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Potential applications of opportunistic sensing data in operational precipitation products at Deutscher Wetterdienst –from first steps to visions

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High-quality precipitation analyses represent key operational products of national meteorological services that serve several applications spanning from weather prediction, flood forecasting, and drought monitoring to disaster management and climate change studies. In Germany, the Deutscher Wetterdienst (DWD) plays a major role in providing regional to global scale quantitative precipitation estimates (QPE) for real-time applications as well as climatological analyses. All these products rely on ground-based precipitation measurements for either interpolation, adjustment, or validation. Opportunistic sensors (OS) - not originally designed for high-quality hydrometeorological observations - such as commercial microwave links (CML) and private weather stations (PWS) increase the density of ground-based sensors and may therefore constitute an important additional source of information that is still neglected in most operational data products.
We will introduce exemplary DWD precipitation products and discuss the yet identified and potential benefits, respectively, of considering OS data: a radar-based QPE for real-time and climate applications (RADOLAN/RADKLIM), the Global Precipitation Climatology Centre's (GPCC) gridded products based on interpolated station data, and the solely satellite-retrieved precipitation estimate GIRAFE.
The radar-based QPE products RADOLAN and RADKLIM use ground-based observations to adjust remotely-sensed indirect information to quantitative precipitation values. Classical pluviometers, however, due to the relatively low network density miss a significant fraction of local heavy precipitation events. Within the project HoWa-PRO, DWD has established a multi-source data merge including CML data to overcome this limitation and provide improved QPE to the flood forecasting centers of the German federal states in charge.
GPCC operates under the auspices of the World Meteorological Organization (WMO) collecting and archiving world-wide station data, performing quality control, and providing interpolated gridded precipitation fields and derived products for monitoring as well as climate change studies. Together with an increasing demand for higher temporal and spatial resolution a high spatial density of observations becomes more important - especially in data-sparse regions. A complementary inclusion of OS data is a promising option to support this plan.
GIRAFE is a solely satellite-based precipitation estimate by the EUMETSAT Climate Monitoring Satellite Application Facility (CM-SAF) operating at DWD. GIRAFE uses ground-based precipitation data for validation purposes. As validation is challenging in data-sparse regions like e.g. on the African continent, OS data may serve as additional ground truth for product quality measures.

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