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IMPACT OF ARM RADIOSONDE HUMIDITY CORRECTION ON CALCULATION OF CONVECTIVE INDICES

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ABSTRACT

Over the course of the history of the ARM and ASR Programs, there have been efforts to improve the humidity profiles that are produced from radiosonde launches. Work began in the late 1990's with research by Clough et al. (1996), Miller et al. (1999), and Lesht (1999). These studies detected a dry bias and a loss of humidity calibration in ARM-used Vaisala soundings. Determining additional problems, devising and implementing numerical solutions to the known problems, and correcting the humidity readings from all types of Vaisala (RS-80, RS-90, and RS-92) radiosondes resulted in at least eight papers in the 2000s. Miloshevich et al. (2009, 2006, 2004, 2001), Hume (2008), Wang et al. (2002), Turner et al. (2003), and Vomel et al. (2007) present research that serve to enhance the community's knowledge of the radiosonde problems and to propose appropriate algorithmic solutions.

These solutions to the humidity problems are incorporated in the Sondeadjust evaluation product. In addition to including the original sounding output, derived fields contained in the output include (1) rh_smooth (relative humidity smoothed from the coarse resolution of the original sounding in order to better capture the physical surroundings), (2) rh_biased (relative humidity that is adjusted to eliminate the dry bias as reported in the literature), (3) rh_adjust (relative humidity that has been corrected for the sensor time lag and for solar warming), and (4) scaled relative humidity field (rh_adjust scaled by the integrated precipitable water vapor from the microwave radiometer).

Using the original RH profile, the scaled RH profile, and the three intermediate RH profiles to calculate various convective indices (e.g. CAPE, CIN), this study's goal is to demonstrate the sensitivity of each RH correction on these thermodynamic variables.