



Assessing the potential for measuring Europa's tidal Love number h_2 using radar sounder and topographic imager data

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The tidal Love number h_2 is a key geophysical measurement for the characterization of Europa's interior, especially of its outer ice shell in the presence of a subsurface ocean. We propose a method to retrieve the tidal amplitude using altimetry profiles produced by the REASON instrument (Radar for Europa Assessment and Sounding: Ocean to Near-surface) selected for the Europa Clipper mission. We assess the accuracy of the measurement of the tidal Love number h_2 by inverting the altimetric ground tracks in combination with stereographic imaging data. The measurement principle exploits both delay and Doppler information in the radar surface return together with topography from a digital terrain model (DTM). The numerical model is combined with the current mission scenario and spacecraft performance expectation of the Europa mission. As a result we make an initial evaluation of altimetric biases including a detailed analysis of the instrument performance taking into account Europa's rough small-scale topography. The inversion simultaneously estimates h_2 and spacecraft orbit parameters from cross-over points and synthetic radio Doppler data. We will show that, while REASON's main focus consists in the direct detection of subsurface water reservoirs, it has the potential to also deliver altimetric measurements useful for the detection of solid body tides and therefore adds a valuable contribution to the characterization of Europa's outer ice shell.