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## **Minor Species in Venus' Night Side Troposphere as Observed by VIRTIS-H/Venus Express**

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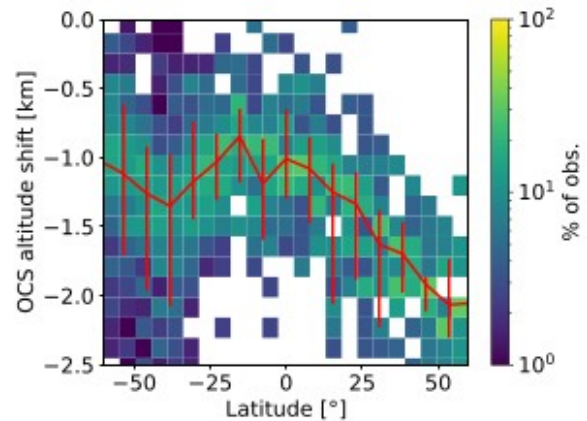
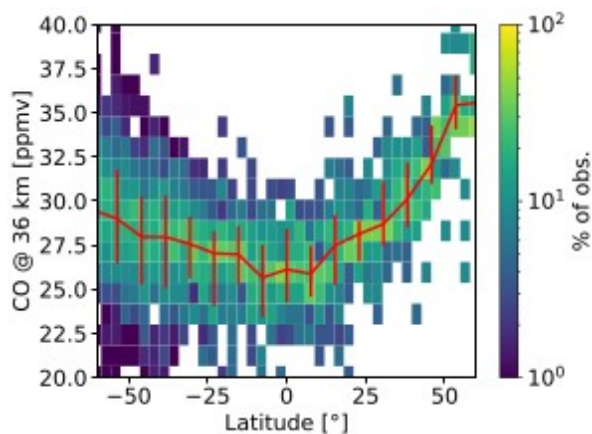
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**MINOR SPECIES IN VENUS' NIGHT SIDE TROPOSPHERE AS OBSERVED BY VIRTIS-H/VENUS EXPRESS.** E. Marcq<sup>1</sup>, B. Bézard<sup>2</sup>, J.-M. Reess<sup>2</sup>, F. Henry<sup>2</sup>, S. Énard<sup>2</sup>, S. Robert<sup>3</sup>, F. Montmessin<sup>1</sup>, F. Lefèvre<sup>1</sup>, M. Lefèvre<sup>1</sup>, A. Stolzenbach<sup>4</sup>, J.-L. Bertaux<sup>1</sup>, G. Piccioni<sup>5</sup> and P. Drossart<sup>6</sup>,<sup>1</sup>LATMOS/IPSL, UVSQ, Université Paris-Saclay, Sorbonne Université, CNRS, Guyancourt, France, <sup>2</sup>LESIA, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, Université Paris-Cité, Meudon, France, <sup>3</sup>BIRA, Brussels, Belgium, <sup>4</sup>IAA, Granada, Spain, <sup>5</sup>IASF, INAF, Roma, Italy, <sup>6</sup>IAP, Sorbonne Université, CNRS, Paris, France

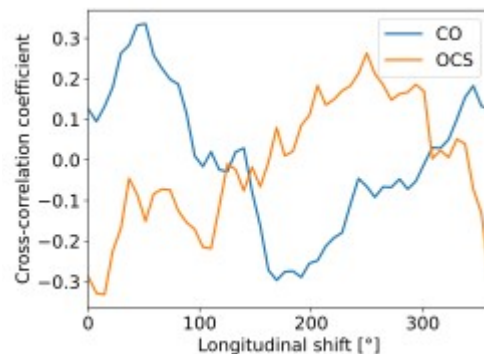
**Summary:** The 2.3  $\mu\text{m}$  spectral window has been used to constrain the composition of the lower atmosphere (in the 30–40 km altitude range) on the night side of Venus for more than thirty years. Here, we present a follow-up study of [1], but using the full VIRTIS-H/Venus Express data archive as well as an updated radiative transfer forward model. We are able to confirm a latitudinal increase of CO of about 30% between 0° and 60°N, as well as an anti-correlated vertical shift of OCS profile by about  $-1$  km in the same latitude range. Both variations are about twice smaller in the southern hemisphere. Correlations of low latitude CO and OCS variations with zonally shifted surface elevation is tentatively found. These results are consistent with CO and OCS variations resulting from the competition between local thermochemistry and a Hadley-cell-like general circulation, albeit influenced by the orography. Finally, no evidence for spatial variations of water vapor (combined H<sub>2</sub>O and HDO) or sulfur dioxide could be evidenced in this data set; better constraining possible variations of these species would require future missions to include infrared spectrometers operating at a spectral resolving power higher than  $\sim 10^4$ , such as VenSpec-H onboard EnVision[2].

### Results:

*CO & OCS latitudinal variations.*



*Correlations with zonally shifted surface elevation*



**Data availability:** These findings have been recently published[3]. VIRTIS-H data can be obtained from ESA's Planetary Science Archive (PSA): <https://archives.esac.esa.int/psa/>. The VIRTIS/Venus Express dataset is also searchable from the Europlanet / VESPA portal (<https://vespa.obspm.fr/>), cured by PADC at Paris Observatory.

### References:

- [1] E. Marcq et al., A latitudinal survey of CO, OCS, H<sub>2</sub>O, and SO<sub>2</sub> in the lower atmosphere of Venus: Spectroscopic studies using VIRTIS-H, *JGR*, 2008
- [2] S. Robert, VenSpec-H, infrared spectrometer onboard EnVision to study Venus' volcanism, *EPSC-DPS joint meeting*, 2019
- [3] E. Marcq et al., Minor species in Venus' night side troposphere as observed by VIRTIS-H/Venus Express, *Icarus*, 2023