

Study on dynamics of Jovian atmosphere by a colorimetric observation of surface structures

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Stripe patterns called belts or zones with various colors persist on Jovian surface. Anticyclonic vortices called an oval with various scales and colors are maintained and drifted in the boundary between zones and belts. Some ovals have different colors despite they are formed simultaneously in same latitude region. Color changes of ovals after an interaction with other ovals were also reported. Such results suggest a strong relationship between dynamics of Jovian atmosphere and colors of local structures. However, detailed mechanisms for such color variations are still unknown. In this study, colors of remarkable Jovian structures like the great red spot (GRS), bands, and zones are focused on as a tracer of the Jovian atmospheric dynamics. It is essential to monitor the Jovian surface continuously to quantify color variations with various temporal scales. However, it is difficult to make a continuous monitoring of Jupiter with large telescopes due to limited machine time. Instead, large amounts of image data reported by amateur astronomers in the world have potential to achieve the continuous monitoring by combining them (e.g. Archive by Association of Lunar and Planetary Observers of Japan: <http://zetta.jpn.ph/Alpo/latest/index.html>). However, quantitative color comparison between color images acquired by different optics and sensors are basically difficult. It is necessary to have standard spectra to correct a white balance of these color images. Thus, a simple device which can observe visible spectra of Jovian surface with resolving spatial structures was developed. Since this device is compact and portable, an observation by combining it with established telescopes managed by public astronomical observatories is immediately possible. On a night of Dec 15 2015, a spectroscopic observation of Jovian surface atmosphere using the device and a 40cm diameter telescope in Kawasaki municipal science museum have been conducted. In this talk, results of the spectroscopic observation of Jovian surface on Dec 15, 2015 and an analysis method to quantify the colors of the surface structures using a chromaticity diagram are presented.

Keywords: Jupiter, atmosphere, colorimetry, GRS, spectroscopy, chromaticity diagram