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NEUTRAL COMPOSITION OF THE VENUS ATMOSPHERE MEASURED BY SPICAV/SOIR ON BOARD VENUS EXPRESS: A COMPENDIUM.

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Introduction: The Solar Occultation in the Infrared (SOIR) instrument on-board Venus Express is an infrared spectrometer covering the 2.2 - 4.3 μm spectral region. This instrument allows the detection of several key species of the Venus atmosphere, including CO_2 , CO, $\text{H}_2\text{O}/\text{HDO}$, HCl, HF and SO_2 . From the CO_2 density measurements, temperature is inferred giving information on the thermal structure of the atmosphere. Here we described the kind of data (profiles, latitudinal average, etc.) that have been obtained during the complete duration of the mission.

SOIR dataset: The Royal Belgian Institute for Space Aeronomy (BIRA-IASB) was in charge of SOIR's development and operations as well as its data pipeline.

BIRA-IASB carried out several studies on the composition of Venus mesosphere and lower thermosphere. The retrieval method has been described in detail in several papers introducing the solar occultation method [1], deriving CO_2 densities [2, 3] and trace gases such as CO [4, 5], HCl and HF [6], SO_2 [7-9], H_2O and HDO [10]. Temperature and total density, and therefore structure, has been retrieved from the CO_2 observations [2, 3, 11, 12]. Density and temperature profiles of the upper atmosphere of Venus (60 km to 170 km) at the terminator have been retrieved from SOIR's spectra using different assumptions, wherein the hydrostatic equilibrium and the local thermodynamical equilibrium in the radiative transfer calculations.

The SOIR spectra give also access to information on the aerosol content in the upper haze. Light extinction due to aerosols and cloud top altitudes have been obtained [13, 14] as well as the H_2SO_4 concentration in the droplets [15].

These results allow us to produce an Atmospheric model of Venus called Venus Atmosphere from SOIR measurements at the Terminator (VAST). Data obtained by SOIR will also contribute to update the Venus International Reference Atmosphere (VIRA) [16].

Recently, the treatment of the raw data to transmittance has been optimized, and a new dataset of spectra has been produced. All raw spectra (PSA level 2) as well as calibrated spectra (PSA level 3) have been delivered to ESA's Planetary Science Archive (PDS). Consequently the re-analysis of all spectra has been undergone. We will describe in detail the new derivation of the transmittances, and the updated dataset.

Results: In the following of the paper, we will describe in detail the data derived from the SOIR instrument, their coverage in terms of latitude, local solar time and altitude. As a general comment, solar occultation observations provide information on a very important region of the atmosphere, i.e. the terminator, the limit between the day and night sides of the planet. As a consequence the observations of SOIR correspond either to 6 am or 6 pm, even if at high latitude the definition of time starts to be meaningless. This region is crucial because it is a place of large longitudinal gradients in temperature and density.

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