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Some new results of operational mixing height determination from routine radiosoundings

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Vertical profiles of atmospheric state variables measured with radiosondes have been used for mixing height estimation for about half a century. The most common application is the determination of the daytime mixing height using the so-called parcel method. Although radiosoundings are typically performed twice a day only at most sounding sites they still represent the most common source of routine upper air data worldwide. Recent achievements and progress in radiosonde technology allow for a more sound estimation of mixing height from the profile measurements, two aspects are of major importance: Sounding data reported at 5s sampling frequency provide a vertical resolution of about 25m adequate to resolve even stable boundary layers. The introduction of GPS technology has increased the reliability of radiosonde wind measurements in the lower part of the atmosphere.

At the Meteorological Observatory Lindenberg / Richard-Aßmann-Observatory of the Deutscher Wetterdienst we have recently introduced an algorithm for the mixing height determination from routine radiosoundings. A set of characteristic heights is derived from the wind, temperature and humidity profiles by searching for inversion boundaries, moisture jumps, wind maxima, and the levels where an adiabatically rising parcel intersects with the ambient potential temperature profile and where the Richardson number exceeds a critical value, respectively. A confidence level of the mixing height is derived from the spread of these characteristic heights and a quality flag is assigned to the mixing height value based on the relative magnitude of the spread.

The paper will describe the algorithm currently used for mixing height estimation from radiosondes at MOL-RAO. The effect of increased profile resolution will be discussed, and results from the analysis of a 10-year data set will be presented.