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Extraction of time-dependent topography variations from BepiColombo laser altimeter data for different realizations of topography

C. Koch (1), U.R. Christensen (1) and R. Kallenbach (1)
(1) Max-Planck-Institute of Solar System Research, Katlenburg-Lindau (Germany)

The Bela laser altimeter is one of the instruments on the BepiColombo mission to Mercury set up by ESA and JAXA. The main goal to be achieved with the BELA instrument is the determination of the global surface topography with an accuracy of the order one meter, expressed in terms of a spherical harmonic expansion. Here we investigate if it is possible to determine time-dependent variations such as the tidal interaction of Mercury with the Sun, i.e. the second-order tidal Love number h_2, and Mercury's forced libration amplitude $\Delta\lambda_{libr}$. Mercury has a 3:2 spin resonance between its rotational and orbital motion. A precise analysis is quite difficult because a particular surface feature is revisited only six times by the spacecraft during two Mercury years. We study this problem by using synthetic data and inverting simultaneously for the static topography and time-dependent variations. Several realizations of the topography are used for testing the inversion method. Measurement uncertainties are added as Gaussian noise to the simulated topography values.