SEDIMENT ESTIMATION IN THE PILCOMAYO BASIN USING A PRECIPITATION PRODUCT COMBINED FROM SENSORS ABOARD SATELLITES

Jhonatan E. Ureña, Oliver C. Saavedra, Moisés Perales

ABSTRACT

The objective of this study is to obtain a precipitation product combining remote sensors with ground measurements and to explore potential applications to estimate liquid and solid flow. This study focuses on the upper portion of the Pilcomayo basin within Bolivia. Two satellite-based precipitation products were used: GSMaP and CHIRPS. Using an iterative adjustment of these products with rain gauges, two products were generated namely GS and CH, respectively. To carry out the validation of generated products, they were compared against GMET grid of 5 km resolution. As it has been found that the GS product showing a slightly higher performance than CH, the combined GS product was employed to estimate the river discharge at sub-basin level. The discharge has been estimated using the combined precipitation product GS and reported runoff coefficients. Firstly, the specific flow at each sub-basin has been estimated for the period 2001-2015. It has been shown that the magnitudes of the river discharged were greater in the plain area and consistent with the precipitation pattern. Subsequently, the discharge in the contribution areas of nine hydrometric stations has been estimated to compare with the observations reported in the 70s, 80s and 90s. Although they are different periods of analysis, the simulated flows have been noted to be consistent with those reported in some stations. For example, at Villamontes hydrometric station, which covers 91% of the study area, 6310 million m^3 of water have been estimated on an annual basis for the period 2001-2015. Subsequently, the solid flow at the same stations has been estimated. At Villamontes, it was estimated 159 million tons per year of sediment production. In this way, the present study has taken advantage of the combined precipitation product per sub-basin to estimate the spatial variation of the liquid and solid flow in the study area. The importance of estimating precipitation has been noted as a key variable in the hydrological processes, which may be even better exploited using distributed hydrological models to convert precipitation to flow and estimate the production of sediments in a basin.

Keywords: Bolivia, Pilcomayo Basin, La Plata Basin, Precipitation, Sediment, GSMaP, CHIRPS.

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