Geophysical Research Abstracts
Vol. 12, EGU2010-11319, 2010
EGU General Assembly 2010

Spatial and Temporal distribution of CO$_{2}$ 4.3-$\mu $m NLTE Emission from nadir VIRTIS-H/Venus Express observations

Javier Peralta (1), Miguel Ángel López-Valverde (2), Gabriella Gilli (3), Pierre Drossart (4), and Giuseppe Piccioni (5)

(1) Instituto de Astrofísica de Andalucía (CSIC), Granada, Spain (peralta@iaa.es / +34958814530), (2) Instituto de Astrofísica de Andalucía (CSIC), Granada, Spain (valverde@iaa.es / +34958814530), (3) Instituto de Astrofísica de Andalucía (CSIC), Granada, Spain (gilli@iaa.es / +34958814530), (4) LESIA/Observatoire de Paris (CNRS), Paris, France (pierre.drossart@obspm.fr / +33145077110), (5) Istituto Nazionale di Astrofisica (INAF), Rome, Italy (giuseppe.piccioni@iasf-roma.inaf.it / +390649934188)

Non-Local Thermodynamic Equilibrium (non-LTE) emissions are known to play a key role in the radiative heating and cooling of the Venus mesosphere and lower thermosphere (Dickinson, JAS, 1973; Roldan et al., Icarus, 2000). In the case of the Venusian atmosphere, CO_2 vibrational-rotational emissions at 4.3 μm and 2.7 μm were predicted to give intense emissions, and since they are originated between 80 and 150 km, their observation might give information on the atmospheric parameters at those altitudes, depending on sensitivity and spectral resolution. The VIRTIS spectrometer on board Venus Express allows for the first time the systematic sounding of these bands in the Venus atmosphere, both in nadir and limb observing geometries. The limb data by VIRTIS has been recently studied by our team (Gilli et al., JGR, 2009; López-Valverde et al., 2010 submitted; Gilli et al., 2010 submitted), focusing on its vertical distribution and the validation of non-LTE models, but an exhaustive study of nadir observations has not been presented so far, except for the detection of gravity waves by García et al. (2008; 2009). In this work, we have used the nadir observations to study the horizontal distribution of the CO_2 non-LTE emissions at 4.3 μm, mainly originated at altitudes about $\sim$110 km. The analyzed dataset comprises the whole nadir measurements with VIRTIS-H (the highest spectral resolution channel) obtained up to September 2009, covering nearly 900 days of observations and more than 140,000 spectra. Similarly to the case of limb data, it was found that the nadir radiance depends not only on the Solar Zenith Angle, but also on the Emission Angle, as predicted by our non-LTE model. After careful radiance averages, the small dispersion found in the mean emission of this band suggests that the Venus lower thermosphere is more stable than expected, with scarce episodes of significant variation during the studied period. Since the spectral resolution of VIRTIS-H allows separating different CO_2 isotopic and hot bands, this dataset implies a valuable test for non-LTE models. Therefore, a revision of some key rate coefficients for collisional relaxation of CO_2 vibrational energy levels is also carried out, by means of a systematic comparison between radiance ratios measured by VIRTIS-H and the ones obtained with our non-LTE radiative transfer model. Conclusions will be briefly discussed at the meeting.