A unique dataset for investigating hydrological extremes: WegenerNet and the research laboratory region Raab catchment in south-eastern Austria

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The Feldbach region in south-eastern Austria, characteristic for experiencing a rich variety of weather and climate patterns, has been selected as the focus area for a pioneering weather and climate observation network at very high resolution: The WegenerNet consists of 154 meteorological stations observing temperature, humidity, precipitation, soil moisture, wind, and other parameters, at a temporal resolution of 5-minutes. The stations are placed on a regular, tightly spaced grid within an area of about 22 km × 16 km (one station per ~ 2 km^2) and provide regular measurements since January 2007, resulting in 11 years of continuous high-resolution climate and weather observations.

Quality-controlled station time series and gridded field data (spacing 200 m × 200 m for temperature, humidity and precipitation, and 100 m × 100 m for wind fields) are available in near-real time (data latency less than 1–2 h) for visualization and download via a data portal (www.wegenernet.org).

Recently, the WegenerNet has been complemented by gridded 100 m × 100 m datasets of hydrological and hydropedologic characteristics, covering the entire Styrian Raab catchment, an area of about 1000 km^2 including the climate station network's core area. The new dataset (Klebinder et al., 2017) consists of extensive soil-hydrologic characteristics (e.g. Mualem-van Genuchten parameters, grain size distribution) for three depth layers (0-20 cm, 20-50 cm, and 50-100 cm), and a detailed land use / land cover map.

Additionally, soil moisture data have been improved by taking probes at the WegenerNet's 12 special base stations which also measure soil parameters. The probes have been analyzed to get the soil moisture retention curves, grain size distribution, dry bulk density, and Mualem-van Genuchten parameters at the specific station locations. Using this information, it was possible to derive more accurate soil moisture data from WegenerNet's pF-meter measurements.

Precipitation data have also been improved by implementing correction factors and calibration curves for the WegenerNet's tipping bucket gauges.

Altogether, WegenerNet and the surrounding Raab catchment serves as a "research laboratory region" for investigating hydrological extremes, long-term monitoring of weather and climate, validation of nonhydrostatic models operated at 1-km-scale resolution and of statistical downscaling techniques (in particular for precipitation), validation of radar and satellite data, study of orography–climate relationships, and many other research topics.

References:
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