SDCLIREF - A sub-daily gridded reference dataset

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Climate change is expected to impact the intensity and frequency of hydrometeorological extreme events. In order to adequately capture and analyze extreme rainfall events, in particular when assessing flood and flash flood situations, data is required at high spatial and sub-daily resolution which is often not available in sufficient density and over extended time periods.

The ClimEx project (Climate Change and Hydrological Extreme Events) addresses the alteration of hydrological extreme events under climate change conditions. In order to differentiate between a clear climate change signal and the limits of natural variability, unique Single-Model Regional Climate Model Ensembles (CRCM5 driven by CanESM2, RCP8.5) were created for a European and North-American domain, each comprising 50 members of 150 years (1951-2100). In combination with the CORDEX-Database, this newly created ClimEx-Ensemble is a one-of-a-kind model dataset to analyze changes of sub-daily extreme events. For the purpose of bias-correcting the regional climate model ensembles as well as for the baseline calibration and validation of hydrological catchment models, a new sub-daily (3h) high-resolution (500m) gridded reference dataset (SDCLIREF) was created for a domain covering the Upper Danube and Main watersheds ($\sim$ 100.000km^2).

As the sub-daily observations lack a continuous time series for the reference period 1980-2010, the need for a suitable method to bridge the gap of the discontinuous time series arouse. The Method of Fragments (Sharma and Srikanthan (2006); Westra et al. (2012)) was applied to transform daily observations to sub-daily rainfall events to extend the time series and densify the station network. Prior to applying the Method of Fragments and creating the gridded dataset using rigorous interpolation routines, data collection of observations, operated by several institutions in three countries (Germany, Austria, Switzerland), and the subsequent quality control of the observations was carried out. Among others, the quality control checked for steps, extensive dry seasons, temporal consistency and maximum hourly values. The resulting SDCLIREF dataset provides a robust precipitation reference for hydrometeorological applications in unprecedented high spatio-temporal resolution.

References:

Sharma, A.; Srikanthan, S. (2006): Continuous Rainfall Simulation: A Nonparametric Alternative. In: 30th Hydrology and Water Resources Symposium 4-7 December 2006, Launceston, Tasmania.

Westra, S.; Mehrotra, R.; Sharma, A.; Srikanthan, R. (2012): Continuous rainfall simulation. 1. A regionalized subdaily disaggregation approach. In: Water Resour. Res. 48 (1). DOI: 10.1029/2011WR010489.