



## **The SPARC water vapor assessment II: intercomparison of satellite and ground-based microwave measurements**

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As part of the second SPARC (Stratosphere-troposphere Processes And their Role in Climate) water vapour assessment (WAVAS-II), we present measurements taken from, or coincident with, seven sites from which ground-based microwave instruments measure water vapor in the middle atmosphere. Six of the ground-based instruments are part of the Network for the Detection of Atmospheric Composition Change (NDACC) and provide datasets which can be used for drift and trend assessment. We compare measurements from these ground-based instruments with satellite datasets that have provided retrievals of water vapor in the lower mesosphere over extended periods since 1996.

We first compare biases between the satellite and ground-based instruments from the upper stratosphere to the upper mesosphere. We then show a number of time series comparisons at 0.46 hPa, a level that is sensitive to changes in H<sub>2</sub>O and CH<sub>4</sub> entering the stratosphere, but, because almost all CH<sub>4</sub> has been oxidized, is relatively insensitive to dynamical variations. Interannual variations and drifts are investigated both with respect to the Aura Microwave Limb Sounder (MLS) (from 2004 onwards), and with respect to each instrument's climatological mean. We find that the variation in the interannual difference in the mean H<sub>2</sub>O measured by any two instruments is typically ~1%. Most of the datasets start in, or after, 2004, and show annual increases in H<sub>2</sub>O of 0-1%/year. In particular, MLS shows a trend of between 0.5%/year and 0.7%/year at the comparison sites. However the two longest measurement datasets used here, with measurements back to 1996, show a much smaller trend of between +0.1%/year and -0.1%/year.