, 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. 2019.
13. American Geophysical Union, Formal Treatment of Bias under Chaotic Dynamics using Optimal Mass Transport, with Sagar Tamang, San Francisco, CA. 2019.
14. American Geophysical Union, Metric Learning for approximation of Microwave Channel Error Covariance: Application for Satellite Retrieval of Drizzle and Light Snowfall, San Francisco, CA 2019.
15. The National Soil Moisture Workshop, 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. 2019.
16. Soil Science Society of America, An Analytical Model Linking Satellite Retrievals of Surface Soil Moisture and Water Fluxes, with M. Sadeghi, S.B. Jones, M. Tuller, San Antonio, TX. 2019
17. American Geophysical Union, 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.

18. Ebtehaj, A., Bras, R. L., A Physically Constrained Inversion for Super-resolved Passive Microwave Retrieval of Soil Moisture and Vegetation Water Content in L-band, American Geophysical Union Fall Meeting, 2018.
19. Tamang S., A. Ebtehaj, Contrasting changes in Snowfall Dominant Regimes at hemispherical scale, American Geophysical Union Fall Meeting, 2018.
20. Gao L., A Ebtehaj, A Combined Dynamically Constrained Inversion for Super-resolved L-band Soil Moisture, American Geophysical Union Fall Meeting, 2018.
21. Takbiri Z., A. Ebtehaj, E. Foufoula-Georgiou, On Radiometric Interactions of Snowfall and Snow Cover: An Experimental Approach Using GPM Satellite Data, American Geophysical Union Fall Meeting, 2018.
22. Z. Takbiri, A.M. Ebtehaj, E. Foufoula-Georgiou, P. Kirstetter, J. Turk A Prognostic Methodology for Precipitation Phase Detection using GPM Microwave Observations —With Focus on Snow Cover, American Geophysical Union, San Francisco, CA., 2017.
23. B. Sloan, A.M. Ebtehaj, M. Guala, Parametrizing Evaporative Resistance for Heterogeneous Sparse Canopies through Novel Wind Tunnel Experimentation, American Geophysical Union, San Francisco,
24. Z. Takbiri, A.M. Ebtehaj, E. Foufoula-Georgiou, P. Kirstetter, J. Turk, Passive Retrieval of Snowfall over Snow Cover: Lessons from GPM and Algorithms, NASA Precipitation Measurement Missions (PMM) Science Team Meeting, 2017. CA., 2017.
25. Z. Takbiri, A.M. Ebtehaj, E. Foufoula-Georgiou, Inundation Retrieval Using Passive Microwave Observations, American Geophysical Union, San Francisco, CA., 2016.
26. A.M. Ebtehaj, E. Foufoula-Georgiou, Towards better understanding of high-mountain cryosphere changes using GPM data: A Joint Snowfall and Snow-cover Passive Microwave Retrieval Algorithm, American Geophysical Union, San Francisco, CA., 2016.
27. Lin L., A.M. Ebtehaj, A. Flores, S. Bastola, R. L. Bras., Assimilation of Satellite Precipitation and Soil Moisture Data into a Coupled Land-Atmosphere Model (oral presentation), American Geophysical Union, with, San Francisco, CA., 2016.
28. Esfahani L., Ebtehaj A.M., A. Torres, M McKee, Application of Unmanned Aerial Systems in Spatial Downscaling of Landsat VIR imageries of Agricultural Fields, in collaboration with, American Geophysical Union, San Francisco, CA., 2016.
29. A.M. Ebtehaj, R. L. Bras, E. Foufoula-Georgiou, Rainfall Microwave Spectral Atoms: A New Class of Bayesian Algorithms for Passive Retrieval (oral presentation), American Geophysical Union, San Francisco, CA., 2015.
30. A.M. Ebtehaj, R. L. Bras, E. Foufoula-Georgiou, Rainfall Microwave Atoms: A New Variational Approach for Combined Passive Retrievals, NASA Precipitation Measurement Mission, Baltimore, MD., 2015.
31. A.M. Ebtehaj, R. L. Bras, E. Foufoula-Georgiou, A New Framework for Robust Retrieval and Fusion of Active/Passive Multi-Sensor Precipitation (oral presentation), American Geophysical Union, San Francisco, CA., 2014.
32. A.M. Ebtehaj, R. L. Bras, E. Foufoula-Georgiou, Shrunken Locally Linear Embedding Algorithm for Passive Retrieval of Precipitation (ShARP), NASA Precipitation Measurement Mission, Baltimore, MD., 2014.
33. A.M. Ebtehaj, R. L. Bras, E. Foufoula-Georgiou, A New Algorithm for GPM Passive Microwave Rainfall Retrieval: Extremes, Discontinuities and Spatial Structure (oral presentation), NASA Precipitation Measurement Mission, Baltimore, MD., 2014.
34. A.M. Ebtehaj, E. Foufoula-Georgiou, From Rainfall Downscaling to Rainfall Retrieval: Inverse Problems of Similar Nature, European Geophysical Union, Vienna, Austria, 2014.
35. A.M. Ebtehaj, E. Foufoula-Georgiou, Passive Microwave Rainfall Retrieval: A Mathematical Approach via Sparse Learning, American Geophysical Union, San Francisco, CA , 2013.
36. A.M. Ebtehaj, E. Foufoula-Georgiou, Coping with Model Uncertainty in Data Assimilation using Optimal Mass Transport (oral presentation), American Geophysical Union, San Francisco, CA., 2013
37. A.M. Ebtehaj, E. Foufoula-Georgiou, Variational Data Assimilation via Sparse Regularization, European Geophysical Union, Vienna, Austria, 2013.

