

Temperature distributions in the Venus O₂ night airglow layer by ground-based observations

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Venus 1.27-micron O₂ night airglow can be used as a probe of chemistry and dynamics at around 95 km. The enhanced rotational temperature at around the anti-solar point found from the O₂ airglow has been supposed to indicate the evidence of downflow. However, the nightside temperatures at 90-100 km found by SPICAV/VEX differ from those by the airglow.

We conducted 5-days monitoring observation of the airglow to detect the planetary-scale waves with CSHELL/IRTF from 11-15 July 2012. The 1.27-micron O₂ night airglow in the Venus atmosphere can pass through the Earth's atmosphere with a help of the Doppler shift. We obtained spectral image cubes at the wavelength of R-branch of the airglow band, which includes several rotational lines. In order to cover spectral information continuously, a slit drifted across Venus' nightside disk. The spatial resolution of the image is governed by seeing. The typical seeing was 0.6'' to 1.5'' in our observing run and corresponds to 200-450km at the center of Venus' disk. Under such conduction, we may detect airglow structures of small scales due to atmospheric waves; this is smaller than the region of enhanced airglow having a horizontal scale of ~3000km. We can also derive the hemispherical distribution of the rotational temperature. To coincide with our observations, SOIR/Venus Express stellar occultations were conducted. We can try to compare our horizontal temperature map and vertical temperature profile from SOIR data.

Keywords: Venus atmosphere, airglow, ground-based observation