



Venus Water Vapour Profiles Obtained by SOIR/VEx

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We present up-to-date observations of the water vapour profile at the Venus terminator, between altitudes of 70 – 110km. The data were obtained by the Solar Occultation in the InfraRed (SOIR) instrument on board Venus Express (VEx). The SOIR instrument allows observations of trace gas profiles at altitudes within the Venus lower thermosphere and mesosphere. Due to the observational technique, all observations are taken at the Venus terminator, on either or both of the evening and morning side of the planet and covering almost all latitudes. These are key locations for study as the mesosphere/thermosphere altitudes correspond to the transition in dynamical regime from a retrograde zonal flow to sub-solar to antisolar flow (approximately 90 km) and at these altitudes we expect a steeper than normal temperature gradient across the terminator which would drive chemical reactions and dynamical flows. Water vapour in the mesosphere is involved in the cloud formation process and contributes to several chemical cycles. Isotopologue ratio studies also contribute towards understanding the evolution of the Venus climate and atmosphere. Determining the abundance, distribution and variability of water vapour is therefore a key element to understanding the development, maintenance and links between dynamical features, important chemical cycles and the evolution of the Venus atmosphere.

Both water vapour isotopologues are targeted simultaneously in the majority of dedicated SOIR water vapour observations. H₂O is detected between 70 – 110km and HDO is detected between 70 – 95km altitude. Early SOIR water vapour observations were published in 2007 and 2008. Previous results show a depletion in the volume mixing ratio (VMR) at 85km in both HDO and H₂O and an increase in HDO/H₂O ratio above the clouds. No noticeable temporal variability was detected.

Numerous subsequent H₂O and HDO SOIR observations have been obtained between 2007 – 2014 and with recent improvements in instrument calibration, data reduction and a long base line of data, a new analysis has become pertinent.