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Don’t blame it on the precipitation input: A hydrological modeling case study with a very dense and redundant rain gauge network in southern Germany

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Accurate rainfall input is the key component in hydrological modeling, in particular for model development. However, accurately capturing precipitation is a challenging, not to say impossible task, due to its high variability in time and space. Typical rain gauge networks are too coarse to deliver spatially representative measurements, while remote sensing techniques suffer from uncertainties of their indirect measurement principle.

To rule out the uncertainty from rainfall input as good as possible, we have carried out two intensive measurements campaigns in 2015 and 2016, using 66 rain gauges, installed at 22 sites within a catchment of 70 km2 in the pre-alpine region of southern Germany. The rain gauge observations were part of the ScaleX campaign (http://scalex.imk-ifu.kit.edu), aiming at concertedly investigating atmospheric, hydrological and biogeochemical processes over a large range of scales.

The average distance between the 22 observation sites was 2.5 km. We further improved the spatial representativeness of our data set using C-band weather radar data from the German Weather Service research radar, only 10 km away from our catchment. To account for the uncertainties of the radar observations, we adjusted the radar rainfall with data from our dense rain gauge network, providing the best possible estimation of ground rainfall for our catchment.

We will present results from hydrological modeling in our catchment, using the stand-alone WRF-Hydro model, driven by different derived rainfall fields from rain gauge, radar and a combination of the two. We will highlight the advantage of having reliable ground rainfall to identify model inherent uncertainties and potential improvements.