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The new Cloud Dynamics and Radiation Database algorithms for AMSR2 and GMI: exploitation of the GPM observational database for operational applications

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Two new precipitation retrieval algorithms for the Advanced Microwave Scanning Radiometer 2 (AMSR2) and for the GPM Microwave Imager (GMI) are presented. The algorithms are based on the Cloud Dynamics and Radiation Database (CDRD) Bayesian approach and represent an evolution of the previous version applied to Special Sensor Microwave Imager/Sounder (SSMIS) observations, and used operationally within the EUMETSAT Satellite Application Facility on support to Operational Hydrology and Water Management (H-SAF). These new products present as main innovation the use of an extended database entirely empirical, derived from coincident radar and radiometer observations from the NASA/JAXA Global Precipitation Measurement Core Observatory (GPM-CO) (Dual-frequency Precipitation Radar-DPR and GMI). The other new aspects are: 1) a new rain-no-rain screening approach; 2) the use of Empirical Orthogonal Functions (EOF) and Canonical Correlation Analysis (CCA) both in the screening approach, and in the Bayesian algorithm; 2) the use of new meteorological and environmental ancillary variables to categorize the database and mitigate the problem of non-uniqueness of the retrieval solution; 3) the development and implementations of specific modules for computational time minimization. The CDRD algorithms for AMSR2 and GMI are able to handle an extremely large observational database available from GPM-CO and provide the rainfall estimate with minimum latency, making them suitable for near-real time hydrological and operational applications.
As far as CDRD for AMSR2, a verification study over Italy using ground-based radar data and over the MSG full disk area using coincident GPM-CO/AMSR2 observations has been carried out. Results show remarkable AMSR2 capabilities for rainfall rate (RR) retrieval over ocean (for RR > 0.25 mm/h), good capabilities over vegetated land (for RR > 1 mm/h), while for coastal areas the results are less certain. Comparisons with NASA GPM products, and with ground-based radar data, show that CDRD for AMSR2 is able to depict very well the areas of high precipitation over all surface types. Similarly, preliminary results of the application of CDRD for GMI are also shown and discussed, highlighting the advantage of the availability of high frequency channels (> 90 GHz) for precipitation retrieval over land and coastal areas.