Reanalysis of the SPICAV-UV nadir spectra on the day side of Venus: SO2 , O3 and other UV absorbers

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Abstract

1. Introduction

The ESA *Venus Express* spacecraft orbited around Venus between 2006 and 2014. During more than 14 Venusian years, its instruments, among which the UV spectrometer SPICAV-UV [1], acquired a wealth of data whose analysis has far from ended. Its nadir observations on the dayside enabled the analysis of the sunlight backscattered at Venus' cloud top in order to derive column densities of UV absorbers above the cloud top, most prominently SO_2 [2, 3].

We present here a wholly new analysis of SPICAV-UV nadir data based on a complete reprocessing of the full observational dataset. Compared to our legacy analysis, this study also take advantage of a greatly improved version of our forward radiative transfer model.

2 Improvements

2.1 Observation processing

Our pipeline has been greatly improved since our previous studies [2, 3]. A more accurate representation of the 2D instrumental PSF and spectral sensitivity has resulted in substantial improvements of the observed radiance factors. This is particularly spectacular in the wavelength range below 210 nm, where the weakness of the solar spectrum results in a poor accuracy of the spectral reflectance and therefore a large sensitivity to any parasitic light on the detector. On the other hand, the better treatment of the spectral sensitivity results in noticeable improvements for wavelengths larger than 300 nm, where the new radiance factors are more in line with other UV observations, such as those from HST [4].

2.2 Forward model

We also greatly improved our forward radiative transfer model. It is now able to take into account not only CO_2, SO_2 and SO as gaseous absorbers, but now includes O_3 as well as the new UV absorber candidate species cis- and trans-OSSO[5]. New mode 1 and mode 2 particle density profiles, based on recent SPICAV-IR data[6], are also included. It is also possible to alter the imaginary refractive index of the cloud and haze particles in order to adjust the UV brightness without resorting to a cruder multiplicative scaling factor, as it was the case in our first studies.

3 Preliminary results

The whole SPICAV-UV archive is currently (as of May 2017) being reprocessed according to the improved pipeline described hereabove. In the meantime, we were able to test out new forward model against a few selected reprocessed *VEx* orbits. Our still in progress work (Fig.1 and 2) indicates that (1) UV absorbers other than OSSO are required in order to account for the observed radiance factors, and (2) inclusion of O_3 absorption results in a statistically significant improvement of the fitting for some spectra.

Acknowledgements

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References

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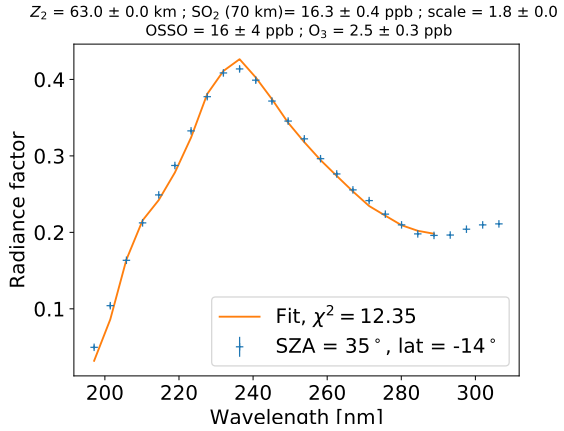

Figure 1: Preliminary fitting of a newly processed spectrum acquired during orbit # 595

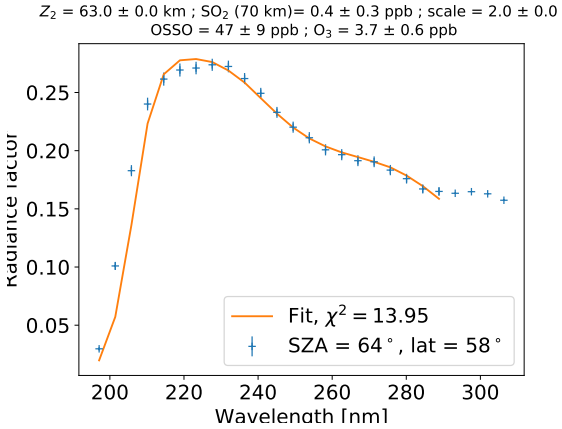

Figure 2: Preliminary fitting of a newly processed spectrum acquired during orbit # 1338

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