

Ground-based spectral observation of Venus UV absorption by Pirka Telescope

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Venus is covered by thick sulfuric acid clouds extending from 50 to 70 km in altitude, which reflect about 80 % of the incident sunlight, but in the ultraviolet (UV) wavelength range, various patterns are observed due to absorption by SO₂ and an unknown absorber. The unknown absorber contributes to about half of the solar heating in the Venusian atmosphere. The distribution and temporal variability of the unknown absorber are important basic information for understanding the Venusian climate system.

Spectral observation of Venus in the UV wavelength range has been conducted by ground-based telescopes and spacecraft including MASCS/MESSENGER, SPICAV and VIRTIS/Venus Express.

Perez-Hoyos et al. (2018) reported that S2O and OSSO's UV absorption spectra, which are the unknown UV absorber candidates, showed the best agreement with MASCS UV spectral data which has 5 nm wavelength resolution, and emphasized the importance of the mid-high resolution spectra data in the regions of higher and lower UV absorption for providing constrain to the physical state of the UV absorber.

Toward the identification of the unknown UV absorber at cloud top altitude of Venus, we developed Ultra Violet Spectrometer, which provides 2 nm wavelength resolution in 250 –450 nm range with 4.3 and 6.3 arcsec field of view (FOV), and is equipped Pirka telescope, 1.6 m ground-based telescope. The observation goal is to get UV spectra of Venus capturing unique spectral features, for example S2O absorption features centered around 339, 346, 353, 360, 368 nm, in higher and lower UV absorption regions over Venus disk to provide constrain to UV absorber. Based on the goal, we observed Venus disk on May, 2022, May, 2023 and, May-June, 2025 with Venus diameter of 15 and 22 arcsecs, by 6.3 and 4.3 arcsec FOV which can separate Venus disk into the south and north hemisphere.

Keywords: Venus, Ground-based telescope, Spectral observation