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Intercomparison of rainfall products from radars, satellites and commercial link networks

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High-resolution inputs of rainfall are deemed important in hydrological sciences, especially for urban hydrology. This is mainly because heavy rainfall-induced events such as flash floods have a tremendous impact in society given the short time scales in which they develop. Nowadays, technologies such as radar, satellite and microwave link networks supply high-resolution rainfall estimates, even in near-real time for the radar and satellite cases.

For the land surface of the Netherlands, we evaluate here four rainfall products, i.e., Link-derived rainfall maps, IMERG Final Run (Integrated Multi-satellite Retrievals for GPM - Global Precipitation Measurement Mission), MSG-CPP (Meteosat Second Generation Cloud Physical Properties), and NIPE (Night Infrared Precipitation Estimates). Out of these four products the first two are are state-of-the-art. All rainfall products are compared against a gauge-adjusted radar rainfall data set, considered as the ground truth given its high quality, resolution and availability. Overall, we found that link-derived rainfall maps outperform satellite products, regardless of the type of satellite the latter are based on.

We also explore the potential use of commercial link networks to validate satellite rainfall products. Usually, satellite derived products are validated against radar or rain gauge networks. If data from commercial link networks would be available, this would be highly relevant for ground validation in areas with few surface rainfall observations, since the link rainfall estimates are truly independent from satellite estimates of rainfall. Conversely to weather radar, the worldwide deployment of commercial link networks offers a more robust platform for the ground validation of satellite estimates over the land surface of the earth because of the relative abundance of such networks. This would be a key aspect for more accurate global estimates of rainfall.