38. A.M. Ebtehaj, E. Foufoula-Georgiou, Precipitation: From Measurement to Modelling and Application in Catchment Hydrology, European Geophysical Union, Vienna, Austria, 2013.

39. A.M. Ebtehaj, E. Foufoula-Georgiou, On Adapting Data Assimilation Framework to Data Fusion of Multi-scale Precipitation Observations, American Geophysical Union, San Francisco, CA., 2012.

40. A.M. Ebtehaj, E. Foufoula-Georgiou, Variational Rainfall Fusion and Downscaling via l1-Regularization in the Wavelet Domain (oral presentation), American Geophysical Union, San Francisco, CA., 2012.

41. A.M. Ebtehaj, E. Foufoula-Georgiou, Regularized Data Assimilation and Fusion of non-Gaussian States Exhibiting Sparse Prior in Transform Domains, American Geophysical Union, San Francisco, CA., 2012.

42. A.M. Ebtehaj, E. Foufoula-Georgiou, Adaptive Fusion and Sparse Estimation of Multi-sensor Precipitation (oral presentation), American Geophysical Union, San Francisco, CA., 2011.

43. A.M. Ebtehaj, E. Foufoula-Georgiou, NASA Precipitation Measurement Missions (PMM) Science Team Meeting, Sparse Precipitation Downscaling and Multisensor Retrieval, Denver, CO, 2010.

44. A.M. Ebtehaj, E. Foufoula-Georgiou Multi-sensor Precipitation Data Fusion with Emphasis on Extremes, San Francisco, American Geophysical Union, CA, 2010.

45. A.M. Ebtehaj, E. Foufoula-Georgiou, Multi-sensor Precipitation Data Fusion with Emphasis on Extremes, NASA Precipitation Measurement Missions (PMM) Science Team Meeting, Seattle, WA, 2010.

46. A.M. Ebtehaj, E. Foufoula-Georgiou, Orographic Signature on Multiscale Statistics of Extreme Rainfall: The Rapidan Storm of June 1995, American Geophysical Union, San Francisco, CA, 2009.

Invited Talks

Fall 2024. *Advancing Nowcasting and Retrievals of Precipitation using CloudSat and GPM Coincidences: Integration of Machine and Deep Learning, NASA PMM science team meeting.*

Fall 2023. *Remote of Snow-covered Permafrost and Boreal Forests using L-band Microwaves*, Jet Propulsion Laboratory.

Spring 2023. *Remote Sensing of soil-snow-vegetation continuum at L-band*, The Scientific and Technological Research Council of Turkiye.

Winter 2022. *Remote Sensing of soil-snow-vegetation continuum at L-band*, UC-Davis CA.

Winter 2021. Physically-informed Inverse Problems in Satellite Hydrology, University of California Irvine, Irvine., CA.

Winter 2020. *A Physically Bounded Inversion Model for Improved Microwave Retrievals of Soil Moisture and Vegetation Water Content in L-band.*, The University of Iowa, Iowa City, IA.

Fall, 2019. *A Physically Bounded Inversion Model for Improved Microwave Retrievals of Soil Moisture and Vegetation Water Content in L-band.*, Jet Propulsion Laboratory, Pasadena, CA.

Winter 2018. *A Physically Bounded Inversion for Improved Microwave Retrievals of Soil Moisture and Vegetation Water Content in L-band*, SMAP Science Utilization Meeting #2, Arcadia, CA.

Spring 2018. *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, Minneapolis, MN.

