Mesoscale to planetary-scale motions in the Venus atmosphere revealed by cloud tracking with Akatsuki IR and UV images

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Since its orbital insertion on Dec 7, 2015, Akatsuki has been providing us with high quality images at multiple wavelengths for both the dayside and the nightside of Venus [1]. In this presentation, we present results based on cloud tracking. Owing to the high quality and a newly developed cloud tracking algorithm with novel error evaluation [2,3], we are able to conduct cloud tracking with unprecedented quality and resolution. In earlier studies, snapshots of wind distributions are shown mainly for demonstrations, but now we are able to seize it with confidence. We found sub-planetary-scale (down to mesoscale in terms of the Earth’ s atmosphere) divergent and vertical motions on the dayside cloud top of Venus by using images from UVI, the ultraviolet imager of Akatsuki. The result suggests the existence of quasi-two-dimensional turbulent motion as well as mesoscale three-dimensional features. We also found a jet-like flow in the lower-cloud layer from the night-side images from IR2, an infrared imager of Akatsuki. The equatorial jet has not been reported previously, so its emergence indicates some temporal variability at this level. Further study is ongoing. For example, we have found vortical motions that are likely associated with barotropic instability.

Keywords: Venus, Atmosphere, Jet, Mesoscale motion, Hydrodynamic instability, Superrotation

