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The Karlsruhe Doppler Wind Lidar: Comparison with Tower, Profiler, Sodar, Radiosonde and Tethersonde Data

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In July 2004, lidar groups from the Institut für Meteorologie und Klimaforschung (IMK), Forschungszentrum Karlsruhe / Universität Karlsruhe, Germany, and the Arizona State University collaborated to compare wind measurements of IMK's new coherent Doppler Lidar with data from a radar profiler, a 200m high tower, tethersondes, radiosondes, and a sodar. During the experimental period, convective storms passed through the measurement domain providing at times strong mean wind velocities and a high degree of turbulence. Two methods of calculating horizontal wind velocity and wind direction from cone and RHI-scans and various types of filtering and averaging procedures, required to compare the data from different instruments and their respective spatial and temporal scales, will be discussed. The authors will assess the accuracy and biases of the instruments as well as differences caused by the measurement techniques and meteorological conditions. In addition to the mean velocities, the possibility of using Lidar to obtain statistical measures of the turbulent wind field will be discussed. For the latter, staring scans of the lidar beam were performed, focussing on two levels of the local 200 meter meteorological tower at which sonic anemometers obtained wind data at 20 Hz. It is shown that in many cases the agreement between the in-situ and remote sensing instrument is quite excellent.