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CDRD and PNPR passive microwave precipitation retrieval algorithms: verification study over Africa and Southern Atlantic

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The ongoing NASA/JAXA Global Precipitation Measurement mission (GPM) requires the full exploitation of the complete constellation of passive microwave (PMW) radiometers orbiting around the globe for global precipitation monitoring. In this context the coherence of the estimates of precipitation using different passive microwave radiometers is a crucial need.
We have developed two different passive microwave precipitation retrieval algorithms: one is the Cloud Dynamics Radiation Database algorithm (CDRD), a physically ¬based Bayesian algorithm for conically scanning radiometers (i.e. DMSP SSMIS); the other one is the Passive microwave Neural network Precipitation Retrieval (PNPR) algorithm for cross¬-track scanning radiometers (i.e. NOAA and MetOp¬A/B AMSU-¬A/MHS, and NPP Suomi ATMS). The algorithms, originally created for application over Europe and the Mediterranean basin, and used operationally within the EUMETSAT Satellite Application Facility on Support to Operational Hydrology and Water Management (H-SAF, http://hsaf.meteoam.it), have been recently modified and extended to Africa and Southern Atlantic for application to the MSG full disk area. The two algorithms are based on the same physical foundation, i.e. the same cloud-radiation model simulations as a priori information in the Bayesian solver and as training dataset in the neural network approach, and they also use similar procedures for identification of frozen background surface, detection of snowfall, and determination of a pixel based quality index of the surface precipitation retrievals. In addition, similar procedures for the screening of not ¬precipitating pixels are used. A novel algorithm for the detection of precipitation in tropical/sub-tropical areas has been developed. The precipitation detection algorithm shows a small rate of false alarms (also over arid/desert regions), a superior detection capability in comparison with other widely used screening algorithms, and it is applicable to all available PMW radiometers in the GPM constellation of satellites (including NPP Suomi ATMS, and GMI).
Three years of SSMIS and AMSU/MHS data have been considered to carry out a verification study over Africa of the retrievals from the CDRD and PNPR algorithms. The precipitation products from the TRMM ¬Precipitation radar (PR) (TRMM product 2A25 and 2A23) have been used as ground truth. The results of this study aimed at assessing the accuracy of the precipitation retrievals in different climatic regions and precipitation regimes will be presented. Particular emphasis will be given to the analysis of the level of coherence of the precipitation estimates and patterns between the two algorithms exploiting different radiometers. Recent developments aimed at the full exploitation of the GPM constellation of satellites for optimal precipitation/drought monitoring will be also presented.