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Operational Estimation of Accumulated Precipitation using Satellite Observation, by Eumetsat Satellite Application facility in Support to Hydrology (H-SAF Consortium).

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ABSTRACT
Operational Estimation of Accumulated Precipitation using Satellite Observation, by Eumetsat Satellite Application facility in Support to Hydrology (H-SAF Consortium).

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Satellite Application Facilities (SAFs) are specialised development and processing centres of the EUMETSAT Distributed Ground Segment. SAFs process level 1b data from meteorological satellites (geostationary and polar ones) in conjunction with all other relevant sources of data and appropriate models to generate services and level 2 products. Each SAF is a consortium of EUMETSAT European partners lead by a host institute responsible for the management of the complete SAF project. The Meteorological Service of Italian Air Force is the host Institute for the Satellite Application Facility on Support to Operational Hydrology and Water Management (H-SAF).
HSAF has the commitment to develop and to provide, operationally after 2010, products regarding precipitation, soil moisture and snow. HSAF is going to provide information on error structure of its products and validation of the products via their impacts into Hydrological models. To that purpose it has been structured a specific subgroups.
Accumulated precipitation is computed by temporal integration of the instantaneous rain rate achieved by the blended LEO/MW and GEO/IR precipitation rate products generated by Rapid Update method available every 15 minutes. The algorithm provides four outputs, consisting in accumulated precipitation in 3, 6, 12 and 24 hours, delivered every 3 hours at the synoptic hours. These outputs are our precipitation background fields. Satellite estimates can cover most of the globe, however, they suffer from errors due to lack of a direct relationship between observation parameters and precipitation, the poor sampling and algorithm imperfections. For this reason the 3 hours accumulated precipitation is compared by climatic thresholds got, basically, by the project “Climate Atlas of Europe” led by Meteo France inside the project ECSN (European Climate Support Network) of EUMETNET. To reduce the bias errors introduced by satellite estimates the rain gauge data are used to make an intercalibration with the satellite estimates, using information achieved by GTS network. Precipitation increments are estimated at each observation location from the observation and the interpolated background field. A field of the increments is carried out by standard Kriging method. The final precipitation analysis is achieved by the sum of the increments and the precipitation estimation at each grid points.
It is also considered that major error sources in retrieval 15 minutes instantaneous precipitation from cloud top temperature comes from high (cold) non precipitating clouds and the use of same regression coefficients both for warm clouds (stratus) and cold clouds (convective). As that error is intrinsic in the blending technique applied, we are going to improve performances making use of cloud type specified retrievals. To apply such scheme on the products, we apply a discrimination from convective and stratified clouds, then we retrieve precipitation in parallel for the two clouds classes; the two outputs are merged again into one products, solving the double retrieval

pixels keeping the convection retrieval. Basic tools for that is the computation of two different lookup tables to associate precipitation at a brightness temperature for the two kinds of cloudiness. The clouds discrimination will be done by the NWC-SAF product named “cloud type” for the stratified clouds and with an application, running operationally at Italian Met Service, named NEFODINA for automatic detection of convective phenomena.
Results of studies to improve the accumulated precipitation as well are presented. The studies exploit the potential to use other source of information like quantitative precipitation forecast (QPF) got by numerical weather prediction model to improve the algorithm where the density of ground observations is low, or using it as a background field to generate a precipitation analysis by an optimal interpolation technique.

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