**HISTORIC SOVIET PLANETARY MAPS ONLINE.** Henrik I. Hargitai[1], Kira B. Shingareva[2], Irina Yu.Golodnikova[2], Mátyás Gede[3] [1]Eötvös Loránd University, Institute of Geography and Earth Sciences, Planetary Science Research Group Budapest 1117 Pázmány P st 1/A hargitai@emc.elte.hu [2] Moscow State University for Geodesy and Cartography, Moscow, Russia, kirash1@yasenevo.ru, nika_saige@mail.ru [3] Eötvös Loránd University, Department of Cartography and Geoinformatics, Budapest, 1117 Pázmány P st 1. Hungary saman@map.elte.hu

**Introduction**: Planetary cartographic products from the Solviet Union has been digitized and published on the internet for the frist time, in the International Planetary Cartography Database (IPCD).

IPCD is an online collection of recent and historic international planetary maps and globes published in various languages [1]. The IPCD is maintained by the Commission on Planetary Cartography of the International Cartographic Association [2] and the Eötvös Loránd University, Budapest, in close cooperation with the Planetology Cartography Laboratory of the Moscow State University for Geodesy and Cartography (MIIGAiK). MIIGAiK's collection of historic Soviet planetary maps and globes has been digitized and made part of the database to make them available for the international planetary science community. These maps are not available in electronic format and are out of print. Making these maps accessible is not only important for the study of the history of planetary science, planetary cartography and multilingual planetary nomenclature [3], but also presents the characteristic style developed by and reflecting Soviet cartographic traditions. The collection also includes other historic Central and East European planetary maps and recent Russian planetary maps from MIIGAiK's collection which are not subject of this paper. The maps and information of the collection may also be used by educators [4].

**The digital collection:** MIIGAiK's collection represents an almost complete part of the planetary maps and globes created by Soviet planetary cartographers published in the Soviet Union. The maps in the database includes (1) individual map sheets, (2) map sheet series, (3) thematic maps appearing in books or Soviet planetary science journals, (4) atlases, (5) globes. Most maps have been produced in the 1960s-1980s by Sternberg Astronomical Institute of Moscow State Lomonosov University (GAISh); Vernadski Institute of Geochemistry and Analytical Chemistry (RAS), Chief Administration of Geodesy and Cartography (GUGK), MIIGAiK and military cartographers.

**Maps available in high quality:** Selected Planetary maps and globes produced in the Soviet Union are now included in the database in high resolution (300 dpi) format, scanned from originals of the MIIGAiK collection. One such example is the First Complete Map of the Far Side of the Moon (*Polnaya karta Luny)* (Fig 1.) produced by GAISh and the Topographic and Geological Service of Soviet Union under the supervision by Yu. N. Lipsky, using Luna-3 (1959) and Zond-3 (1965) images. The series consists of nine sheets of 1:5M (including cylindrical and polar projections) and a globe of the Moon 1:10M which reflects 95% of the lunar surface. In the index sheets it lists the Latin transcriptions of the Cyrillic nomenclature [5], i.e. it includes a full biscriptural Soviet Gazetter of the Lunar Features. Some sheets of the 1979 edition are also scanned; just as the last, one-sheet edition (1985).

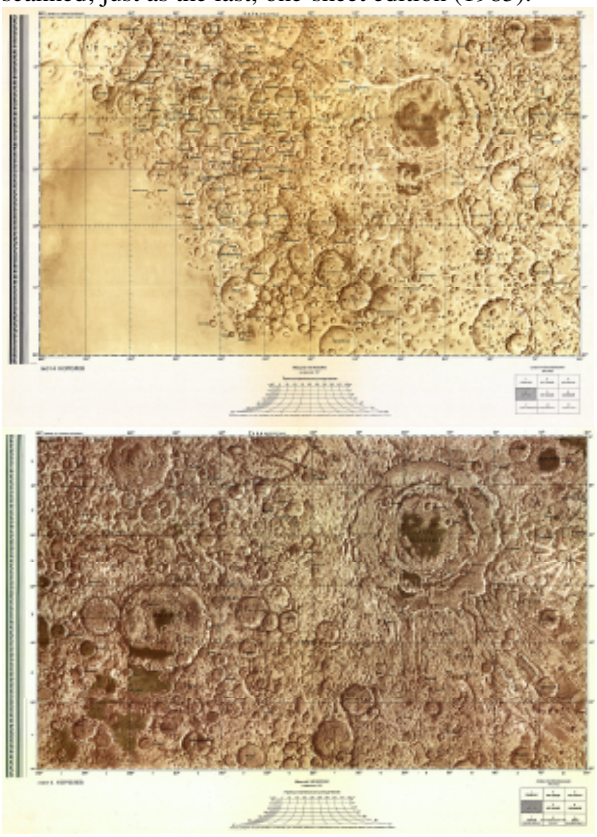

Fig 1. Sheet 4 (Mare Orientale) in the "First Complete Map of the Far Side of the Moon" (1967) (upper image) and its new edition in 1979 (lower image). For the far side, the 1967 map used low resolution Luna 3 images, combined with Zond 3 images for the near side. The 1979 map also used Lunar Orbiter images. Detailed description is available online at IPCD's website.

