R009-27
B 会場 ：9/27　PM1 （13:45-15:30）
13:45〜14:00

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Remote sensing of near infrared spectral maps on Phobos, Deimos, and Mars by an imaging spectrometer MIRS onboard MMX

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Martian Moon eXploration (MMX) is the first sample return mission from the Martian moon, Phobos, planned by JAXA (Kuramoto et al., 2022). The MMX will be launched in 2024, and stay at circum-Mars orbits for 3 years (2025-2028), bringing back samples (>10 g) from Phobos return to Earth in 2029. The MMX infrared spectrometer (MIRS) is an imaging spectrometer onboard MMX, developed by LESIA-Paris Observatory in collaboration with four other French laboratories, collaboration and financial support of CNES and close collaboration with JAXA and Japanese colleagues. MIRS will remotely provide near-infrared (0.9-3.6 micron) spectral maps of Phobos and Deimos containing compositional diagnostic spectral features (Barucci et al., 2021). The derived spectra will be used to analyze the surface composition and to support the landing site selection.

One of the major mission goals is to understand the origin of the two moons, which will provide important constrains on planetary formation and on the material transport in the region connecting the inner and outer solar system. MIRS will acquire spectra of Phobos at a spatial resolution of about 20 m during the Medium altitude survey (at altitude around 60 km) and of Deimos at spatial resolution of 100 m (at a distance of 300 km during the multi-flybys). The high signal to noise ratio (>100 up to 3.2 micron) and the unprecedented spatial resolution achieved by MIRS will contribute to characterize the detailed surface composition material of Phobos and Deimos to investigate the local heterogeneity associated with the different surface morphology. The similarity to carbonaceous chondrites with the possible presence of hydrous minerals (features at 2.7-2.8 micron, water (ice)) and/or organic matter (3.3-3.5 micron) would imply a capture origin, while the presence, even if partially, of high-temperature phase materials representing a mixture from crust and mantle of Martian silicates would indicate a giant impact origin.

Thanks to its unique orbit near the equatorial plane on the quasi satellite orbit (QSOs), MIRS can also offer the first opportunity to probe the atmospheric processes of mesoscale to synoptic scale in the Martian atmosphere, such as horizontal water transport including surface-atmosphere interaction, clouds formation, and dust storm evolution etc. The MMX will have a 7-hr orbit around Mars, allowing to complete a global coverage. The well-controlled scanner system of MIRS enables the wide spatial coverage at low-mid-latitudes by combining with the spacecraft slewing maneuvers in hourly time-scale. These spectra provide the atmospheric species (CO2, H2O, CO) and aerosols (dust and clouds) to reveal the rapid transport processes with relatively high spatial resolution (typically 2-5 km) over a wide coverage. Owing to the unprecedented high-frequent and multi-spectral maps by MIRS on Mars, thousands to million spectra in a single orbit will be obtained, and need to be retrieved in an appropriate time manner.

In this paper, these planned observations, current status of data pipelines, Japanese contributions will be presented, with possible collaborations with other MMX instruments, sample analysis, and with other missions by MAVEN, MEx, and EMM.