Geophysical Research Abstracts,
Vol. 11, EGU2009-13652, 2009
EGU General Assembly 2009

Statistical analysis of a new European Cloud Dynamics and Radiation Database

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Physically-based algorithms for the retrieval of precipitation from satellite-borne microwave (MW) radiometers, make use of Cloud Radiation Databases (CRD's) that are composed of thousands of detailed microphysical cloud profiles, obtained from Cloud Resolving Model (CRM) simulations, coupled with the corresponding brightness temperatures (T_B's), calculated by applying Radiative Transfer (RT) schemes to the CRM outputs. Usually, CRD's are generated on the basis of CRM simulations of past precipitation events and then utilized for the analysis of satellite observations of new events.

Notably, retrieval precision and accuracy is strictly related to the appropriate generation of the cloud profile datasets associated to the typologies of the observed precipitation events more than to an *a-posteriori* statistical treatment of uncertainties. In essence, the retrieval performance can be improved by generating a statistically significant CRD by means of a large number of different CRM simulations representing all precipitation regimes that are of interest for the zone(s) and season(s) under investigation. In addition, it should be noted that despite some reasonable successes with the CRD and the Bayesian approach, there is a considerable reservoir of potential information available that has not been yet tapped. This ancillary information exists in the knowledge of the "synoptic situation" of the considered event and the geographical and temporal location of the event. This knowledge renders some entries into the CRD more relevant than others by virtue of how similar the circumstances of the simulated events are to those of the event for which the database is applied. We can capture this information in the form of "dynamical tags" which can be used to link a satellite-observed event to a subset of the entire CRD using an independent estimate of these tags. To accomplish this, we have expanded the CRD approach so as to include these "dynamical tags" and have developed a new passive MW precipitation retrieval algorithm which employs these tags in addition to the upwelling T_B's. We call these the Cloud Dynamics and Radiation Database (CDRD) approach and the CDRD Algorithm, respectively.

Recently, we have generated a CDRD database for Europe using a large amount of CRM simulations of precipitating systems over this area by means of the "University of Wisconsin – Non-hydrostatic Modeling System" (UW-NMS). In our presentation, we will briefly review the main design features of the CDRD approach and will show an analysis of the statistical properties of this highly-populated European CDRD database. Finally, we will compare its radiative characteristics with an equivalent set of MW radiometric measurements from polar satellites.