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Differential VLBI observations of two sub-satellites of SELENE (KAGUYA), OKINA and OUNA for lunar gravimetry

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Abstract

The Japanese lunar explorer SELENE (KAGUYA), which has been launched on Sep. 14th, 2007, utilizes VLBI observations in lunar gravimetry investigations. This can particularly improve the accuracy of the low degree gravitational harmonics. Combination of ground based VLBI observations and Doppler measurements of the spacecrafts enable three dimensional orbit determinations and it can improve the knowledge of the gravity field near the limb. Differential VLBI Radio sources called VRAD experiment involves two on-board sub-satellites, Rstar (Okina) and VBtar (Ouna). These will be observed using differential VLBI to measure the trajectories of the satellites with the Japanese network named VERA (VLBI Exploration of Radio Astrometry) and an international VLBI network. Two new techniques, a multi-frequency VLBI method and the same-beam VLBI method, are used to precisely measure the angular distance between the two sub-satellite radio sources Okina and Ouna. The observations are at three frequencies in S-band, 2212, 2218 and 2287 MHz, and one in X-band, 8456 MHz. We have succeeded in making VLBI observations of Okina/Ouna with VERA and the international network, and have also succeeded in correlating of signals from Okina/Ouna, and obtained phase delays with an accuracy of several pico-seconds in S-band.
