WATER VAPOR AND HYDROGEN ISOTOPIC RATIO AT THE VENUS TERMINATOR FROM SOIR/VEX. A. C. Vandaele[1], A. Mahieux[1,2,3], S. Chamberlain[1], V. Wilquet[1], S. Robert[1], A. Piccialli[1], I. Thomas[1], L. Trompet[1], [1]Belgian Institute for Space Aeronomy (Avenue Circulaire 3, 1180 Brussels, Belgium and arnaud.mahieux@aeronomie.be) for first author, [2]Fonds National de la Recherche Scientifique (Rue d'Egmont 5, 1000 Brussels, Belgium), [3]The University of Texas at Austin (Austin, TX 78712, USA).

Introduction: The Solar Occultation in the InfraRed (SOIR) instrument onboard Venus Express sounded the Venus mesosphere and lower thermosphere using solar occultation geometry between April 2006 and December 2014. The observations were all taken at the terminator.

Water vapor: We report on the water vapor vertical distribution above the clouds and geo-temporal variations, observed during the full Venus Express mission. Water vapor profiles are sampled between 80 and 120 km, and calculations of the water vapor volume mixing ratio agrees with those from previous studies. Short term variations over several Earth days dominate the data set, with densities varying by up to a factor 19 over a 24 hr period. Similarly to what was found for other trace gases detected with the SOIR instrument, such as HCl, HF and SO_2, no significant spatial or long term trends are observed.

287 water vapor vertical profiles obtained at the Venus terminator between 80 km and 120 km from 13th August 2006 and 25th September 2014 were analyzed for temporal and spatial abundance variations. The average atmospheric profile is found to vary with altitude between 0.56 ppmv and 2.45 ppmv which is in good agreement with previous observations [1-3]. Standard deviations are significantly smaller than the full range of volume mixing ratio values at all altitudes indicating that the variations are real.

The decrease in volume mixing ratio abundance below 100 km appears to be a common feature of most water vapor volume mixing ratio profiles and agrees with the decrease in water vapor observed by both Bertaux et al. Bertaux, Vandaele [1] and Fedorova et al. Fedorova, Korablev [2]. It is difficult to conclude whether the altitude trend of the water vapor VMR is in agreement with the study by Sandor and Clancy Sandor and Clancy [4] as the altitude range covered by mm-wave ground-based spectra only partly overlaps with the one covered by the SOIR experiment for which the altitude sounded is also much better resolved. Based on a very limited number of spectra, the variability of the water vapor VMR was found to be higher in the lower than in the upper mesosphere of Venus [4]; this is in agreement with our observations as the standard deviation of the SOIR mean profile is the smallest at 100 km and increases with decreasing altitude.

No significant spatial variations or long term temporal variations are observed in the present data set in which short term variability masks all other possible trends. Our observations agree that short term (between 1 and 10 Earth days) variability is dominant.

All the water profiles used for the analysis presented in the current study are available on the Virtual European Solar and Planetary Access (VESPA, http://www.europlanet-vespa.eu/), which aims at building a Virtual Observatory for Planetary Science, connecting all sorts of data in the field, and providing modern tools to retrieve, cross-correlate, and display data and results of scientific analyses [5]. The full Venus Express SOIR dataset is available in the open access VESPA infrastructure [6] under the label 'Venus atmospheric profiles - From SPICAV-SOIR/VEx'.

Hydrogen isotopic ratio:

We also report on simultaneous observations of the water first isotopologue HDO made by SOIR, which occurred 194 times during the whole VEx mission. Similarly to water vapor, we observe a large variation of HDO with time and space, without any clear time of spatial dependency.

We report on the ratio of the simultaneously measured HDO and H_2O profiles, that show a constant ratio of 0.1 ± 0.1 below 100 km, and increase exponentially at higher altitude to reach a value of 1 ± 0.4 at 120 km of altitude. The results are in agreement with previous works below 100 km. The results above that altitude could not be compared to any other results as they are not reported in the literature [1, 2, 7-9].

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