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The H-SAF passive microwave precipitation retrieval algorithms: a verification study over Europe

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Within the H-SAF program (Satellite Application Facility on Support to Operational Hydrology and Water Management, http://hsaf.meteoam.it) we have developed two different passive microwave precipitation retrieval algorithms, one based on a physically-based Bayesian approach for conical scanning radiometers, and the other one based on Neural Network approach for cross-track scanning radiometers. The foundation of both algorithms is the use of a Cloud Dynamic and Radiation Database (CDRD) built for European and the Mediterranean regions. The database is generated upon the microphysical and dynamical output of 60 simulations of different precipitation events carried out using the cloud resolving model Non-hydrostatic Modeling System (NMS), coupled with a radiative transfer model. Brightness temperatures (TBs) are computed at the frequencies and spatial resolutions of cross track scanning radiometers (NOAA and MetOp-A AMSU/MHS) and of conical scanning radiometers (SSMIS, TMI), with different surface emissivity conditions, relative to the surface conditions of each simulation.
Since both algorithms use the same physical foundation (same cloud model simulations, microphysics parameterization, and radiative transfer model), it is reasonable to expect consistency of the precipitation retrievals from cross-track and conical scanning radiometers for the same event. This consistency, besides the accuracy of the retrievals, is necessary in order to be able to fully exploit all cross-track and conical scanning radiometer overpasses for a specific event (available at about 3 hour time interval), and to be able to use both algorithms for monitoring precipitation at higher spatial/temporal resolution (i.e. blending with IR observations), as well as for nowcasting and/or hydrological applications. The two algorithms are undergoing continuous development, such as the use of dynamical/meteorological variables, as well as topography, season, and geographical location, as ancillary information to characterize the observed event, and mitigate the ambiguity of the (many) cloud microphysical structures (and rainfall rates at the ground) associated to any given set of measured multichannel TBs.
A verification study of the latest versions of the two algorithms is being carried out within the H-SAF program, where the rainfall estimates are compared against radar observations and rain gauge network measurements. We will present the main characteristics of the two algorithms, and we will discuss their strengths and potentials, and future challenges based on the results of the verification study for different precipitation events in Europe and in the Mediterranean area.