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Precipitation estimation over complex terrain from passive microwave observations

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Precipitation retrieval from satellite passive microwave observations is an ill-posed problem, i.e. multiple solutions are possible. This is especially true overland where the warm background significantly limits the information provided by microwave brightness temperatures. The problem is even more challenging over complex terrain because large variations in the height and the temperature of the surface make clear sky radiances harder to distinguish from rain affected radiances. To overcome these indeterminacies, an ensemble based methodology is proposed. The methodology consists of the generation of an ensemble of parallel runs of cloud resolving models and the simulation of associated microwave brightness temperatures. The ensemble is generated by including random perturbations into the model's initial conditions. A Kalman Filter formulation is used to determine the model's state variables most consistent with the satellite observations. The methodology is tested on a storm that occurred over Crete in November 2003. The Weather Research and Forecasting (WRF) model is used in the study to produce the ensemble needed to investigate the relationships between precipitation and brightness temperatures. Initial and boundary conditions for WRF are derived from Global Forecasting Model (GFS) analyses. Results indicate the feasibility of the approach. General implications on precipitation retrievals over complex terrain in the Mediterranean region will be discussed during the presentation.