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HydroGFD3: a climatological and real-time updated hydrological forcing dataset

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Hydrological forecasting benefits substantially from good initial conditions, which translate information into the forecast. It is therefore important to perform frequent updates of the initial state of the model before the forecast, which demands good meteorological forcing data. For a continental or global hydrological model, it is difficult to find observational data sets which fulfill the requirements of (i) long time series for calibration and spin up, (ii) consistent quality, (iii) at least daily time steps, and (iv) at least data for temperature and precipitation. HydroGFD3 is a new data set that fulfills all the criteria and provides real-time updated data.

HydroGFD3 builds upon the ERA5 reanalysis data set, and performs a bias correction for each new produced month. In contrast to earlier versions (Berg et al., 2018), HydroGFD3 is based on a multi-source climatological background, upon which individual days are produced by adding anomalies from different freely available monthly global observational data sets. These are then disaggregated based on the ERA5 reanalysis. For production redundancy and local tailoring, HydroGFD3 is produced in several tiers, each using different observational data sets originating from GPCC and CPC. Further, intermediate daily updates of the reanalysis through the source ERA5T allow the data set to be updated to within a few days of real-time.

To reach actual real-time, one tier is based on a bias correction method calibrated on the period 1980-2009, which is applied on ERA5T, and further prolonged to current day using the ECMWF deterministic forecasts. The assumption for this to work is that the forecasts have a similar bias as the reanalysis model, which is currently the case. The method also allows bias correction of the forecasts themselves; solving the issue of “drift” in the forecasts as the hydrological model adjusts to the (biased) climatological state of the forcing data.

Berg, Peter, Chantal Donnelly, and David Gustafsson. "Near-real-time adjusted reanalysis forcing data for hydrology." Hydrology and Earth System Sciences 22.2 (2018): 989-1000.