Statistical analysis of the morphology of Venusian clouds

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In order to understand the mechanism by which Venus' s cloud is maintained, it is necessary to clarify the transport of atmospheric constituents at various temporal and spatial scales. In the ultraviolet images of Venus, various small-scale patterns indicative of convention and waves are seen at the cloud top. Though their relation to material transport has been drawing attention, their dynamical properties and contribution to transport are not known. These patterns will evolve over time while being advected by the high-speed easterly wind called the superrotation. To obtain clues to the processes, we analyzed ultraviolet images at the wavelength of 283 nm taken continuously by UVI onboard the Venus probe Akatsuki. SO_2 is the dominant absorber at the wavelength of 283 nm on Venus, and the horizonal distributions of SO_2 and clouds near the altitude of 65 km can be observed. By analyzing the images separately for each local time, we extracted convective patterns dependent on the local time. The complexity of the pattern was evaluated quantitatively with Fractal dimension, thereby examining the statistical tendency of the local time variation. We also performed the same analysis using IR images at the wavelength of 2.02 μm taken by IR2 onboard Akatsuki. CO_2 is the dominant absorber at 2.02 μm on Venus, and the cloud top altitude can be observed at this wavelength. The comparison between the wavelengths would lead to the elucidation of the processes controlling small-scale patterns such as convection.

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