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Gridded precipitation fields at high temporal and spatial resolution for operational flood forecasting in the Rhine basin

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Gridded areal precipitation, as one of the most important hydrometeorological input variables for initial state estimation in operational hydrological forecasting, is available in the form of raster data sets (e.g. HYRAS and EOBS) for the River Rhine basin. These datasets are compiled off-line on a daily time step using station data with the highest possible spatial density. However, such a product is not available operationally and at an hourly discretisation.
Therefore, we constructed an hourly gridded precipitation dataset at 1.44 km2 resolution for the Rhine basin for the period from 1998 to present using a REGNIE-like interpolation procedure (Weerts et al., 2008) using a low and a high density rain gauge network. The datasets were validated against daily HYRAS (Rauthe, 2013) and EOBS (Haylock, 2008) data. The main goal of the operational procedure is to emulate the HYRAS dataset as good as possible, as the daily HYRAS dataset is used in the off-line calibration of the hydrological model.
Our main findings are that even with low station density, the spatial patterns found in the HYRAS data set are well reproduced. With low station density (years 1999-2006) our dataset underestimates precipitation compared to HYRAS and EOBS, notably during the winter. However, interpolation based on the same set of stations overestimates precipitation compared to EOBS for the years 2006-2014. This discrepancy disappears when switching to the high station density. We also analyze the robustness of the hourly precipitation fields by comparing with stations not used during interpolation. Specific issues regarding the data when creating the gridded precipitation fields will be highlighted. Finally, the datasets are used to drive an hourly and daily gridded WFLOW_HBV model of the Rhine at the same spatial resolution.

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