

Gravity Estimation in Hayabusa2 Mission

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The Japanese asteroid explorer Hayabusa2 will be launched in the mid-2010s to return samples from C-type near earth asteroid 1999JU3. During the rendezvous phase (i.e., proximity operation phase), we will make scientific observations to estimate physical parameters (e.g., gravity field, shape, pole direction, spin-rate, ephemeris) of the target body, which are very important not only for its scientific investigation but also for the spacecraft navigation. In particular, the mass is essential to perform a stable touch down sequence to collect samples from the asteroid's surface. We will attempt to estimate the gravity field of the target body using earth-based radiometric tracking measurements (2way Doppler and range) and spacecraft-based measurements (information from optical navigation camera and laser altimetry) with global parameter estimation technique. As the first step for the gravity field estimation, we performed a simulation study about mass estimation under simple configuration and evaluated the relation between the quality and quantity of measurements and the accuracies of estimation results. The detectability of the low degree and order gravity field coefficients is also investigated.

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