Radiosonde Observation Accuracy

Twice daily radiosonde temperature, humidity and wind soundings from hundreds of worldwide locations provide fundamental atmospheric information for weather modeling and forecasting. It is widely recognized that more frequent and spatially dense boundary layer thermodynamic and wind soundings are needed to improve high-impact local weather modeling and forecasting\(^1\). When evaluating alternative sounding methods\(^2\), it is important to consider observation error assigned to radiosonde soundings when they are assimilated in numerical weather models.

![Figure 1. Global (solid) and mesoscale (dashed) radiosonde observation errors.](image)

Representativeness error\(^3\), sensor error\(^4\) and model physics/background error all contribute to radiosonde observation error plotted in Figure 1 (from Gridpoint Statistical Interpolation model *errtables*)\(^5\). Model vertical resolution also contributes to radiosonde data smoothing during assimilation. Temperature and dewpoint profiles observed by a radiosonde and after radiosonde assimilation in model gridded analysis are shown in Figure 2.

It is evident that humidity fine structure in the radiosonde sounding is strongly smoothed by radiosonde observation error during numerical model assimilation. This smoothing should be taken into account when evaluating alternative sounding methods.

---

\(^1\) U.S. National Research Council, 2008.
\(^2\) Hardesty et al, 2011.
\(^3\) Kitchen, 1989.
Figure 2. Radiosonde (red) smoothing in mesoscale gridded analysis\(^6\) (blue).

References


Kitchen, M., Representativeness errors for radiosonde observations, QJRMS, 1989.


Strauch et al, Precision and Relative Accuracy of Profiler Wind Measurements, JAOT, 1990.


Xu et al, Effect of off-zenith observation on reducing the impact of precipitation on ground-based microwave radiometer measurement accuracy in Wuhan, Atmos. Res., 2014.

\(^6\) Ft. Worth, Texas, 00Z 5 Apr 2014.