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Models, Learning and Sensing in Hydrology

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What is the Optimal Mixture of Space-borne Sensors for Remote Sensing of Terrestrial Freshwater?: A Comparative Analysis of Passive Optical, Passive Microwave, Active Microwave, and LiDAR Retrievals

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Abstract: An observing system simulation experiment (OSSE) is used to evaluate different observing strategies of terrestrial freshwater and to help create a mission planning tool with a particular focus on the coupled snow-soil moisture-vegetation system at the land surface. The NASA Land Information System (LIS) is used to model the spatiotemporal dynamics of the hydrologic cycle. LIS is then linked to the Trade-space Analysis Tool for Constellations (TAT-C) in order to provide a realistic view of land surface conditions as seen by a given space-borne sensor that is then used to generate synthetic, space-borne retrievals of snow, soil moisture, and vegetation. The merger of LIS with TAT-C enables the simulation of different mixtures of space-borne sensors designed to explore the trade-off in scientific utility related to passive microwave radiometry, microwave RADAR, and optical LiDAR. An ensemble-based data assimilation framework is employed to systematically merge the land surface model with the space-borne retrievals of snow, soil moisture, and/or vegetation. The results from the OSSE enable systematic comparisons across a wide range of different observing system strategies. The end result of this project will be a framework to help decide how to harness the information content of Earth science mission data in order to best characterize the spatiotemporal dynamics of freshwater in the natural environment.

Moderated by Dr. Jawairia Ashfaq Ahmad, Centre for Water Informatics & Technology (LUMS)

Speaker Biography: Dr. Bart Forman is currently an associate professor of civil engineering at the University of Maryland. He completed his undergraduate studies in Civil Engineering at the University of Virginia and then pursued his master's and doctorate degrees in Civil Engineering at UC Berkeley and UCLA, respectively. Upon completion of his Ph.D. in 2010, Dr. Forman was awarded a NASA Postdoctoral Fellowship at the Goddard Space Flight Center in Greenbelt, Maryland. Dr. Forman is a member of the NASA GRACE / GRACE-FO Science Team and the NASA High Mountain Asia Science Team. He was awarded a Fulbright Scholarship to conduct research in India during 2019-2020. Dr. Forman's current research interests include the use of artificial intelligence and machine learning algorithms to diagnose passive microwave observations over snow-covered land in conjunction with space-borne measurements of the Earth's gravitational field to better diagnose terrestrial water storage during periods of flood or drought.

The webinar can be attended via Zoom. In order to attend, the participants must register at the following link:
https://wit.lums.edu.pk/MLSH2022
Instructions to log into the webinar will be sent via email.

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