



New geoscience techniques for Earth and planetary studies developed in Moscow State University of Geodesy and Cartography (MIIGAiK)

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The University was established in 1779 and for all these years it has been the centre of higher geodetic education in Russia, the largest specialized educational institution of this profile in Europe. The great historical past, long pedagogical and scientific traditions developed throughout almost the two and a half centuries' history of the University, importance of geodetic sciences and land survey branch for many fields of knowledge and national economy, a wide range of specialties in which MIIGAiK trains specialists have given the University the leading position as a specialized higher educational institution [1]. Now, the University is a large educational-and-scientific and production complex including six faculties of full-time training, a faculty of distance learning, a Training Centre for teachers of high schools and retraining of experts, postgraduate and doctoral courses, educational specialized laboratories in various directions of geodesy, cartography and remote sensing. In the University structure, there are also research-and-production centers Geodynamics, Geomonitoring, a Center for satellite technologies in geodesy, a Cartographic centre, Geodesy and Air Photography Journal Publishing House, two educational test fields, computing centers, an educational-and-geodetic museum and a library.

New MIIGAiK Extraterrestrial Laboratory (MExLab) [2], which was established in 2010 under the leadership of invited scientist Prof. Dr. Jürgen Oberst (DLR, TUB, Germany), studies of characteristics of Solar System bodies with geodetic and cartographic methods. The several celestial bodies are chosen as subjects for new planetary project: Europa, Ganymede, Callisto (Galilean satellites of Jupiter), and Enceladus (a satellite of Saturn), as well as the Moon, Mars, its satellite Phobos, and Mercury. The significance of the project objectives is defined both by necessity of gaining fundamental knowledge about properties of the Solar System bodies, and practical needs of exploration in preparation to prospective new Russian and international space missions in cooperation with European Space Agency (ESA): to the Moon (Luna-Glob and Luna-Resurs), Mars (Exo-Mars), Mercury (Bepi-Colombo), the Jupiter system (JUICE), and a possible future mission to Phobos. MExLab has new modern infrastructure, including facilities and software, and it help us to develop innovative techniques for planetary studies. We use ArcGIS (ESRITM), and special developed modules based on PHOTOMOD software (RacursTM), created for Earth image processing and extended for studies of celestial bodies.

Main directions of MIIGAiK research of Earth and planetary bodies:

- 1) Innovative technologies for digital surveying and laser scanning;
- 2) Unmanned aerial vehicles (UAV) and special software developing;
- 3) Photogrammetric stereo image processing;
- 4) 3D-modeling of Earth and planetary surface;
- 5) Geo-portal and database developing [3];
- 6) GIS-analyses and mapping, including comparative planetology study of terrestrial planets.

A great volume of scientific investigations and industrial work is carried out in MIIGAiK using modern geoscience technologies, ensure a wide use of GIS in cartography, cadaster and while studying the Earth and other terrestrial planets of Solar system by remote sensing methods.

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References:

- [1] <http://www.miigaik.ru/eng/>;

[2] <http://mexlab.miigaik.ru/eng/>

[3] <http://cartsrv.mexlab.ru/geoportal/#body/>