

## Simulation of Phobos internal density structure estimation by orbit determination of MMX

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The Martian Moons eXploration (MMX) mission aims to clarify the origin of Martian moons, the evolution of the Martian sphere, and the formation of solar system planets by remote-sensing observations and sample returns. For studying their origins and evolution processes, it is important to obtain information on the internal structures of the Mars moons. In this study, we simulated estimations of Phobos' gravity field and internal density structure by the precise orbit determination of the MMX spacecraft. In the vicinity of Phobos, the orbit of the spacecraft is disturbed by the gravity of Phobos. Therefore, it is possible to estimate the gravity field and internal density structure of Phobos by orbit analysis of the spacecraft.

Based on the exploration plan, we first assumed some types of the orbit of the spacecraft: ascending orbit after landing on the surface of Phobos and Quasi-Satellite Orbits (QSO). Then, simulated data sets of Doppler observations, imaging observations and laser altimetry (LIDAR) was created. Using these data sets as observed values, we performed the following simulations. 1) Estimation of the depth of the density change boundary or the density of each layer of Phobos from the data of the ascending orbit after surface landing. 2) Estimation of regionally different density structures from the data of ascending orbit after surface landing. 3) Estimation of Phobos' gravity field coefficients from QSOs with different altitudes. In the presentation, we will show the results of these simulations and discuss how much constraints can be given to the internal density structure of Phobos.

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