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Ground based submillimeter observations of thermal structure, CO distribution, and wind in the Venus mesosphere

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Heterodyne spectroscopy at the millimeter/submillimeter domain is a powerful tool to study the thermal structure, chemical compositions, and dynamics in the Venus mesosphere. A large number of roto-vibrational transitions of many photochemically important species in the Venus atmosphere such as H₂O, HDO, CO, SO and SO₂ are found in this spectral region. The vertical profiles of the atmospheric state (e.g., temperature, chemical compositions) can be retrieved by using the pressure dependency of the spectral line shape of those rotational transitions. Furthermore, the high spectral resolving power of the submillimeter heterodyne technique achieves the detection of the Doppler shift of molecular lines, which provides the capability of direct measurements of the mesospheric wind as line-of-sight velocity. The spatial resolution of such observations can be improved by using the interferometer facilities.

This paper describes about the recent works on the ground-based submillimeter observations of Venus atmosphere using the Combined Array for Research in Millimeter-wave Astronomy, CARMA, and the Sub-Millimeter Array, SMA, in 2009. Disk-resolved wind field maps are obtained from these observations, and the results are suggesting that an intense spatial variability of the wind pattern in the Venus mesosphere.