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Where is Ridge A?

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Abstract. First identified in 2009 as the site with the lowest precipitable water vapour (PWV) and best terahertz transmission on Earth, "Ridge A" is located approximately 150 km south of Dome A, Antarctica. We use three years of data from the Microwave Humidity Sensor (MHS) on the NOAA-18 satellite and recent ground-based measurements from Ridge A to probe the PWV variations and stability over the high Antarctic plateau.

Keywords. Ridge A, site testing, PWV, terahertz

1. Introduction

The terahertz (THz) region of the electromagnetic spectrum remains one of the last truly unexplored spectral regimes, however the efficient absorption of THz radiation by atmospheric water vapour, oxygen and ozone limit observations to the highest and driest locations on Earth. In 2009, various existing and potential observing sites in Antarctica were compared based on a variety of criteria (Saunders *et al.* 2009), with Ridge A appearing to have the lowest PWV, and hence best THz transmission, of them all.

2. NOAA-18 satellite

The PWV extractions from MHS/NOAA-18 were calibrated and ground-truthed in 2010 using the Pre-HEAT instrument at Dome A (Yang *et al.* 2010). We then applied these same calibrations to data from the region surrounding Dome A. The 2008–2010 winter median PWV is plotted as a function of location in Figure 1.

3. HEAT at Ridge A

During early 2012, the High Elevation Antarctica Terahertz (HEAT) telescope at Ridge A observed a 24 hour period of exceptionally stable PWV (< 10 μm variance). Interestingly, contemporaneous PWV from the MHS/NOAA-18 showed an apparent high dependence of PWV on the viewing angle of the satellite. While this is nominally taken into account during the extraction process (Miao *et al.* 2001), additional adjustments were required to obtain a suitable correlation. A comparison is shown in Figure 2.

4. Future Work

The exceedingly low water vapour content of the Antarctic atmosphere warrants a more thorough and careful treatment of satellite data for the purpose of PWV extraction.

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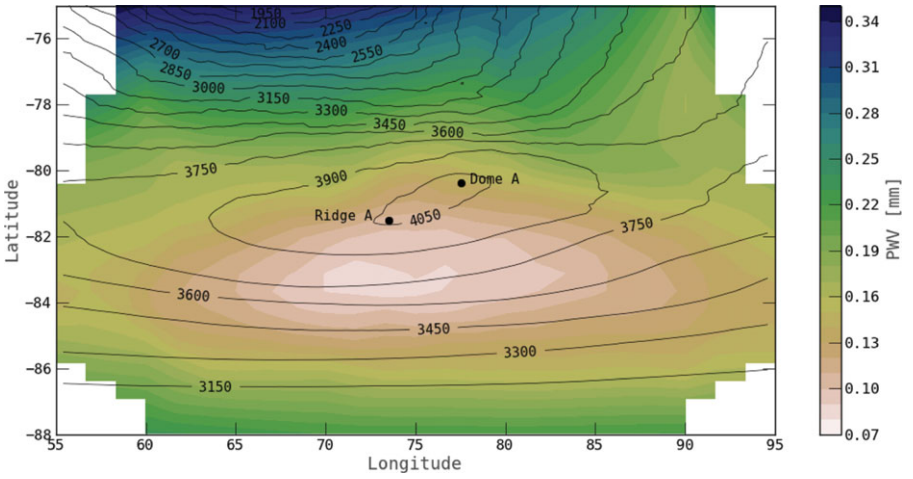

Figure 1. Winter median PWV (during 2008–2010) as a function of location using the MHS instrument on the NOAA-18 satellite. Elevation contours are shown in metres.

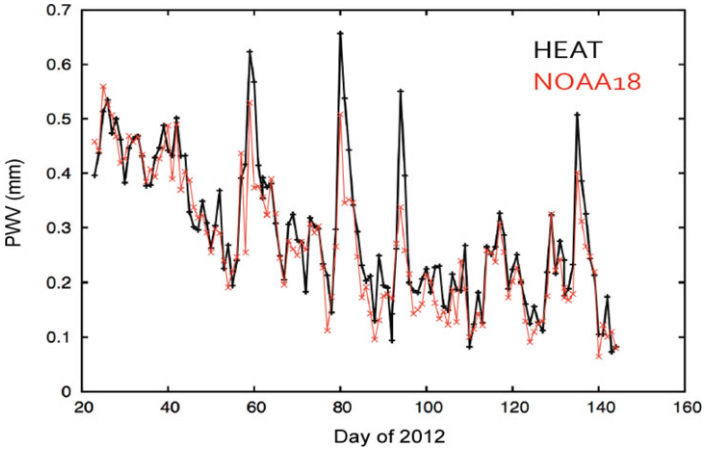

Figure 2. Comparison of PWV as measured by HEAT and the NOAA-18 satellite. The calibration of NOAA-18 satellite was obtained by a comparison with HEAT data during a time of stable PWV.

Ground truthing at one site can not necessarily be generalised to even nearby locations, as is the case for Dome A and Ridge A (separated by less than 150 km). We intend to use years of archival satellite data, calibrated with ground-based observations, to obtain reliable PWV maps for the Antarctic continent.

5. Acknowledgements

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