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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Application of a high resolution network of meteorological stations during COPS

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In the summer of 2007 the COPS (Convective Orographically induced Precipitation Study) field campaign took place in the region of south-western Germany and eastern France. During this time (June to August 2007) Department of Meteorology and Geophysics of the University of Vienna operated a dense measurement network containing 96 automatic weather stations (AWS) in the eastern part of the COPS-domain (eastern Black Forest), covering an area of $\sim$100 km^2. The stations were arranged in a grid with an average spacing of the stations of nearly 1 km. AWS (of the type HOBO) were equipped with sensors for temperature, due point, pressure and wind measurements with time sampling of 1 minute and one tipping bucket rain gauge for precipitation measurements with a resolution of 0.2 mm. The event-based records of the rain gauge logger were converted to 1 min precipitation sums to match the time sampling of the other AWS-sensors. This experimental mesonet of AWS was placed in the overlapping region of 2 C-band weather radars situated near Karlsruhe (research radar of Karlsruhe Institute of Technology - KIT) and Türkheim (operational radar of German Weather Service - DWD).
Data set of meteorological parameters measured with this mesonet was thoroughly quality checked and published in the data archive at the World Data Center for Climate (WDCC) for research purposes.
Due to its high spatial (1 km) and temporal (1 minute) resolution this data set can be used for the diagnostic investigations of the atmosphere in pre-convective stage as well as for the investigations of the evolution of meteorological phenomena connected with initiation and development of convection (moisture flux divergence, precipitation, etc.).
One important application of this data set for precipitation studies is the comparison between the radar based precipitation estimation and precipitation measurements using rain gauges on the ground. Combination of the rain gauge network and radars allows estimation of the uncertainty of the radar based precipitation estimation and reveals insight into dynamics of precipitation evolution in time and space.
For the entire period of observation (3 months) correlation structure of the rainfall measurements on different time scales (5 min, 15 min, 1 h and 1 day) was investigated using gauges and radar data and a quantitative estimation of the differences between these two observation types (radar to gauge ratio) was conducted. The results show that in some cases, depending on the type of precipitation, the difference in the precipitation amount can be substantial. One of the reasons for these discrepancies (beside those arising from the wind drift of the precipitation particles) relies on the shortcomings of the radar based precipitation estimation (e.g. shielding and attenuation of the radar beam due to the topography and strong precipitation regions respectively). Due to the position of the mesonet between 2 oppositely lying radars the occurrence of these phenomena could be detected.