Local-time dependence of the cloud-top Temperature of Venus obtained by close-up observations of LIR on board Akatsuki

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The Long-wave infrared camera (LIR) on board Akatsuki detects thermal infrared radiation at wavelengths of 8–12 μ m from cloud-top level (65 km) of Venus in order to provide brightness temperature map. LIR has mainly obtained Venus disk images with more than 50,000 km distance along Akatsuki's elliptical orbit. Meanwhile, 500 sheets of close-up images at equatorial region were obtained with high spatial resolution. In this study, temperature deviations were derived from the close-up images in latitude from 30 to -30 degree. After that, zonal wavenumber spectra of the temperature deviation at mesoscales (wavelengths of 20–1000 km) were obtained in 5 degrees step of latitude as a function of local time (LT). The result shows that the temperature deviation is obviously high in LT 14:00-18:00, and the spectral peak corresponds to the wavelengths of 500 km. The temperature deviation would be caused by the stationary gravity wave discovered by LIR initial observation (Fukuhara et al., 2014, Nature Geo). We could detect the stationary gravity wave in the LIR image not only in the Venus disk image but also in the close-up image. Another high temperature deviation is seen in LT ~23:00, and the spectral peak corresponds to the wavelengths of ~150 km. A numerical simulation (Imamura et al., 2014, Icarus) has predicted that temperature deviation at the cloud-top level can be caused by upward propagation of the gravity wave, which is generated by the convection in the cloud layer of the night-side of the equatorial region. Our result can support existence of such upward propagation of the gravity wave in the cloud level of Venus.

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