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ピリカ望遠鏡による金星紫外輝度の数ヶ月変動の観測
Observation of a few months temporal variability of UV brightness in Venus with Pirka telescope

今井 正尭 [1*] ; 高橋 幸弘 [1] ; 渡部 重十 [1] ; 渡邊 誠 [1]
IMAI, Masataka[1*] ; TAKAHASHI, Yukihiro[1] ; WATANABE, Shigeto[1] ; WATANABE, Makoto[1]

[1] 北海道大学・大学院理学院・宇宙理学専攻
[1]Department of Cosmosciences, Graduate School of Science, Hokkaido University

The superrotation, which is a phenomenon that Venusian atmosphere moves westward at a velocity 60 times faster than the planetary rotation, is a unique atmospheric system of Venus. There are several theories to explain what drive the superrotation, but it is still unknown. Yamamoto and Tanaka (1997) suggested that the Kelvin wave in equator and the Rossby wave in mid-latitude, which propagating at an altitude of 70 km or higher, play an important role in the driving of the superrotation. They also suggested that the Kelvin and Rossby wave forms the Y-feature when they balanced. The Y-feature is the bright and dark pattern in UV range, and it has a planetary scale. From the Pioneer Venus spacecraft observation, it was revealed that the propagation and the distribution of UV features cause variation in several time scales [Del Genio and Rossow, 1982, 1990], but it has not been understood which dynamical processes determine these time scales. In our study, we focused on about 2-month brightness variation. That variation seems to be strongly associated with the Rossby wave because there is inverse correlation between low-latitude and mid-latitude, suggesting the existence of quasi-barotropic eddy. After the Pioneer Venus mission, there were no further observations to reveal the mechanism of the 2-month variation.

In this study, we observed the Venusian UV brightness variation as a function of latitude and time. We carried out the ground-based observations with Multi-Spectral Imager (MSI) onboard the Pirka telescope. The Pirka 1.6 m telescope, owned and operated by the graduate school of science in Hokkaido University, is primarily dedicated to the observations of solar planets. Using this system, we can monitor the planetary scale UV-features ($\sim$ 5,000 km) in Venus atmosphere over 8 hours in a day at 365 nm wavelength. In 2013, we carried out about 2 months total observations from mid-Aug. to mid-Nov.

There was a problem to estimate the absolute brightness variation because we observed Venus in the daytime and the correction of the extinction of the Earth's atmosphere had some difficulty. To investigate the brightness variation, we perform additional procedure for each image that we normalize the brightness in each latitudinal band with the mean brightness in 70^oN-70^oS area. Our results showed two types of UV feature. One showed the strong periodicity in both of equatorial region and mid-latitude and it also had the symmetric structure between northern and southern hemisphere. The other one did not show the strong periodicity and had the symmetric structure. We suppose that the Y-feature does not always exist and the balance of the Kelvin and Rossby wave might be lost when the periodicity and the symmetry disappear. From our observations, it seems to take more than 2 months to return from the asymmetric phase to symmetric phase. Additionally, we found that 2-month variation of brightness in each latitudinal band showed weak inverse correlation between both hemispheres like a seesaw. Such inverse correlation was not seen in the past Pioneer Venus observation. In this paper, we discuss the dynamical state of Venus during our observations and show further observation plans.

キーワード: 金星, ピリカ望遠鏡, スーパーローテーション, Y 字模様
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