Spring 2017. *Data Science and Geophysical Remote Sensing: Applications for Rainfall Remote Sensing from Space.*, Minnesota Institute of Mathematics and its Applications, Minneapolis, MN.

Spring 2016. *Improved Passive Microwave Retrievals of Precipitation from Space Using Sparse Approximation.*, Society of Industrial Mathematics, Conference on Applied Mathematics Education (ED16), Mathematical Advances in Hydrology: Non-stationarity and Data Assimilation - Philadelphia, PA.

Spring 2013. *Variational Data Assimilation via Sparse Regularization.*, Society of Industrial Mathematics, Conference on Applied Mathematics Education (AN13), San Diego, CA.

Winter 2012. *On Estimation of Hydrometeorological Signals with Sparse Priors.*, Goddard Space Flight Center, ESSIC, Greenbelt, MD.

Software Developments and Data Sets

1. Machine Learning for Explanation of Sub-grid Extreme Convective Precipitation
   : https://github.com/hs-safl/CPF_demo
2. FTC-Encoder: A convolutional autoencoder framework for probabilistic characterization of the ground freeze-thaw dynamics using satellite data
   : https://github.com/aebtehaj/FTCEncoder
3. A Hyperspectral Reflectance Database of Plastic Debris in River Ecosystems
   : https://github.com/aebtehaj/Hyperspectral_reflectance_library
4. Passive Microwave retrieval of soil moisture below snowpack at L-band
   : https://github.com/aebtehaj/SM-Snow-L-band
5. Inversion of the Dense Media Radiative Transfer model
   : https://github.com/aebtehaj/DMRT_inv_demo
6. Global Precipitation Nowcasting using Convolutional LSTM deep neural network
   : https://github.com/reyhaneh-92/GENESIS_Nowcast
7. SWEFormer: A transformer-based deep learning architecture to predict the peak Snow water equivalent using L-band brightness temperature observations from NASA's SMAP satellite
   : https://github.com/Divak14/SWEFormer
8. Incremental Learning for Passive Microwave Precipitation Retrievals using Advanced Technology Microwave Sounder
   : https://github.com/MahyarGarshasbi/TLP-R2S-ATMS/
9. Learning Lake Ice Phenology and Freeze-Thaw Dynamics using L-band Radiometry: Insights from SMAP Satellite Observations
   : https://github.com/prodh004/LIMEM

Projects

1. Investigator status (Co-PI)
   External Agency: National Aeronautics and Space Administration Project title: Advanced Inversion Algorithms for GPM Passive Microwave Retrievals and Multi-sensor Merging
   Project dates: June 2016- 2019
   Total budget: $ 150,000
2. Investigator status (Co-PI)
   External Agency: National Aeronautics and Space Administration
   Project title and Dates: Soil Moisture Super-resolution and Regularized Data Assimilation: From Algorithm to Hydro-agronomic Applications in SMAP Era
   Project dates: June 2016- 2019
   Total budget: $150,000
3. Investigator status (PI) External Agency: National Aeronautics and Space Administration
   Project title: Physically Constrained Inversion of the First-order Radiative Transfer Equations for High-resolution Retrievals of Soil Moisture and Vegetation Water Content using SMAP Data
   Project dates: September 2019- 2022
   Total budget: $135,000
4. Investigator status (PI)
   External Agency: National Aeronautics and Space Administration
   Project title: Robust Variational Data Assimilation under Incomplete, Extremes, Biases, and Observability in Joint Assimilation of Satellite Precipitation and Soil Moisture
   Project dates: September 2018- 2021
   Total budget: $299,469
5. Investigator status (PI)
   External Agency: National Aeronautics and Space Administration
   Project title: Reducing Uncertainties in GPM Snowfall Retrievals: Applications for Improved Prediction of Snowstorms

Project dates: September 2018- 2021
Total budget: $262,478

6. Investigator status (PI)
   External Agency: National Aeronautics and Space Administration
   Project title: Improving Passive Microwave Retrieval of Snowfall and Snowpack on Ice-covered Surfaces Project dates: October 2020- 2023
   Total budget: $369,658

7. Investigator status (PI)
   External Agency: National Aeronautics and Space Administration
   Project title and Dates: Metric Learning for Joint Inversion of Land-atmosphere Radiative Transfer Equations: Improved Microwave Remote Sensing of Cryosphere and Atmosphere
   Project dates: October 2020-2023
   Total budget: $325,665

8. Investigator status (PI)
   External Agency: Legislative-Citizen Commission on Minnesota Resources
   Project title: Remote Sensing of Microplastics in Minnesota Waters
   Project dates: August 2021-2024
   Total budget: $309,000

