# UPDATING AND UPGRADING OF THE DATABASE ON THE PLANETARY NOMENCLATURE

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***Abstract***

The database on the planetary nomenclature which we include in Planetary Cartography GIS is created on the basis of the corresponding DB of the USA Geological Survey placed in the Internet in a free access. The initial DB contains about 8000 names of objects with their various characteristics. The concept of the planetary nomenclature includes classification of relief forms in aggregate with the list of names for the largest objects and uniform system of designations for the finest objects. The nomenclature of relief details for separate celestial bodies has both the general features, and the specific features connected to history of these bodies studying and the structure of their surface. For assignment of names large enough or something to remarkable formations the system including names of oustanding people, scientists and cultures is developed by International Astronomical Union (IAU). Thus names in the planetary nomenclature have memorial character. Our analysis of the information on nowadays existing DB has shown, that it requires both updating concerning GIS technology, and upgrading specification of object characteristics. First of all, it concerns mistakes in their coordinates, spelling of names, data on in what memory these names are given. Besides in DB there are no some important characteristics of objects and these gaps it is necessary to fill. The DB created by us differs also that it is bilingual what will allow to expand sphere of its use.

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The database on the planetary nomenclature which is included in our Planetary Cartography GIS is created on the basis of the USA Geological Survey corresponding DB placed in the Internet in a free access /1,2/. The initial DB is prepared in English. It contains about 8000 names of objects with their various characteristics. Our first task was to make translation and sometimes transliteration of this DB information into Russian. Then it became clear that it would be more practical to have so called bilingual DB because it will allow to wide the sphere of its use. That is why almost all of columns in the main table were later given double e.g. in English and in Russian. During compiling our DB version we understood that it would be also more useful to prepare at first the separate tables for each celestial body parallel to the whole list of names. It is more comfortable when you are busy with a concrete planet or some moon. The problems concerning all the names massive information are not so often.

In general the concept of the planetary nomenclature includes classification of relief forms in the aggregation with the list of proper names for the largest objects and some other names categories for the finest objects. For example, names of Earth's villages and small towns must be used for small craters. It is possible to use some systems of designations with letters or figures. For example, on the Moon the small craters situated close to the large crater were given the same names with adding the letters of English alphabet (crater Gigin, then Gigin A, Gigin B etc.) or it is used numbers in definite order. For example, we have a small crater 1020, where 10 and 20 are its latitude and longitude in frame of some map sheet.

The nomenclature of relief details for separate celestial bodies includes both, namely the general features terms (for example, craters), and the specific features terms connected to history of these bodies' studying (seas, lakes and others water features on the Moon) which are not changed because of old traditions and to the specific structure of celestial bodies' surface (tesseras on Venus, chaoses on Mars etc.).

International Astronomical Union (IAU) has developed the system including traditionally names of outstanding people, scientists and cultures for assignment of names to large enough or something to remarkable formations. Thus the names in the planetary nomenclature have memorial character.

Our analysis of the information on nowadays existing USGS DB has shown, that it requires both updating names information (transliteration, translation, spelling, additional memorial data) and upgrading GIS technology specification of an object characteristics.

Concerning updating there are differences on spelling in the various sources, parallel existence of double names of the same object, distortion of the nomenclature name in the field of planetary names. Besides different interpretations, the volume of the data connected to the growing level of Solar System studying, also leads to necessity of specification and constant updating of the information. Besides there are huge files of the spatial data on planets and other bodies among which space images and cartographical data (electronic maps, schemes) substantially for the present are not described and, hence, are outside of wide access. First of all, it concerns mistakes in features coordinates, spelling of names, data on in what memory these names are given. We considered such sources of mistakes as

- features false location explained by map recompiling or coordinate mistakes, or more exactly data obtained later,
- some wrong information about the personality whose name was used for the feature
- not true data of life period,
- false writing of the name or various versions of it.

Today we have completely finished updating for the Mercury name list and the whole table and are almost ready with the Moon information. The others are in work now.

Concerning upgrading we have some ideas which are tried to realize in the next future. Developed principles of planetary nomenclature standardization allow to avoid many difficulties connected to identification of objects as it takes place in sciences about the Earth. Besides, DBPN has no some important characteristics of objects and these gaps it is necessary to fill.

The problem for search of the spatial information and access to it is solved by the metadata, namely by the structured coded information accompanying the specialized data for simplification of their automated search. Methods of the metadata traditionally include the description of the maintenance, quality, search attributes and other data on the spatial information, including own names. Modern GIS enables at a stage of creation spatial data to make generation of the metadata as the electronic text-through document without doubt identifying the entered information. Such documents do not lose the information qualities neither by search of the spatial data, nor by transfer on computer networks. Sets of the metadata can be effectively used for cataloguing information resources.

