

Laser altimetry at the centimeter-level

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Laser altimetry is a powerful tool to map planetary surfaces. In addition to the static topography, time-dependent variations such as libration and tidal elevation can be extracted from laser altimeter data in order to investigate the internal structure of the planetary body. In the frame of the BepiColombo Laser Altimeter project, simulations on the extraction of the tidal amplitude on Mercury's surface due to the solar gravitation have been carried out. Based on these results, we evaluate the instrument requirements for a laser altimeter that orbits Jupiter's moon Europa. The tidal bulges of Europa's ice crust should be as high as 30 m, if there is a subsurface ocean, but less than 1 m, if there is solid ice all the way down to the bedrock. The measurement precision achievable with an altimeter applying a miniaturized diode laser-pumped Nd:YAG laser and a single photon counting technique is explored, and the potentials of the integration of the laser altimeter with a high-resolution camera are discussed.