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Profiling the planetary boundary layer at an airport: Comparison of AMDAR aircraft data to a wind profiler

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AMDAR (Aircraft Meteorological DAta Relay) weather reports from commercial aircraft provide an increasing amount of input for operational numerical weather prediction models. Especially in the European AMDAR programme, aircraft are predominantly used to collect vertical profiles of the atmosphere. Usually one profile per hour or per three hours is collected at the major European airports.

Some previous studies have investigated the quality and errors of AMDAR data. These studies were, however, mostly targeted at data collected in the free atmosphere, similar to radiosonde measurements. Nevertheless, AMDAR also provides data of similar vertical resolution in the planetary boundary layer as wind profilers do.

At various airports, wind profilers have been proven to be a valuable tool to identify wind shear and to yield input for the prediction of wake vortex development.

In our study, vertical profiles measured by aircraft are compared to wind profiler soundings at a major European airport. The differences between aircraft and wind profiler data are analysed. In addition to other known characteristics, the differences are found to have significant annual cycle.

From profiles collected by both sources, temperature inversion and wind shear layers are detected. The height and thickness of the detected layers are compared and the coincidence of the detected patterns is examined. The degree of mutual probability of detection was found to depend upon the season, too.