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Modeling the gravity field of Jupiter's moon Europa: Influence of icy crust topography and subsurface structures

S. Musiol (1), M. Pauer (1,2) and D. Breuer (1)

(1) Dept. of Planetary Physics, Institute of Planetary Research, DLR Berlin-Adlershof, Germany (stefanie.musiol@dlr.de)
(2) Dept. of Geophysics, Charles University, Prague, Czech Republic

We investigate questions concerning a gravity inversion for a future orbital space mission to Jupiter's moon Europa with respect to the reconstruction of features beneath the surface. In our simulations we take into account the topographic relief of the surface and the water/silicate boundary and also the state of compensation depending on the extent of structures and on the crustal/elastic thicknesses of the respective layers.
Since no global topography data for Europa is yet available, we produce a synthetic model represented by a set of spherical harmonic coefficients which is based on synthetic data created from local stereo-topography samples and photoclinometric profiles. The ocean floor model was build up obeying the power law common for the silicate surface topography of terrestrial planets. With the help of a theoretical admittance function topography is converted into a gravity field.
Forward simulations show, that for an icy crust with undulations up to $\pm$ 1500 m a gravity field above degree 20 is needed to obtain a gravity signal not contaminated by the possible ocean floor topography signal. Expected gravity anomalies for the icy crust are of size of several mGals at the surface. Orbit heights of 100 and 200 km are further involved in the investigation of the needed measuring accuracy for the detection of ocean floor structures from the orbit. We find a good chance for the detection of such structures with size > 150 km in a maximum assumed depth of 160 km with an instrument of 1 mGal measuring accuracy.