Structure of Venus' sub-cloud atmosphere revealed by Akatsuki radio occultation experiments

*Takeshi Imamura[1], Hiroki Ando[2], Katsuyuki Noguchi[3], Silvia Tellmann[4], Martin Pätzold[4], Bernd Häusler[5], R. K. Choudhary[6]

1. Graduate School of Frontier Sciences, The University of Tokyo, 2. Kyoto Sangyo University, 3. Nara Women' s University, 4. Universität zu Köln, Germany, 5. Universität der Bundeswehr München, Germany, 6. Space Physics Laboratory, Vikram Sarabhai Space Center, India

Radio science (RS) experiment in Akatsuki mission observes the vertical structure of the Venusian atmosphere from about 35 km to 90 km altitude. Akatsuki RS mainly probes the low and middle latitude regions thanks to the near-equatorial orbit in contrast to the previous radio occultation experiments using polar orbiters. By using more than 30 profiles of the temperature and the pressure obtained by 2017, the background profiles and the local time-dependent structures were studied. The pressures below the cloud layer are systematically different from those in the Venus International Reference Atmosphere that was developed based on the measurements made by early 1980s. Significant local-time dependence of the pressure below the cloud was also seen, suggesting downward propagation of thermal tides that are generated near the cloud top. Such thermal tides can transport zonal momentum from the lower atmosphere to the upper atmosphere, thereby sustaining the super-rotation.

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