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## Comparing 18 precipitation datasets for large scale distributed hydrological modelling

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Our understanding of the advantages and limitations of satellite derived precipitation datasets as a forcing to hydrological models has made tremendous progress over the past decade. However, most studies have only analysed the performance of one or few datasets, have used global precipitation datasets to force lumped models on regional/large-scale basins, or have adopted more complex distributed models but applied them to small basin scales.

We aimed at addressing these gaps in the literature: in particular, we compared the performance of 18 different precipitation datasets used as input in a grid-based distributed hydrological model to assess streamflow in large-scale river basins. These datasets are classified as Uncorrected Satellites, Corrected Satellites, and Reanalysis-Gauges based datasets. The hydrological model is applied to 8 large scale river basins (Amazon, Brahmaputra, Congo, Danube, Godavari, Mississippi, Rhine and Volga) with different sizes, presence of hydraulic structures, human footprint, hydrometeorological characteristics, and precipitation gauge network density were selected.

The results of this study showed that there is not a unique best performing precipitation dataset for all basins and results are very sensitive to the basin characteristics. However, there are few datasets which persistently outperform the others: SM2RAIN-ASCAT for Class 1, CHIRPS V2.0, MSWEP V2.1, and CMORPH-CRTV1.0 for Class 2, GPCC and WFEDEI GPCC for Class 3. The use of a distributed modelling approach rather than lumped is supported by the fact that precipitation datasets showing the highest model result at the basin outlet do not show the same high performance at internal locations of the basin. In addition, precipitation datasets belonging to Class 2 outperform the other datasets in basins with Tropical and Temperate-Arid climate (e.g. Congo, Mississippi and Godavari), while Class 3 datasets show the highest NSE values in Temperate and Temperate-Cold basins (e.g. Danube, Rhine and Volga).