Thus, the need for the electronic catalogue of planetary names is connected with necessity of the data description and maintenance of their information availability with the help of the metadata. Development of an information resource as a database on planetary nomenclature (DBPN) is carried out within the framework of designing specific cartographic GIS « Planets of Solar System » (Shingareva, Karachevtseva, Leonenko, 2004). Its integration with additional functionalities for DBPN were provided. DBPN basis consists of the electronic Gazetteer [1,2] in which there are basic data on all extraterrestrial topographical names accepted IAU till 1986 and also of names lists (Shingareva, Burba

1977, Shingareva 1977, Burba 1981,1982,1984, 1986,1988) issued in Russian. As a result the bilingual database of planetary names is created. It considerably expands opportunities by search of the spatial information in electronic libraries connected with objects of Solar System. Within the framework of DBPN development there is a constant specification of a names information on various sources. That is why now it allows to count this created information resource as the most actual one. In the whole electronic libraries on the planetary nomenclature created on the basis of traditional sources and the information added with formalized descriptions (metadata) can form a basis for creation and accumulation of electronic cartographical collections which will allow the user to carry out inquiries on search of planetary objects and their names in a mode on-line.

DBPN, as it mentioned above, is a component of GIS « Planets of Solar System ».
Databases in GIS have a various thematic orientation and serve for the various purposes. Besides the name there are data on an access of object to a concrete celestial body, a morphological type of the feature and its location that provides search and navigating functions inside the GIS project in created DBPN. Thanks the presence of geographical coordinates in DBPN, one more aspect of toponims use in GIS is possible. So, topographical objects can be divided on precisely located (for example, craters) and objects with the indistinct localization having the big extent (for example, mountain ridges). At integration DBPN with GIS, having a full set of figures on the certain territory, it is possible to establish unequivocal communication between a GIS object and a toponim corresponding to it in DBPN. For the spatial objects having indistinct borders on original maps (owing to what they frequently have no digital representation in GIS) DBPN enables to specify their localization by accommodation of the name.
Automation of signatures accommodation on maps in GIS allows to automate and speed up designing, drawing up and registration of maps. So, the opportunity of names density definition at accommodation on a map in view of scale change allows to facilitate process of cartographical generalization. Features created DBPN are representation of toponims in two forms: Latin and Cyrillic. Toponims of the countries using the Latin alphabet are given in a corresponding national spelling; toponims of the countries having alphabets with other graphics are transferred according to form with the Latin transliteration officially accepted for these countries. Features of BDPN structure connected to presence of the information in two languages, allow to use it by development of bilingual maps, by translation of cartographical products.(Karachevtseva, Esenkov, 2002). Thus mistakes of names spelling are completely excluded that conducts to a fast proof-reading by map preparation for the edition.
Today DBPN structure includes more than 30 columns. Besides references to maps and other sources of names, there are given data on an origin of the name (continents and the countries, ethnic groups and languages etc.) in its metadata. Such a structuring of these data gives the opportunity of deeper statistical analysis for all of this information. This structure fragment is shown on fig. 1.

| ID_NN | P | Russian_NAME | CT | CT_RU | FIELD_RUS | LIFE_PERIOD | COMMENTS_RUS |
|---|---|---|---|---|---|---|---|
| 597 | H | Аврора а | EU | 4 | | | название детали альбедо для H-2, район Виктория |
| 618 | H | Австралия а | EU | 4 | | | название детали альбедо для H-15, район Баха |
| 680 | H | Бах | EU | 4 | композитор | 1685-1750 | немецкий |
| 720 | H | Балагтас | AS | 3 | писатель (поэт??) | 1788-1862 | филиппинский Балагтас - псевдоним) |
| 745 | H | Бальзак | EU | 4 | писатель-романист | 1799-1850 | французский |
| 773 | H | Барма | UR | 9 | архитектор | 16th century | русский, создатель храма Василия Блаженного (Покровский собор) в Мо |
| 792 | H | Барток | EU | 4 | композитор | 1881-1945 | венгерский |
| 797 | H | Басё | AS | 3 | поэт | 1644-1694 | японский |
| 839 | H | Бетховен | EU | 4 | композитор | 1770-1827 | фламандского происхождения |
| 851 | H | Белинский | UR | 9 | литературный критик и журналист | 1811-1848 | русский |

*Fig. 1. Fragment of BDPN structure connected to an origin of the name.*

One of DBPN development directions and increase of efficiency of search functions is the inclusion in its structure of topological characteristics which serve for definition of spatial interrelations between objects. It is known, that topological models of a data structure are used at GIS creation. They allow to fix spatial interrelations of geographical objects (they can cross each other, be inside or outside concerning other objects, etc.). Therefore the information in BDPN can be divided into some hierarchical levels on which access to the data will be carried out:

- Access to a space body (a planet, a satellite, an asteroid);
- Inclusion in global structures (extended valleys, large craters);
- Own name of object;
- Type of object (a relief form );
- The maintenance of finer objects located inside allocated object.