9. Investigator status (PI)
   External Agency: Office of Vice President for Research
   Project title: Grant-in-aid for Purchasing an ASD Hyperspectral Spectroradiometer
   Project dates: December 2021-2024
   Total budget: $36,500

10. Investigator status (PI)
    External Agency: National Aeronautics and Space Administration
    Project title: Extending Forecast Skills of Global Precipitation: A Deep Learning Framework for IMERG Data Assimilation over the Wasserstein Space, GPM Science Team
    Project dates: January 2022-2025
    Total budget: $447,534

11. Investigator status (PI)
    External Agency: National Aeronautics and Space Administration
    Project title: A Multi-Decadal Satellite Snowfall data RecOrd (MAESTRO)
    Project dates: July 2023-2028
    Total budget: $2,900,000

12. Investigator status (PI)
    External Agency: Legislative-Citizen Commission on Minnesota Resources Project title: Hyperspectral Characterization of Harmful Algal Blooms
    Project dates: August 2024-2027
    Total budget: $399,000

13. Investigator status (PI)
    External Agency: Legislative-Citizen Commission on Minnesota Resources
    Project title: The Fate of Minnesota Lakes in the Next Century
    Project dates: August 2024-2027
    Total budget: $460,000

14. Investigator status (Co-PI)
    External Agency: DOD, United States Army Corps of Engineers
    Project title: Harmful Algal Blooms, remote sensing and removal technologies
    Project dates: January 2025-2028
    Total budget: $2,100,000

15. Investigator status (PI)

External Agency: National Aeronautics and Space Administration, SMAP Science Team
Project title: Arctic Lake-ice Phenology and Methane Emissions: Can SMAP Observations Shrink the Uncertainties?
Project dates: January 2025-2028
Total budget: $500,000

16. Investigator status (PI)
External Agency: National Aeronautics and Space Administration, SMAP Science Team
Project title: High-Fidelity Modeling of Net Ecosystem Exchange Responses to Winter and Shoulder Season Heat-waves in the Arctic and Boreal Zone
Project dates: September 2025-2028
Total budget: $730,000

Outreach & Professional Development

Editorial and Review Services

2024-Pres **Editor,** *Journal of Hydrometeorology*,
2016-2024 **Associate Editor,** *Journal of Hydrometeorology*,
Reviewer, *Journal of Geophysical Research-Atmosphere*,
Reviewer, *Journal of Water Resources Research*,
Reviewer, *Journal of Geophysical Research Letter*,
Reviewer, *Journal of Advances in Water Resources*,
Reviewer, *Journal of Hydrology*,
Reviewer, *Tellus A, Dynamic Meteorology and Oceanography*,
Panleist, *Cryosphere Sciences, NASA*,
Reviewer, *NSF Hydrologic Sciences*,
Panleist, *NASA EPSCoR*,
Panleist, *NSF EPSCoR*,
Panleist, *NASA GRACE-FO satellite Science team*,
Panleist, *NASA Terrestrial Hydrology Program*,
Panleist, *NASA Future Investigator Program*,
Panleist, *NASA Biodiversity and Eco Forecasting Program*,

Organization of conferences, workshops, panels, symposia

- Sparse and Low-rank Modeling in the Geophysical Sciences, SIAM-AN13 (Committee)
- Statistical Characterization and Probabilistic Modeling of Precipitation Variability and Extremes Across Multiple Scales, AGU 2018 (Committee Co-chair)
- Machine Learning for Precipitation Remote Sensing, AGU 2021(Committee Co-chair)

Community Services

- Member representative of the University of Minnesota at the University Corporation for Atmospheric Research (UCAR, 2016, present)
- Faculty Senate (2022-present)
- Executive committee member of the UMN data science center (2022-present)

Advises

Zeinab Takbiri, PhD (2018)

Morteza Sadeghi, Research Scientist (2020)

Lun Gao, PhD (2021)

Sagar Tamang, PhD (2021)

Sajad Vahedizadeh, PhD (2022)

Reyhaneh Rahimi, PhD (2025)

Mohammadali Olyaie, PhD (2025)

Mohammed Azhar, Postdoc (2024-2025)

Divya Kumawat, PhD (current)

Buddha Subedi, PhD (current)

Mahyar Garshasbi, PhD (current)

Sandesh Dahal, PhD (current)

Denesh K., PhD (current)

Mehedi Prodhan, PhD (current)

Lucas Burnette, PhD (current, co-advised with Prof. Hondza)

Shaoming Xu, PhD (current, co-advised with Prof. Kumar)

MD Zuber, M.Sc (current)