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GIRAFE v1: A global precipitation climate data record from satellite data including uncertainty estimates

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We present a new precipitation climate data record (CDR) GIRAFE (Global Interpolated Rainfall Estimation), which has recently been released by EUMETSATs Satellite Application Facility on Climate Monitoring (CM SAF). For now, it covers a time period of 21 years (2002 – 2022) with global coverage and 1° x 1° spatial resolution. GIRAFE is a completely satellite-based dataset obtained by merging infrared (IR) data from geostationary satellites and passive microwave radiometers (PMW) onboard polar-orbiting satellites. Additional to daily sum and monthly mean precipitation rate, a sampling uncertainty on daily scale within the range of geostationary satellites (55°S-55°N) is provided. The implementation of a continuous extension of GIRAFE via a so-called Interim CDR service started and associated data will become available.

For retrieving instantaneous rain rates from PMW observations, three different retrievals for microwave imagers (HOAPS) and sounders (PNPR-CLIM and PRPS) were used. Quantile mapping is applied to the instantaneous rain rates of the 19 different PMW sensors to achieve stability in GIRAFE over time. The IR observations undergo a dedicated quality control procedure. The uncertainty estimation is based on decorrelation ranges from variograms in spatial and temporal dimensions. The merging of PMW and IR data as well as the technique for uncertainty estimation in GIRAFE is based on the Tropical Amount of Precipitation with an Estimate of ERrors (TAPEER) approach.

Here, we present details on the GIRAFE algorithm and uncertainty estimation as well as results of the CM SAF quality assessment activity comprised of comparisons against other established global, regional and local precipitation products.