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Sodar / RASS – Tower Intercomparison: Mean Values, Gradients and Beyond

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Sodar / RASS systems have been used for about two decades to provide operational profile measurements of wind speed, wind direction and virtual temperature in the lower atmospheric boundary layer. Depending on the sodar system configuration and site conditions data cover a height range between 25 m and 50 m as a lower limit and 150 m up 600 m and higher as an upper limit, sodar systems are thus a less-expensive alternative to tower measurements for a variety of applications.

Numerous experiments have been performed in the past by different sodar operators to proof the reliability and quality of sodar data when compared to in-situ tower measurements. Typical values of bias (root-mean-square deviation) found in these studies are around 0.2 ms-1 (0.5 ms-1) and 5 deg (10 deg) for wind speed and direction, respectively.

Besides an accuracy assessment of absolute values, vertical gradients are of special interest for many applications. However, these have rarely been analysed in previous inter-comparison experiments. In the present study we consider a one-year data set of simultaneous sodar / RASS and tower measurements collected at the boundary field site (Grenzschichtmessfeld, GM) Falkenberg of the Lindenberg Meteorological Observatory – Richard-Aßmann-Observatory of the German Meteorological Service (DWD). The sodar / RASS used is a METEK DSDPA.90-64 system. Tower measurements for the comparison include standard wind and temperature sensors at 60 m, 80 m and 98 m height.

In analysing the data, we will first discuss the effect of an update of the sodar data evaluation and quality assessment software on the system performance and data quality. In a second step we compare sodar and tower data with respect to both mean values and vertical gradients of wind and temperature. Finally we assess the suitability of the sodar / RASS profiles for an estimation of bulk Richardson number profiles across the lower boundary layer.