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A comprehensive assessment of satellite rainfall products in Europe: a multimodel-multiproduct hydrological approach

Stefania Camici, Silvia Barbetta , Christian Massari , Luca Ciabatta , and Luca Brocca
National Research Council, Research Institute for Geohydrological Protection, Perugia, Italy (s.camici@irpi.cnr.it)

Rainfall is the primary input for hydrologic models that simulate the rainfall-runoff processes at basin scale. Because rainfall is highly variable in space and time, accurate hydrological simulations require accurate rainfall data at the best possible resolution. The conventional rain gauge observations in many parts of the world are sparse and unevenly distributed. Satellite-based rainfall products (SRPs) could be an alternative to traditional rain gauge observations and nowadays are available on a global scale at ever increasing spatial and temporal resolution.
This study proposes a comprehensive assessment of SRPs for flood modeling in Europe. For this purpose, multiple SRPs (i.e. the Tropical Rainfall Measurement Mission (TRMM) Multi-satellite Precipitation Analysis TMPA; the Climate Prediction Center (CPC) Morphing algorithm, CMORPH, the Precipitation Estimation from Remotely Sensed Information using Artificial Neural Networks, PERSIANN; the SM2RAIN-ASCAT rainfall product obtained from ASCAT satellite soil moisture through the SM2RAIN algorithm) will be used to force different lumped hydrologic models (e.g., MISDc, GR4J, HYMOD) over several (+900) basins throughout Europe with different sizes and physiographic characteristics. In particular, this study will allow to: 1) assess the quality of different SRPs for flood modelling and its relationship with climatic/geomorphological conditions; 2) explore the connection between the accuracy of SRPs and their performance in terms of flood modeling taking into account the rainfall-runoff model structure as well. Preliminary results indicated that: 1) satellite rainfall products are not completely reliable for flood forecasting; 2) the hydrological performances of satellite rainfall products depend both on the product and on the selected hydrological model making general guidelines for the optimal use of SRPs in flood modeling difficult to be drawn. To overcome this issue a multimodel-multiproduct approach would help to exploit relative skills of each satellite product-hydrological model configuration and would bring to a more reliable flood forecasting system.