フォボス高緯度分光観測の検討：スペクトル形状の入射角依存性

Examination of Phobos high-latitude spectroscopic observations: Incidence angle dependence of spectral shape

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The sample return mission MMX (Martian Moon exploration) plans spectroscopic observations by remote sensing and two times landings on Phobos over a period of three years. In selecting a landing site, it is necessary to observe the surface morphology and spectra of Phobos by remote sensing to find the best places for landing. However, Phobos has few flat areas near the equator, making it difficult to find a suitable landing site. Therefore, it is necessary to include high-latitude regions in the candidate landing areas. However, the observation ofc high-latitude regions are challenging, especially due to the high solar incidence angles. In this study, we conducted an experiment to investigate the incident angle dependence of spectral features and shapes, in order to understand the feasibility to accurately observe high-latitude regions on Phobos.
Reflectance spectra were measured in the wavelength range of 0.38-25 μm with a vacuum FT-IR (VERTEX 70v Bruker Optics) using UTPS-TB particles (77-155 μm in diameter) that simulate the surface material of the Phobos used by Miyamoto et al. [1]. The measurement conditions were as follows. The phase angle was fixed at 30 degrees, and the angle of incidence was varied from 0 degrees to 30, 50, 60, and 70 degrees along the axis perpendicular to the sample. The spectra of the samples were normalized by the standard (gold and Spectralon) values measured at the same angular conditions of each sample.
It is shown that the reflectance spectra of the samples become brighter as the angle of incidence increased. The shape of the spectra in the near-infrared region and beyond was little affected by the change of the incident angle, and the absorption bands and peak positions were consistent in all angles. On the other hand, the UV to visible spectra were affected by the change of the incidence angle and tended to become redder as the incidence angle increased. The continuous spectrum measured this time was converted to a spectrum of the multi-band camera (OROCHI)[2] that will be onboard on MMX, and the incident angle dependence was examined and the necessary calibration values were discussed in the presentation.

reference
[1]Miyamoto et al. 2021. Earth, Planets and Space, 73:214 [2]Kameda et al. 2021. Earth, Planets and Space. 73:218

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