Geophysical Research Abstracts,
Vol. 11, EGU2009-9239, 2009
EGU General Assembly 2009

Atmospheric temperature structure of Venus as observed by VIRTIS on Venus-Express

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After almost 3 years in orbit on the ESA mission Venus-Express, the spectrometer VIRTIS (Visible and InfraRed Thermal Imaging Spectrometer) has collected an extensive dataset. We used in particular the infrared channel of VIRTIS to derive the thermal maps of Venus in the pressure range 100 - 0.1 mbar, corresponding to about 65 – 90 km altitude respectively, from the carbon dioxide absorption band at 4.3 micron (Grassi, et al, JGR, 2008). Results about the thermal structure of the Southern hemisphere of Venus are presented. Typically, air temperature increases towards the pole in the entire altitude range effectively sounded by VIRTIS. An exception exists at the approximate level of clouds top altitude - about 65-70 km - where a local minimum around 60-70°S is observed. This cold collar is also a region of strong thermal inversion. In terms of variability, fluctuations are observed both on short and long time scales, especially around 1 mbar.
Mean temperature maps at selected pressure levels are also presented. The highest temperature contrast is seen in the lowest layer effectively probed at about 65-70 km altitude where both cold collar and polar vortex dominate the dynamics from mid to high latitudes. Here the temperature is in average warmer at dusk than at dawn and the most important gradient, about 10K, is observed around 70°S, in the cold collar region. The thermal contrast tends to vanish at higher altitudes where the atmosphere becomes more horizontally isothermal.
Finally, a first attempt of comparison with the previous results from the Venera15 FTS observations are presented. The VIRTIS mean maps present significant similarities with those observed by the Soviet instrument in the Northern hemisphere (Zasova, et al, Icarus, 2007), a qualitative clear indication in terms of axial symmetry N-S of the Venus' atmospheric temperature structure.