



## A 1-D radiative conductive model to study the SOIR/VEx thermal profiles

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SOIR is an infrared spectrometer on board Venus Express that probes the Venus terminator region since 2006. The measurements are taken on the morning and evening sides of the terminator, covering all latitudes from the North Pole to the South Pole. Its wavelength range - 2.2 to 4.3  $\mu\text{m}$  - allows a detailed chemical inventory of the Venus atmosphere [1-5], such as  $\text{CO}_2$ , CO,  $\text{H}_2\text{O}$ , HCl, HF,  $\text{SO}_2$  and aerosols.  $\text{CO}_2$  is detected from 70 km up to 165 km, CO from 70 km to 140 km, and the minor species typically below 110 km down to 70 km. Number density profiles of these species are computed from the measured spectra. Temperature profiles are obtained while computing the spectral inversion of the  $\text{CO}_2$  spectra combined with the hydrostatic law [6]. These temperature measurements show a striking permanent temperature minimum (at 125 km) and a weaker temperature maximum (over 100-115 km). The time variability of the  $\text{CO}_2$  density profiles spans over two orders of magnitude, and a clear trend is seen with latitude. The temperature variations are also important, of the order of 35 K for a given pressure level, but the latitude variation are small.

Miss-RT, a 1D radiative transfer model has been developed to reproduce the SOIR terminator profiles, derived from the Mars thermosphere code presented in [7]. This model has been expanded to better account for the  $\text{CO}_2$ , CO, and O non-LTE radiative heating and cooling processes which have to be considered in the dense atmosphere of Venus. Radiative cooling by minor species detected by SOIR (e.g. HCl,  $\text{SO}_2$ , and  $\text{H}_2\text{O}$ ) are found to be small in comparison to the 15  $\mu\text{m}$   $\text{CO}_2$  cooling. Aerosol cooling in the 60-90km altitude range may be important to the thermal balance. There is a good agreement between the 1D model temperature profile and the mean SOIR temperature profile. Further we can suggest parameters that can be adjusted to improve the agreement between the model and measurements. The remaining differences can be attributed to the atmosphere dynamics at the terminator.

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