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Thermal Structure of Venus Night-Side Atmosphere as Seen by Ground-Based Heterodyne Observations at 10μm

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The structure of Venus atmosphere has been the target of intense studies in the past decade. The recent space mission Venus Express (VEX) has shed light on many open question concerning the thermal and dynamical behavior of its atmosphere. In the vicinity of the imminent shut down of the space craft, the importance of ground-based observations increases significantly.

We want to introduce a new and unique opportunity to retrieve temperature profiles from the Venusian night-side atmosphere, using ground-based observation techniques. The application of heterodyne spectroscopy in the infrared enables the capability to resolve single molecular ro-vibrational transition features. Pressure broadened CO_2 absorption lines, observable on the Venusian night side, have proven to be a good tracer for analyzing the predominant temperature. The profiles originate from the altitude region between the cloud top at $\sim$65km ($\sim$100hPa) and 95km ($\sim$0.1hPa). With a spectral limited altitude resolution of 5.3km, vertical profiles can be variably deduced on various position on the planet.

Initial results from two observing campaigns in March (A) and May (B) 2012 will be presented. During campaign A, Venus was shortly after maximum Eastern elongation and about 45% illuminated, while on campaign B, the Planet was close to its latest transit and thus almost completely dark. At each campaign, two different locations on the planet were investigated, by probing the CO_2 P(12) transition at 10.5μm. A comparison to space-based data, including a coordinated observation with VEX, performed during campaign B, and the spatial variability of the temperature profiles are under investigation.