# Vertical Propagation of the Large Stationary Gravity Waves in the Venus Atmosphere

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The Longwave Infrared Camera onboard Akatsuki has observed a bow-shaped stationary temperature feature [Fukuhara et al., 2017]. It extended from the northern polar region to the southern polar region across the equator, and stayed near the evening terminator for four earth days at least in contrast to the background wind speed of about 100 m $s^{-1}$ at the cloud-top level. Furthermore, Kouyama et al. [2017] has reported that the stationary features repeatedly appeared only above the highlands in the low latitudes in the afternoon. A simple numerical simulation using a model based on Imamura [2006] suggested that the stationary feature is caused by a gravity wave propagating from near the surface [Fukuhara et al., 2017]. However, conditions under which the wave can propagate are still unknown. In the present study we investigated the wave propagation in the numerical simulation under various conditions of the static stability and eddy diffusion coefficient in the cloud layer in the altitude range of 45–55 km.

For all simulation cases with several different thicknesses and static stabilities of a near-neutral layer around the cloud-top level, the waves with a vertical wavelength of around 30 km can propagate from near the surface to the cloud-top level, though the amplitude of the wave at the cloud-top level changes for a factor of two. For cases with an eddy diffusion coefficient much larger than the nominal value, the stationary waves are also hardly damped. It is found that the Venus atmosphere is transparent to the gravity wave with a large vertical wavelength. These results suggest that the occurrence of the stationary gravity waves depends not on the conditions under which the waves pass through the atmosphere but rather on those of wave excitation near the surface.

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