7.1 WEATHER RADAR AND SUPERCONDUCTING GRAVIMETER FOR ESTIMATING HEAVY RAINFALL

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The radar-based estimation of intense precipitation produced by convective storms is a challenging task and the verification through comparison with gauges is questionable due to the very high spatial variability of such type of precipitation. In this study, we explore the potential benefit of using a superconducting gravimeter for improving and verifying radar-based precipitation estimates.

The underground superconducting gravimeter used in this study is installed in Membach (BE) at 85 km distance from a C-band weather radar located in Wideumont (BE). The 15-year observation record 2003-2017 is available for both gravimeter and radar with 1-min and 5-min time steps, respectively. The gravimeter integrates soil water in a radius of about 200 m around the instrument. This allows measuring rainfall at larger spatial scale than traditional rain gauges. The precision of the gravimeter is a few nm/s^2; 1 nm/s^2 corresponding to 2.6 mm of water.

The comparison of reflectivity and gravity time series for severe rainfall events shows that high reflectivity peaks are associated with a rapid decrease of the underground measured gravity. The precipitation amounts derived from gravity measurements and from radar observations are further compared for the whole 15-year period. In order to reduce the influence of non-meteorological factors on gravity changes, the focus is given on rain and hail fall events producing large precipitation amounts over short durations. The results are analysed and the added value of the superconducting gravimeter is discussed.