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A new planetary mapping for future space missions

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The wide studies of Solar system, including different planetary bodies, were announced by new Russian space program. Their geodesy and cartography support provides by MIIGAiK Extraterrestrial Laboratory (<http://mexlab.miigaik.ru/eng>) in frames of the new project "Studies of Fundamental Geodetic Parameters and Topography of Planets and Satellites". The objects of study are satellites of the outer planets (satellites of Jupiter - Europa, Calisto and Ganymede; Saturnine satellite Enceladus), some planets (Mercury and Mars) and the satellites of the terrestrial planets - Phobos (Mars) and the Moon (Earth). The new research project, which started in 2014, will address the following important scientific and practical tasks:

- Creating new three-dimensional geodetic control point networks of satellites of the outer planets using innovative photogrammetry techniques;
- Determination of fundamental geodetic parameters and study size, shape, and spin parameters and to create the basic framework for research of their surfaces;
- Studies of relief of planetary bodies and comparative analysis of general surface characteristics of the Moon, Mars, and Mercury, as well as studies of morphometric parameters of volcanic formations on the Moon and Mars;
- Modeling of meteoritic bombardment of celestial bodies and the study of the dynamics of particle emissions caused by a meteorite impacts;
- Development of geodatabase for studies of planetary bodies, including creation of object catalogues, (craters and volcanic forms, etc.), and thematic mapping using GIS technology.

The significance of the project is defined both by necessity of obtaining fundamental characteristics of the Solar System bodies, and practical tasks in preparation for future Russian and international space missions to the Jupiter system (Laplace-P and JUICE), the Moon (Luna-Glob and Luna-Resource), Mars (Exo-Mars), Mercury (Bepi-Colombo), and possible mission to Phobos (project Boomerang).

For cartographic support of future missions, we have created various maps as results of first year research: new base maps of Ganymede, including a hypsometric map and a global surface map; the base and thematic maps of Phobos which were updated using new image data sets from Mars Express; a newest map of topographic roughness of Mercury (for north polar area) [2] and a map of topographic roughness of the Moon using laser altimeter data processing obtained by MESSENGER (MLA) and LRO (LOLA) for their comparative analyses; a new global hypsometric map of the Moon.

Published version of the maps will be presented at the conference, and all data products using for mapping will be available via MExLab Geoportal (<http://cartsrv.mexlab.ru/geoportal/#body/>).

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References:

- [1] <http://mexlab.miigaik.ru/eng/>
- [2] Kreslavsky et al., *Geophys. Res.Lett.*, 41, doi:10.1002/2014GL062162
- [3] <http://cartsrv.mexlab.ru/geoportal/#body/>