# Modeling of the 1.10- and 1.18-µm nightside windows observed by SPICAV-IR aboard Venus Express

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Emission from the surface of Venus can be detected in the 1.10- and 1.18-µm nightside windows. The two windows are limited on one side by strong $CO_2$ bands (at 1.05 and 1.21 µm) and on the other side by a water vapor band centered at 1.13 µm. Analysis of his emission allows us to determine the water vapor abundance profile near the surface of Venus. We present here a first analysis of the 1.10- and 1.18-µm nightside windows observed with the long-wavelength (LW) channel of the SPICAV Vis-IR AOTF spectrometer at a resolution of 5.1 $cm^{-1}$ (resolving power of ~1700 at 1.15 µm). We used a large weighted average of SPICAV-IR spectra recorded between Orbits 800 and 815, between latitudes 28°S and 57°S. All selected spectra have an emission angle less than 45° and a surface elevation between -1.0 and 0.2 km. The S/N ratio of the SPICAV-IR average spectrum at the peak of the 1.18-µm window is about 300. This spectrum was compared with radiative transfer calculations to constrain the surface $H_2O$ mixing ratio and to investigate the uncertainties introduced by the spectroscopic parameters in the model. In particular, we tested various representations of the $CO_2$ line opacity (line mixing, theoretical and empirical far-wing models) and the effect of an additional $CO_2$ continuum opacity, possibly from collision-induced absorption. We also compared calculations with different spectroscopic databases: HITEMP and CDSD for $CO_2$, GEISA and BT2 for $H_2O$. The whole range 1.05-1.25 µm cannot be fully satisfactorily reproduced with these calculations, which points to incompleteness or inaccuracies in the $CO_2$ and possibly $H_2O$ databases. Our best fit model suggests an $H_2O$ mole fraction between 30 and 45 ppm, with a precision presently limited by these modeling uncertainties.