Another high resolution example is the Photomap of the Visible Side of the Moon *(Fotokarta Vidimogo Polusariya Luny)* (1967) which was used for landing site selection of Luna spacecrafts. MIIGAiK's 2-sheet

1:20M Map of Mars (1982) also presents a unique cartographic style.

**Maps available in moderate quality:** Some maps have been photographed at moderate to high resolution with considerable geometric and radiometric distortion in some cases. They include the subsequent, improved editions of the general maps of the Moon; thematic maps like the trilingual (Russian-English-French) Tectonic Map of the Moon (1969) (Fig 2); Zond-6 and Zond-8 thematic maps, examples of the Venus Photomaps series that have used Venera-15, -16 radar images of the Northern hemisphere of Venus (GUGK 1987), and few of the Mars map series that have used the imagery of the the only Soviet spacecraft (Mars-5, 1974) that provided images of Mars in a resolution sufficient for 1:500k mapping *(Karta Utsastka Poverhnosti Marsa*, 1976-1980, TSIIGAiK/GUGK).


Fig 2, Tekonitseskaya Karta Luny = Tectonic map of the Moon 1969

Some maps of MIIGAiK's grandiose project, *Atlas of Terrestrial Planets and Their Satellites* (1992) are also included. This Atlas presents more than 70 maps and map-diagrams and it was the first attempt to present the existing information in the comparative planetological aspect. The preparation of the Atlas had been started in 1980, and it was finished by 1990. Arrangements for publishing took 2 additional years. The full digital edition of this Atlas is now available at MIIGAiK's own website [6]; it is planned to update the original texts and convert this edition to a continuously updated online Planetary Atlas.

**Globes:** Soviet globes of the collection have been photographed. These include the globes of Mars and the Moon. If the original prints were available, they have been scanned and this way the original globe could be re-created as virtual globe in VRML virtual reality or as Zipped Keyhole Markup Language (Google Earth Saved Working Session) file. These virtual globes have been created in cooperation with the Virtual Globes Museum maintained by the Department of Cartography and Geoinformatics of Eötvös Loránd University [7, 8]

One such globe is the 1:10 000 000 globe of the Moon made in the 1980s by Sternberg Institute, using Terrestrial, Luna-3 and Zond-3 imagery; colored shading was made by painter-cartographer V.V. Solokolov [5, 10] The method of the production of these globes are also discussed. (Fig. 4).

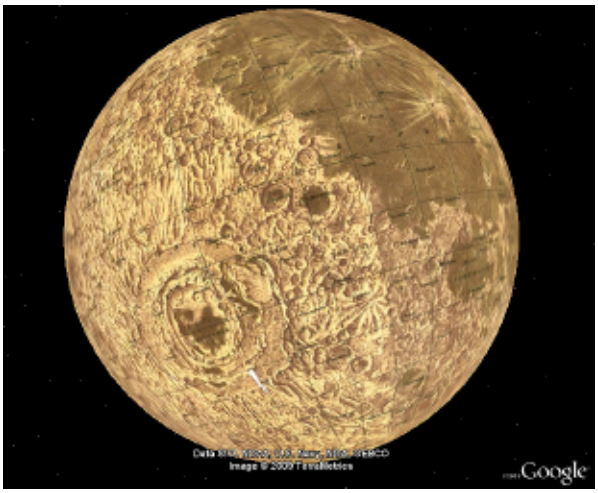


Fig. 4. Soviet Moon Globe recreated in the virtual space for the Database, available as add-on for Google Earth.

**Papers:** The database includes several scientific papers related to Planetary Cartography, and in particular, Soviet Planetary Cartography. Some of these papers are available only in Russian [9].

**References:** [1] http://planetologia.elte.hu/ipcd/ [2] Shingareva, K.B., Zimbelman, J., Buchroithner, M.F. and Hargitai H.I., 2005. The Realization of ICA Commission Projects on Planetary Cartography *Cartographica*, vol. 40, no. 4 /Winter 2005 pp 105-114 [3] Hargitai H.I. 2006. Planetary Maps: Visualization and Nomenclature. *Cartographica* vol. 41, no 2 / Summer 2006 pp 149-167 [4] Kereszturi Á, Horvai F 2009. Geology of Mars: new university course in Hungary. F. LPSC XL #1673 [5] Rodionova Zh F 1991. Otobrazhenie dostizheniy kosmonavtiki v kartografitseskih proizvedeniyah *Geodeziya i Kartografiya* Moscow, 1991, Nr 7 / p 15-22. [6] Атлас планет земной группы и их спутников http://www.planetmaps.ru/ru/projects/onlineatlas [7] Gede M 2009a. The Projection Aspects of Digitising Globes. ICC 2009, Chile [8] Gede, M. 2009b. Publishing Globes on the Internet *Acta Geodaetica et Geophysica Hungarica* Vol. 44/I [9] Shingareva, K.B.: Картографическая изученность лунной поверхности In: Исследование космического пространства Part 5. Moscow 1973. [10] http://planetologia.elte.hu/globes/