Evaluation Data for Precipitation Estimates from dual-pol Radar Data

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The great potential of the dual-polarization technique in radar meteorology has been demonstrated in numerous studies. With the new technique a refined quality control and precipitation estimation is expected. But not only has the potential been shown, also the complexity and sensitivity of the new technology is revealed. Therefore, the evaluation of new radar-derived precipitation products with highly resolved and exact ground measurements is important. The THIES Laser disdrometer, operated by the Conrad Observatory, provides precipitation information of high temporal resolution. The FFG Project "Tuning dual - pol radars in the Alps" (TUNDRA) with the objective to establish a data processing chain for the recently upgraded Austrian weather radar network utilizes these data.

Since 2013 the Austrian weather radar network consists of five dual-polarized C-Band radars (figure 1). The new data allow for a wide range of novel possibilities for data quality control, quality improvement (e.g. attenuation correction), a hydrometeor classification and improved precipitation estimations. But the complexity of the technology, the unique characteristic of each radar, the Austrian topography, mountainous in the West and flatland in the East, and specialized application requirements demand an individual tuning of the Austrian radars. This is the objective of the 45 month FFG project TUNDRA.

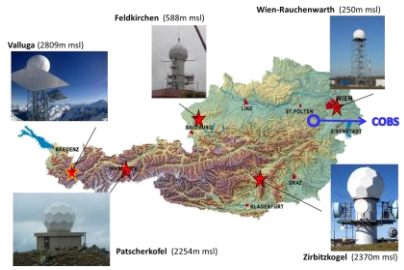

Figure 1: Sites of the five weather radars in Austria and the Conrad Observatorium.

TUNDRA is a collaboration between the radar operator ACG and the Austrian Weather Service ZAMG. Based on a test radar (Rauchenwarth), the possibilities of the new radar equipment in Austria are exploited and a road map toward the optimal usage within the radar network shall be developed. Different approaches for the data quality assessment and control as well as for the derivation of precipitation products, selected from literature or self-developed, will be tested. Finally, the products are compared with reference measurements. One of the reference measurements is the THIES Laser disdrometer, owned by the Conrad Observatory. In comparison with the general precipitation measurement devices of ZAMG, the TAWES (semi-automatic weather stations), the Laser disdrometer provides a higher resolution and an extended set of additional parameters, such as the information about the amount of solid and fluid precipitation, and an estimated radar reflectivity (figure 2).

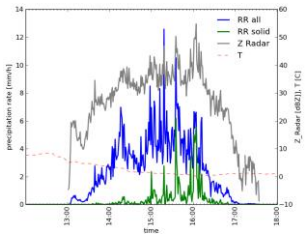

Figure 2: Time series from 11 January 2016 of THIES disdrometer parameters total and solid precipitation rate in mm/min (left ordinate) and radar reflectivity in dBZ, and temperature in °C (right ordinate).

Although the disdrometer is not perfectly located for comparisons with radar data since the radar beams are partly blocked by mountains the detailed information makes the disdrometer to an appreciated additional information source to evaluate radar derived precipitation products (figure 3).

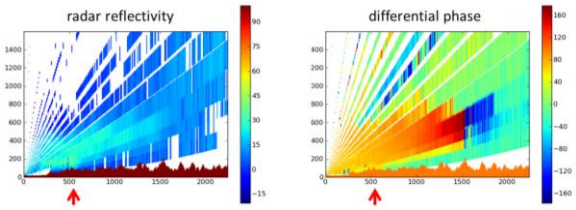

Figure 3: Cross section of radar volume data for two selected parameters radar reflectivity and differential phase (right) for 11 January 2016 15.20h UTC. The location of the THIES Laser disdrometer is indicated by red arrows.

Up to now, the radar data processing chain has been established and a first set of approaches for quality control, data preprocessing, and precipitation estimation is implemented. Within the next year the processing chain will be tested and refined. This includes repeated comparisons of the derived precipitation products with information from the THIES disdrometer and TAWES data.

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