Microwave Sensing Through the Subsurface for Addressing the Water Puzzle
Mahta Moghaddam

Abstract

Active microwave remote sensing has long been recognized as a key component of an effective environmental observing strategy, due to the strong relationships of radar measurements with geometric and compositional properties of the Earth's landscape. In particular, radar signals of various wavelengths are sensitive to changes in water state and content of foliage, soils, ice, aquifers, and permafrost. Characterizing and monitoring water resources are of critical importance in today's world because there is only a limited supply of fresh water globally. With increasing population and changes in the global climate, water-related issues have been identified by the Intelligence Community as an important factor in the US world-wide threat assessment. Much of the environmental remote sensing work discussed in this talk has been motivated and designed based on the above recognition. This talk starts by a brief description of some of the critical problems in the remote sensing of water resources today, and discusses how our research addresses several components of these problems by developing new low-frequency (e.g., P-band) spaceborne and airborne radar sensor technologies, electromagnetic scattering and inverse scattering models, and in-situ sensor networks. The emerging research on subsurface characterization is discussed, which aims to map the profiles of soil water content from surface to the root zone, variations in permafrost properties, and ground water.

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Mahta Moghaddam is Professor of electrical engineering at the University of Southern California (USC) Ming Hsieh department of electrical engineering. Until 2011, she was at the University of Michigan. She received the Ph.D. degree in electrical and computer engineering from the University of Illinois, Urbana, in 1991. From 1991 to 2003, she was with the Jet Propulsion Laboratory (JPL), Pasadena, CA. During the past ~25 years of active involvement in environmental remote sensing Dr. Moghaddam has introduced new approaches for quantitative interpretation of synthetic aperture radar imagery. Her most recent contributions include the development of new radar measurement technologies for subsurface and subcanopy characterization, development of forward and inverse scattering techniques for layered random

media with rough interfaces, developing sensor web technologies for in-situ environmental sensing, and transforming concepts of radar remote sensing to high-resolution medical imaging. She is a member of the NASA Soil Moisture Active and Passive (SMAP) mission Science Team, member of the Arctic-Boreal Vulnerability Experiment (ABoVE) Science Team, and was the PI for AirMOSS NASA Earth Ventures Suborbital 1 Mission. She is a Fellow of IEEE, Editor-in-Chief of the IEEE Antennas and Propagation Magazine, and a 2016 recipient of the NASA Outstanding Public Leadership Medal for "Outstanding Leadership in Advancement of Microwave Remote Sensing."