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Potential reduction of uncertainty in passive microwave precipitation retrieval by the inclusion of dynamical, thermodynamical, and hydrological constraints as the Cloud Dynamics Radiation Database (CDRD) approach

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Physically based precipitation retrieval algorithm under study uses Bayesian approach to find microphysical profiles solution applied within a subset of Cloud Radiation Database (CRD), which consists of many realizations with sets of relationships between brightness temperatures (TBs) and rain rates. However, the relationship between the simulated microphysical profiles and the simulated multi-spectral TBs are not likely unique, as many configurations of liquid and ice hydrometeors in different directions can generate an observed set of multispectral TBs. Therefore during precipitation retrieval, given a set of observed TB's, one can often match with sets of simulated microphysical profiles with strongly different precipitation outcomes. To improve precipitation estimation, additional constraints that could describe the dynamical / thermodynamical state of the atmosphere at the time of retrieval are needed. Fortunately, constraints are typically available in the form of recent or short term projections of the synoptic situation which dramatically reduces the number of applicable profiles in the data base, when the profiles include the synoptic situation in effect when the profiles were simulated. The Cloud Dynamics and Radiation Database (CDRD) approach is an attempt to include this additional information in the CRD to increase the available constraints in selecting applicable database entries used in the estimation procedure. In this paper, we are going to determine by thorough statistical analysis of North America CDRD, degree to which uncertainty in precipitation estimation can be reduced through use of dynamincal / thermodynamical constraints.