Uncertainty in decadal precipitation estimates over the Rur catchment

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Precipitation is an important input for hydrological models. Uncertainty in its spatiotemporal variability is a major error source for forecasts generated with distributed hydrological models, because this uncertainty propagates non-linearly into simulated soil moisture patterns, groundwater table depths, discharge and surface energy flux partitioning. Thus, it is imperative to use accurate rainfall datasets that reproduce rainfall's intrinsic highly-spatiotemporal variability to obtain better forecasts from hydrological models.

In this study, we present the evaluation of the high-resolution precipitation product RADKLIM against precipitation from the COSMO-DE analysis over the Rur catchment, in western Germany, at a decadal time scale (2007-2015). RADKLIM is the climate version of the quantitative precipitation estimation product RADOLAN developed by the German national weather service (DWD, Deutscher Wetterdienst) by adjusting radar-derived estimates to gauge observations. Its spatiotemporal resolution is ~1x1 km and 5 minutes. The hourly COSMO-DE analysis precipitation data is obtained from the German weather forecast model (also available from DWD) with a spatial resolution of ~2.8x2.8 km. To make a scale-consistent comparison, the RADKLIM product was upscaled to the COSMO-DE resolution.

Overall, the COSMO-DE analysis yields over the studied area 50% more of the average precipitation of the RADKLIM product. The highest biases (COSMO-DE over RADKLIM) predominantly occur during afternoon (i.e., 15:00 - 21:00), and in the summer season; whereas the negative biases predominantly occur during autumn, with their highest in the early afternoon (i.e., 12:00 - 18:00).