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Oral
Water vapor is the most important tropospheric greenhouse gas, but it still has the highest uncertainty in weather and climate models. All current in-situ and satellite observations of water vapor have known or unknown biases and limitations, such as coverage, vertical resolution, availability of data in and under clouds, or dependence on a-priori information.

We compare multiple observational data sets at several radiosonde stations using ERA-Interim as reference for the entire year of 2007. As a baseline for the comparison we compute the ERA-Interim local 2007 climatology as well as a "persistence", or “time minus 24 hours" ERA-Interim data set. Observational data sets are radiosonde (RS), RO (three variations of moisture retrievals), and AIRS, plus the GFS analysis. The three variations of RO water vapor retrieval include a 1D-VAR retrieval from UCAR, a “simple” retrieval in which the temperature from the GFS data set is used to compute water vapor from the RO refractivity, and a retrieval from the Wegener Center. The goal is to identify potential bias and random errors of the various data sets using high resolution, localized time series rather than annual and spatial mean values.

We use the tropical location Guam, which experiences extremely dry air/sharp vertical moisture gradients in winter (higher likelihood of RO experiencing super-refraction), and subtropical locations around Japan, which are frequently affected by typhoons.

Some of the biases found are well-known, e.g. the AIRS dry bias throughout the troposphere at Guam, the RS dry and warm bias above ~500 hPa, or the RO dry bias in the tropical lower troposphere under conditions of super-refraction.

All three RO moisture retrievals perform very well even in the 400-200 hPa layer and show very little to no bias in the mid troposphere and subtropical lower troposphere. The seasonal RMS errors are comparable or smaller than those of the RS, showing that RO water vapor measurements are valuable still in the mid- and lower troposphere, where their errors are often assumed to be large in data assimilation.
OSTS session
Regional and Global CAL/VAL for Assembling a Climate Data Record