

## Variability of the propagation periods of the Y-feature on Venus in one Venus year

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The fast atmospheric circulation named the super-rotation is one of the great mysteries on Venus. Planetary scale bright and dark UV feature, which is called the Y-feature, circulate around the planet about 4-days or 5-days associated with the super-rotation. Until now, Venus exploration spacecraft such as Pioneer Venus and Venus Express have monitored the circulation of this Y-feature for many years. Variation of the circulation period of the Y-feature was observed (e.g. 5-10 Earth years [Del Genio and Rossw, 1990]) and it was suggested that the dynamical state of Venusian atmosphere changes on a time scale of one Venus year (~224 Earth days) or more. However, orbital planes of past spacecraft were nearly fixed in the internal frame of reference, and there were some difficulties to investigate the variation of periods in one Venus year without interruption. There are several numerical models reconstructing the steady super-rotation, however we have not been able to explain the mechanism of the super-rotation especially at the point of its long-term variability.

Since the Venus-Earth synodic period is 584 days, the ground-based telescope has great potential to monitor the circulation of Y-feature continuously over one Venus year except for the conjunction seasons. We conducted Venus imaging observation using 365 nm UV filter for six times at one or two months intervals from mid-August 2013 to the end of June 2014, and each observational periods has a half or one months. We analyze the UV brightness variation from equatorial to mid-latitude regions in both hemispheres and investigate the periodicity of the propagation of the Y-feature. Our data has good correlations with the one from Venus Monitoring Camera (VMC) on-board Venus Express spacecraft observing southern hemispheres in 2013.

Here we found the variation of the propagation period of the Y-feature with a few months or more time scale. Faster and slower periodical brightness variations were obtained and it was shown that the period was changed from ~5.2 days to ~3.5 days perhaps in eight months. In the middle observational period, two periodical components were obtained in the brightness variation and the Y-feature considered not maintaining in this season. On the other hand, it was confirmed that the ~3.5 days periodical component, which was apparently faster than the one ever reported, exists in all observational periods with a substantial significance. Our study suggests that the planetary scale wave activities with ~3.5 days periods contribute to the change of dynamical states on Venus. We will add our new observation results taken from April to July 2015 and discuss about the annual variability of the super-rotation.