

Improved Phobos Shape and Gravity Working Models

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While Phobos Grunt is readied for launch, the larger of the two natural satellites of Mars, is also in the focus of a number of future mission studies [1,2,3]. Phobos is believed to represent an important waypoint for missions to Mars. In the past, shape models have been computed with very high quality that fully exploit the available data [4,5,6]. However, missions anticipating to place landers on the surface of Phobos require topographic information of even higher detail.

To support landing site selection for the Phobos-Grunt mission and future mission planning, we further improved the digital terrain model which was based on flyby images of the High Resolution Stereo Camera (HRSC) on board the European Mars Express Mission. We used HRSC images with ground resolutions ranging between 4 m/pixel and 80 m/pixel and applied standard photogrammetric techniques to derive the 3D information. Individual computing parameters needed to be set for each of the 25 flyby image sequences to improve the results in comparison to the previous model.

Based on the shape model [6] we also derived working models for the gravity potential of Phobos. Comparing both, the topography and the gravity potential, on a global scale reveals that Phobos' potential field does typically not correlate with its topography. We will further study designated landing site areas for such relationships between surface gravity and topography, as this may represent valuable information for landing site selection and assessment.

It is expected that the data obtained by the Russian Phobos-Grunt mission, to be launched in early November 2011, will allow us to make further improvements of the DTM and the gravity model possible.

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