PCG32-P05 会場:コンベンションホール 時間:5 月 26 日 18:15-19:30

NIIHAMA カメラ及び SOLAR-C 望遠鏡による金星の赤外偏光撮像観測
Infrared imaging-polarimetric observations of Venus with NIIHAMA and SOLAR-C on Haleakala

榎本 孝之 [1*] ; 佐藤 毅彦 [2] ; 米田 瑞生 [3] ; Kuhn Jeff[4]
ENOMOTO, Takayuki[1*] ; SATOH, Takehiko[2] ; YONEDA, Mizuki[3] ; KUHN, Jeff[4]

[1] 総合研究大学院大学, [2] 宇宙航空研究開発機構・宇宙科学研究本部, [3] 東北大学大学院理学研究科惑星プラズマ・大気研究センター, [4] ハワイ大学天文学研究所
[1]SOKENDAI (The Graduate University for Advanced Studies), [2]Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, [3]Planetary Plasma and Atmospheric Research Center, Graduate School of Science, Tohoku University, [4]Institute for Astronomy, University of Hawaii

To best utilize the polarization data from Venus, as a useful tool to study its atmosphere and aerosols, one needs to cover enough either a range of phase angles or spectra by observations. While most of previous studies were based on ”phase curves” in a few visible wavelengths, we are motivated to perform multi-wavelength polarimetry in the infrared at a few selected phase angles. To acquire infrared imaging-polarimetric data of Venus, preparative works were done at the Institute for Astronomy (IfA), University of Hawaii, Maui.

From recent our visible-wavelength observations (2012 - 2014) using HOPS (Hida Optical Polarimetry System), we found that the optical thickness of polar hazes of Venus are now in thinning phase. Since polarization is dominated by the main cloud, it is difficult to significantly derive the optical thickness of decreasing hazes without affected by the errors due to an assumption that main cloud parameters are same as Hansen and Hovenier (1974). Additionally because the previous observations take long time to obtain polarization data varying with phase angle changes of Venus, it is a problem that variation of polarization can contain its temporal variations.

Considering the polarization of the infrared light scattered by H_2SO_4 droplets with radius of 1.05 microns, standard Venusian cloud model (Esposito, 1980), the sign of polarization shall vary from negative to positive at middle phase angle range, between 60 and 80 deg. At this phase angle range, polarization degrees caused by single scattering vary like J: negative, H: neutral, K: positive (astronomical bands, central wavelength (microns) J: 1.25, H: 1.65, K: 2.2). Actually according to test calculations taking into account multiple scattering, disk-averaged polarization degree at phase angle 80 deg. J: -3%, H: -0.5% K: +2% are expected. In case that observed signs of polarization are different from that of expected, parameters such as radius of cloud particle can be different from standard cloud model. For example if main cloud particles are larger ($\sim$ 1.5 microns), these signs can vary like J: negative, H: negative, K: neutral. Inversely if the particles are smaller ($\sim$ 0.6 microns) J: neutral, H: positive, K: positive. From combination of these signs, we can know microphysical properties of the clouds with single observation run. Because especially phase angle around 80 deg. is near greatest elongation, which means that observation is much easier compared with other phase angles, we are planing to perform observations at that time.

To realize our idea, preparative works, optical design of SOLAR-C telescope with a polarizer (Savart plate) inserted into the optical system and test observations, were done from September through December 2014, and in February 2015 at IfA. The test observations were carried out by using NIIHAMA camera attached to SOLAR-C, off-axis gregorian telescope of diameter 45cm, at the top of Haleakala altitude about 3000m. The Savart plate separates the light into two beams whose vibrating plane is orthogonal each other. We could verify that the separation distance is about 200 pixels on images (pixel scale $\sim$ 0.45 arcsec./pixel) by the observations. For precise measurements of polarization degrees, calibration of polarization generated by primary mirror of SOLAR-C is future work.

キーワード: 金星, エアロゾル, 偏光撮像観測
Keywords: Venus, Aerosols, Imaging-Polarimetry