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A Radar Climatology for Germany – a 16-year high resolution precipitation data and its possibilities

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One of the main features of heavy precipitation events is their small-scale distribution. Despite a local occurrence, these intensive rainfalls may, however, cause most serious damage and have significant impact on the whole river basin area resulting in e.g. flash floods or urban flooding. Thus, it is of great importance not only to detect the life-cycle of extreme precipitation during its occurrence but also to collect precise climatological information on such events.
The German weather service (Deutscher Wetterdienst) operates a very dense network of more than 2000 weather stations collecting data on precipitation. It is however not sufficient for detecting spatially limited phenomena. Thanks to radar data, current monitoring of such events is possible. A quality control process is applied to real-time radar products, however only automatic rain gauges data can be used in the adjustment procedure.
To merge both radar data and all available rain gauges data, the radar climatology dataset was established. Within the framework of a project financed by the federal agencies' strategic alliance 'Adaptation to Climate Change', 16 years (2001-2016) of radar data have been reanalyzed in order to gain a homogenous, quality-controlled, high-resolution precipitation data set suitable for analyzing extreme events in a climatological approach. Additional corrections methods (e.g. clutter, spokes and beam height correction) were defined and used for the reprocessing procedure to enhance the data quality.
Although the time series is still rather short for a climatology, for the first time the data set allows an insight into e.g. the distribution, size, life cycle, and duration of extreme events that cannot be measured by point measurements alone.
All radar climatology products share the same spatial and temporal coverage. The whole dataset has been produced for the area of Germany. With the relatively high spatial resolution of 1km, the data can be used as a component of wide range of spatial analyses: from country to city scale. Multiple events can be investigated in details, depending on the user needs, as temporal resolution differs from 15 years to 1 hour. Apart from standard products such as precipitation sum, the radar climatology will provide its derivatives as well e.g. extreme precipitation characteristics and rain erosivity potential (R factor) map.
Employing GIS functionalities into the Radar Climatology dataset has made it universal and interoperable - suitable for integration with a wide range of other geodata formats or services. It can be treated also as input layer for further analyses which demand spatially continuous data on precipitation and for building more integrated products tailored to the user needs. One of the most important concepts may be an application of the Radar Climatology data as a key factor in risk assessment analysis and developing strategies for risk management in urban planning, hydrology, agriculture etc.