MEETING

Understanding Snow Microstructure for Microwave Remote Sensing

Workshop on Microstructure in Snow Microwave Radiative Transfer; Reading, United Kingdom, 6–8 August 2014

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Scientists from the snow and soil remote sensing communities met to build on recent developments in objective snow microstructure measurement techniques by improving the understanding of their application in remote sensing at microwave frequencies.

On the first day of Snow Microwave Radiative Transfer meeting (MicroSnow), participants concentrated on reviewing historic observations, theory, and new techniques to quantify the microstructure of snow. Current emission and backscattering models were presented and discussed, with a focus on the theory and implementation of microstructure within these models and the model limitations.

On the first evening, a model clinic was held in which microwave scattering models were made available to workshop participants while the model developers were on hand to assist with any questions. The second day was devoted to new microstructure theory and its application, uncertainties in model inputs, model evaluation, and an intercomparison of microwave models. On the third day, a morning session covering applications of those models to satellite retrievals was followed by an afternoon discussion on the future of theory, applications, and collaborative efforts within the snow research community.

Significant progress has been made in understanding how to quantify snow microstructure. At present, only one length scale is used in most microwave scattering models of snow (either an effective diameter or a correlation length), to which the scattering of microwave radiation is very sensitive. However, these models rarely work perfectly and often require an empirical correction factor to compensate for spherical grain assumptions.

MicroSnow paved the way to defining the steps needed to allow full microstructural information to be used in microwave scattering models. This approach will move the community away from subjective or empirical corrections and toward microstructure quantification using an objective and physics-based interpretation that will be consistent across microwave models.

Stratigraphy, representation of soil and melt-freeze processes, and vegetation effects are other areas of significant research activities that will contribute to global-scale remote sensing of snow. There is a strong need and desire for a satellite mission to measure global snow water equivalent at high resolution, and an improved understanding and representation of snow microstructure will be at the core of such an effort. The research community represented at MicroSnow is well coordinated and is moving toward collection of a gold-standard data set for evaluation of improved snow remote sensing retrieval systems.

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