

Study on the material transport in the Venusian cloud layer with cloud tracking method

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By using ultraviolet images of Venus obtained by VMC on Venus Express spacecraft, a relationship between the wind velocity, which is derived by cloud tracking method, and the cloud morphology at the cloud top is investigated to reveal the mechanism of distributions of unidentified absorber. In this study, we focus on the planetary-scale distributions of brightness fixed to the local solar time and those propagating with a period of several days. Averaging the brightness in a coordinate fixed to the local solar time, we found a dark band extending from the sub-solar region to the middle latitude on the afternoon side, resembling so-called Y-feature. This suggests that Y-feature is composed of components fixed to the local solar time and propagating westward. The component fixed to the local solar time can be explained by the transport of dark material by the upward flow around the sub-solar point and poleward flow around the noon in the middle latitude associated with the thermal tide. As for the propagating component, a spectral analysis found almost the same periods in the radiance variation in the equatorial and middle latitude, although it propagates westward relative to the background zonal wind in the equatorial region and eastward in the middle latitude because of differential rotation of the background atmosphere. The observed phase difference between radiance and meridional velocity in the middle latitude suggests that the absorber is transported by the meridional flow propagating eastward relative to the background zonal wind. Then a possible process of the propagating Y-shape is: unidentified absorber is transported upward to the cloud top by Kelvin wave in the equatorial region, advected by Rossby wave and the meridional circulation in the middle latitude, and advected westward due to mid-latitude jet. Then, the band structure tilted with respect to latitude circle is generated.

Keywords: Venus, Mechanism of Y-feature, Cloud tracking