Geophysical Research Abstracts, Vol. 9, 07109, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07109

Ground based high spatial resolution mapping of Venus dynamics in the upper atmosphere by IR heterodyne spectroscopy

M. Sornig, G. Sonnabend, P. Krötz, D. Stupar and R. Schieder
I. Physikalisches Institut, University of Cologne, Germany

The investigation of the global circulation of the Venusian atmosphere is one of the science objectives of the ESA space mission VenusExpress. Ground based observations can provide additional information to the satellite data.

Besides ground-based observations in the visible and mm-wavelength regions the detection of CO_2 features at mid-infrared frequencies can probe the Venusian wind field. The different methods provide complementary information because they are sensitive to different altitudes.

In the case of mid-infrared CO_2 observations the information about the wind velocities is gathered from analysis of Doppler(wind)-shifted molecular non-LTE emission from the upper atmosphere above the cloud deck ($\sim$100-120 km). Ultra high spectral resolution is necessary to fully resolve the narrow non-LTE emission lines ($\sim$10 MHz) around 10 μm and to measure their Doppler(wind)-shifts. Heterodyne technique is needed to achieve a combination of high spectral resolution and high sensitivity. Given a good knowledge of additional atmospheric parameters like temperature/pressure profiles, molecular abundances etc. and a radiative transfer code, the modeling of atmospheric features and extraction of Doppler shift information from high resolution data is relatively straightforward and has been demonstrated on a number of objects.

The Cologne receiver THIS (Tuneable Heterodyne Infrared Spectrometer) is the only tuneable heterodyne system allowing broad application and less limitations in the choice of target lines and usable observing periods. In addition IR-observations also provide good spatial resolution at the diffraction limit of the telescope. We plan obser-

vations of Venus during the coordinated ground based observing campaign to support VenusExpress in May/June 2007.

Like on Mars dynamical properties of the atmosphere on Venus will be studied and wind velocities will be measured with an accuracy of better than 10 m/s. An improved understanding of the global wind field and the interconnection between the global retrograde zonal flow and the sub-solar to anti-solar wind pattern is the goal. We believe that in the wake of the mentioned Venus missions the efforts in modeling the Venusian atmosphere will increase and that our data will help to constrain the models.