



WegenerNet 1km-scale sub-daily rainfall data and their application: a hydrological modeling study on the sensitivity of small-catchment runoff to spatial rainfall variability

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WegenerNet Feldbach region (WEGN), a pioneering experiment for weather and climate observations, has recently completed its first 10-year precipitation measurement cycle. The WEGN has measured precipitation, temperature, humidity, and other parameters since the beginning of 2007, supporting local-level monitoring and modeling studies, over an area of about 20 km x 15 km centered near the City of Feldbach (46.93 °N, 15.90 °E) in the Alpine forelands of southeast Austria. All the 151 stations in the network are now equipped with high-quality Meteoservis sensors as of August 2016, following an equipment with Friedrichs sensors at most stations before, and continue to provide high-resolution (2 km²/5-min) gauge based precipitation measurements for interested users in hydro-meteorological communities. Here we will present overall characteristics of the WEGN, with a focus on sub-daily precipitation measurements, from the data processing (data quality control, gridded data products generation, etc.) to data applications (e.g., ground validation of satellite estimates).

The latter includes our recent study on the propagation of uncertainty from rainfall to runoff. The study assesses responses of small-catchment runoff to spatial rainfall variability in the WEGN region over the Raab valley, using a physics-based distributed hydrological model; Water Flow and Balance Simulation Model (WaSiM), developed at ETH Zurich (Schulla, ETH Zurich, 1997). Given that uncertainty due to resolution of rainfall measurements is believed to be a significant source of error in hydrologic modeling especially for convective rainfall that dominates in the region during summer, the high-resolution of WEGN data furnishes a great opportunity to analyze effects of rainfall events on the runoff at different spatial resolutions. Furthermore, the assessment can be conducted not only for the lower Raab catchment (area of about 500 km²) but also for its sub-catchments (areas of about 30-70 km²). Beside the question how many stations are necessary for reliable hydrological modeling, different interpolation methods like Inverse Distance Interpolation, Elevation Dependent Regression, and combinations will be tested.

This presentation will show the first results from a scale-depending analysis of spatial and temporal structures of heavy rainfall events and responses of simulated runoff at the event scale in the WEGN region.