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Simulation of a flash flood event in an Andean catchment based on IMERG Day-1 and TMPA v7

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Limitations of rainfall data in the Tropical Andes of Ecuador and the high spatio-temporal variability of rainfall patterns, associated to mountainous regions, leads to a poor understanding of hydrological processes in basins located in this region. The lack of representation of these processes become relevant when extreme events such as floods, landslides and others affect communities and industries.

In the last decade, satellite precipitation products (SPP) have become a complementary source of rainfall information. These products has been tested for several applications, namely hydrological modeling, geomorphology, flood forecasting, early-warning systems and meteorological processes. Although SSP represent the spatial structure of rainfall, a correction based on rainfall gauge data is necessary to correct bias effects. In the last years, some methods for rain merging have been developed and tested in order to enhance SPP performance in data scarce regions.

Moreover, since March 2014, IMERG Day-1 product from GPM core observatory have been provided by NASA/JAXA with high spatio-temporal resolution (0.1°x0.1° / 30 minutes). Recent investigations show that IMERG Day-1 product outperforms its predecessor TMPA product, especially at sub-daily time steps, not only due to extended capability of GPM sensors but also because its algorithm structure has been improved compared to TMPA.

We tested merged rainfall datasets, obtained by nonparametric methods, from TMPA version 7 and IMERG Day-1 at hourly time step as input to a semi-distributed event-based hydrological model in order to simulate a flood event occurred on March 2014 in Cañar River Basin, a mountainous catchment located in the western Andes of Ecuador largely influenced by the Pacific Ocean.

This study evaluates the potential application of merged SPP, namely IMERG-Day1 and TMPA v7, as a complement of a low density rain gauge network in order to simulate flash flood events for early-warning systems.