Thus, it is possible to organize effective information search with use of SQL-inquiries on several attributes in DBPN (fig. 2). Besides for DBPN objects by integration with GIS it is possible in addition to specify the included spatial objects, and also objects, adjacent on spatial localization that is the new approach by development of a names topographical DB objects.

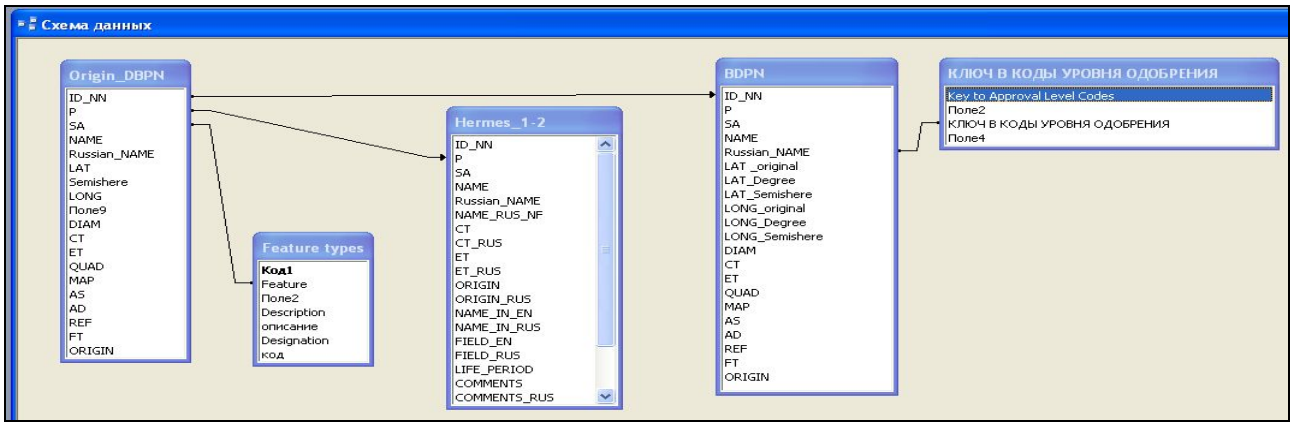


*Fig. 2. The communications scheme for the organization of SQL-inquiries at information search on Mercury*

Thus, modern information technologies allow to create on the basis of traditional maps and indexes of names the multipurpose database which has been not adhered to the concrete atlas or a map, Besides, this DBPN has opportunities of its effective utilization in the various purposes: by development of the metadata, for search of the spatial information in electronic collections of maps and space images, as means of navigation in GIS, and also by preparation of maps for the edition.

THE LITERATURE

1.HTTP://ASTROGEOLOGY.USGS.GOV/PROJECTS/PLANETARYMAPPING

2.HTTP://PLANETARYNAMES.WR.USGS.GOV/

Biographical information: Kira B.Shingareva, professor at Moscow State University for Geodesy and Cartography, a principal scientist of Planetary Cartography Laboratory, was graduated from Technical University Dresden at 1961, Ph.D. at1974, Dr.of Sci. at 1992, was busy at the Lab. of Comparative Planetology at the Institute of Space Researches by Academy of Science till 1977, then at the University up today, participated in the National Space program by mapping the Moon, Mars, Phobos, Venus since 1965, author of more than 150 publications, among them “Atlas of Terrestrial Planets and their Moons”, “Space Activity in Russia – Background, Current State, Perspectives”, co-chairman of ICA Planetary Cartography Working Group 1995-1999, chairman of ICA Planetary Cartography Commission 1999-2003, managed such projects as Series of Multilingual maps on planets and their moons, Glossary on planetary cartography, Specialized map-oriented DB on planetary cartography in frames of commission activity, prepared with co-authors the textbook on Geograpgy of Extraterrestrial Territories, published the Atlas “Solar System” in 2005.