Active and inactive behaviors of the planetary-scale waves on Venus cloud top

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Planetary-scale waves on Venus cloud top cause periodical fluctuations in winds and also UV brightness. The candidates of these waves are 4-day Kelvin wave and 5-day Rossby wave of zonal wavenumber 1, however, their temporal evolutions are poorly understood. In this work, we conducted time-resolved periodical analysis in 365 nm brightness and cloud tracking wind fluctuations obtained by UVI onboard AKATUSKI Japanese Venus Climate Orbiter from January to September 2017, and we have revealed the dramatical evolution of planetary-scale waves and the dynamical connection between wave and planetary-scale UV features.
During the observation season, we could find prominent ~5-day periodicity in both wind and brightness fluctuations, whose phase velocity was slower than dayside mean zonal winds (or the super-rotation) by > 35 ms^{-1}. We succeeded to reconstruct the horizontal wind field related to the observed 5-day mode, and since planetary-scale vortices, whose the center existed ~35^{o} latitudes, having large equatorial symmetric structures in the latitudinal direction were found, it can be a strong manifestation of the retrograde propagating Rossby wave. The observed Rossby wave subjected to temporal changes of enhancing and attenuating in the amplitude of wind fluctuations with ~100-day time scale. According to the temporal evolution of the Rossby wave, white cloud belts in 45^{o} --60^{o} latitudinal regions began rippling synchronously in both hemispheres. Moreover, the Rossby wave deformed the planetary-scale dark UV feature in the equatorial region, and that should be the reason for significant 5.1-day periodicity in brightness variation. Before the Rossby wave enhancement, weak 3.8-day periodical signals can be observed in zonal wind and brightness variations in the equatorial region. This is a suggestive prograde propagating Kelvin wave, and this might be the reason for the origin of dark clusters in the equatorial region.
While wave activities during the observation season from January to September 2017 were clear, significant periodical wind or brightness fluctuations were not always confirmed in the other observation seasons. In orther to investigate the reason for active and inactive behaviors in planetary-scale waves, we will compare seasons when significant planetary-scale waves were observed and they were not focusing on the connection with mean zonal wind speed, global UV albedo, and cloud top temperature.

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