

Rawinsonde Observation Accuracy

Twice daily rawinsonde 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 forecasting¹. When evaluating alternative sounding methods², it is important to consider observation error assigned to rawinsonde soundings when they are assimilated in numerical weather models.

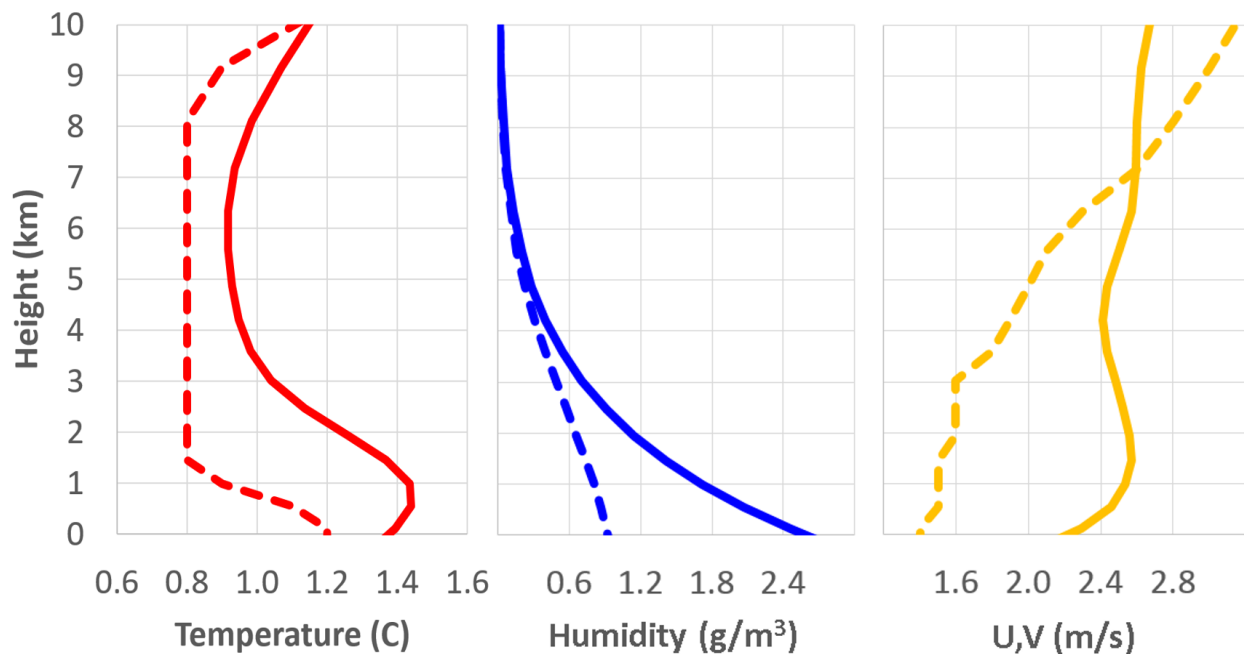


Figure 1. Global (solid) and mesoscale (dashed) rawinsonde observation errors.

Representativeness error³, sensor error⁴ and model physics/background error all contribute to rawinsonde observation error plotted in Figure 1 (from Gridpoint Statistical Interpolation model *errtables*)⁵. Model vertical resolution also contributes to rawinsonde data smoothing during assimilation. Temperature and dewpoint profiles observed by a rawinsonde and after rawinsonde assimilation in model gridded analysis are shown in Figure 2.

It is evident that humidity fine structure in the rawinsonde sounding is strongly smoothed by rawinsonde 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.

⁴ Strauch et al, 1990; Smith, 1999; Guldner and Spänkuch, 2002; Löhnert and Maier, 2012; Kumer et al, 2014; World Meteorological Organization, 2010.

⁵ GSI User's Guide (Chapter 7: *Observation and Background Error Statistics*), 2014.

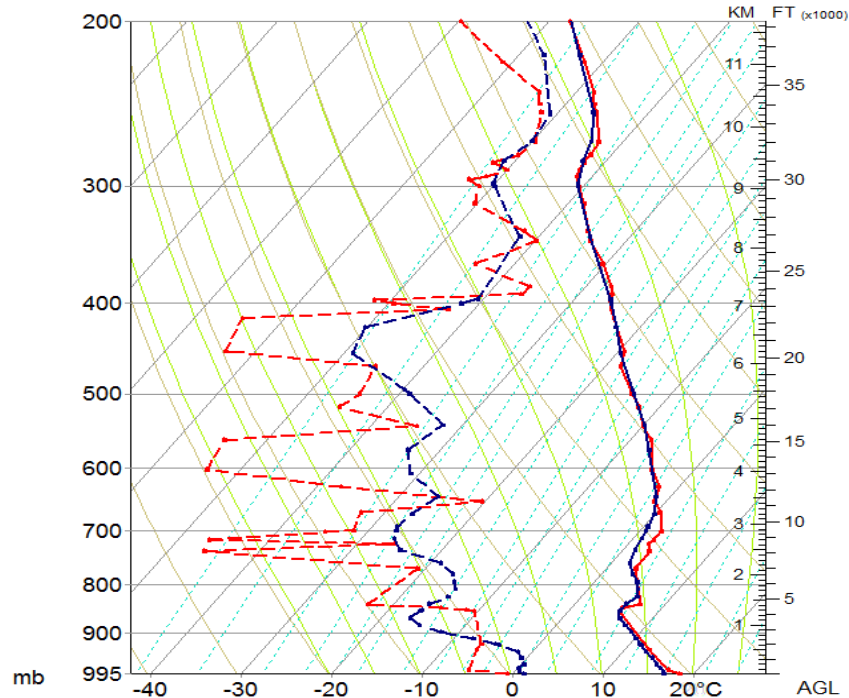


Figure 2. Rawinsonde (red) smoothing in mesoscale gridded analysis⁶ (blue).

References

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⁶ Ft. Worth, Texas, 00Z 5 Apr 2014.