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木星極域波動のスペクトル撮像観測 Multi-spectral imaging of jupiter's circumpolar wave

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Jupiter's polar region is covered by haze, which is bright in images taken in the strong methane absorption band around 889 nm. The edge of polar haze region shows circumpolar wave with averaged zonal wavenumbers of 12 at planetographic latitude of -67 degrees. Previous studies showed that the zonal wave velocity has annual variability, however, variation in few months is uncertain because of poor sampling period of previous observations. Furthermore, the polar wave was only detected at 889 nm, there is no observation to detect the circumpolar wave at another wavelength in methane absorption band indicates different altitude.

In this study, to investigate the variation of zonal velocity of the circumpolar wave in time scale shorter than a year, we continually observed Jupiter in 5 terms from 2011 to 2012 using 1.6-m Pirka telescope and multi-spectral imager. In these observations, images were captured at wavelengths of 727 nm, 750 nm and 889 nm, corresponding to continuous, medium methane absorption and strong methane absorption, respectively. From data analysis of these observations, we recognized wave structures at 727 nm and 889 nm at -67 degrees. We conclude that the zonal wave velocity is smaller than ~3 m/s during the period from October to November in 2011, which is consistent to previous observations.

In addition to above observations, we conducted the spectral scan of Jupiter in strong methane absorption band (872 - 950 nm), at 3 nm step to investigate the vertical structure of the circumpolar wave. As a result, we succeeded in imaging the different feature of horizontal wave structure.

In future work we will try to detect the variation of the zonal wave velocity in a period shorter than a year. Furthermore, we will calculate the sounding level of each wavelengths in methane absorption band and estimate quantitatively the vertical variation of the wave structure.

Keywords: Jupiter, haze, circumpolar wave, ground-based observation