

Evaluation of Vaisala RS92 Radiosonde Water Vapor Dry Bias Correction Algorithms Using Long-Term ARM Datasets

Introduction

Vaisala RS92 radiosondes are the most widely used radiosondes in the world. In particular, radiosonde data provides one of the most extensive records of water vapor data to atmospheric scientists worldwide. Radiosonde water vapor measurements (e.g. relative humidity) are long known to have a water vapor dry bias due to solar radiative heating.

This research evaluates two Vaisala RS92 solar radiation dry bias (SRBD) correction algorithms:

- \rightarrow Wang et al., 2013¹: Radiation Dry Bias Correction of Vaisala RS92 Humidity Data and Its Impacts on Historical Radiosonde Data
- \rightarrow Miloshevich et al., 2009²: Accuracy assessment and correction of Vaisala RS92 water vapor measurements.
- → Both algorithms correct the relative humidity measured by the radiosonde.
- → Data is provided by the **Atmospheric Radiation Measurements** (ARM) program's global network of research facilities.



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Empirical Equation – Wang (2013)	Em
$RH_{CORR} = RH\left(\frac{e_s\left(T + hf * \Delta T_{CORR}\right)}{e_s\left(T\right)}\right)$	
\rightarrow hf is a heating factor, set to 13	$\rightarrow G(I)$
$\rightarrow \Delta T_{CORR}$ is equal to $cf * \Delta T_{CORR, RSN}$, where cf is an adjustment	fro
factor (0.4 below 500hPa and 0.6 above 500hPa), and	$\rightarrow RH$
$\Delta T_{CORR RSN}$ is given by Vaisala ³ .	→ Foi
1: Wang, Junhong, Liangying Zhang, Aiguo Dai, Franz Immler, Michael Sommer, Holger Vömel, 2013: Ra	diation Dry I
2: Miloshevich, L. M., H. Vö ^m el, D. N. Whiteman, and T. Leblanc (2009), Accuracy assessment and correction 10.1029/2008JD011565.	ection of Vai
3: Revised Solar Radiation Correction Table RSN2010 for RS92 Temperature Sensor: http://www.vaisala	.com/en/me

revisedsolarradiationcorrectiontableRSN2010.aspx

P,RH) is a function of pressure and RH, where G is derived om a "look up" set of empirically derived coefficients². $I_{T \mid AG}$ is the time-lag corrected relative humidity. r RS92 sensors, RH is already time-lag corrected.

Bias Correction of Vaisala RS92 Humidity Data and Its Impacts on Historical Radiosonde Data.

isala RS92 radiosonde water vapor measurements, J. Geophys. Res., 114, D11305, doi:

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- \rightarrow All data will be evaluated using remotely sensed water vapor profiles from a high altitude (5km) mobile ARM site.
- \rightarrow Corrected water vapor data will be used to calculate ice supersaturation statistics in cirrus clouds with the help of a micropulse lidar.

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