EARTH DATA INFRASTRUCTURES AS A BASIS FOR A MAP AND INFORMATION LIBRARY IN THE DOMAIN OF PLANETARY SCIENCES

A. Naß[1], K. Asch[2], S. van Gasselt[3], J. Laura[4], T. Hare[4], J. Skinner[4], A.P. Rossi[5], S. Besse[6], S. Erard[7], T. Roatsch[1], and R. Jaumann[1]; [1]DLR, Berlin, Germany (andrea.nass@dlr.de), [2]BGR, Hannover, Germany, [3] National Chengchi University, Taipei, Taiwan, [4] USGS, Flagstaff, USA, [5]Jacobs' University, Bremen, Germany, [6]ESA/ESAC, Spain.

Introduction: After a planetary mission's lifetime, digital data such as raster images, data cubes, terrain-model data and photomosaics, as well as the respective pieces of metainformation are stored in digital archives or repositories and are potentially compiled into higher-level data products and maps to form a basis for continued research and for new scientific and engineering studies. For the planetary sciences, the main archives are ESA's *Planetary Science Archive (PSA)* and the *Planetary Data System (PSA)* Nodes in the USA **[1,2]**. In addition, a number of national space science institutes and agencies across the globe may provide access to archived mission data for a period of time as long-term archiving and making data accessible to the public requires dedicated long-term resources.

Modern geographic and geological planetary maps are commonly developed from processed raster and terrain-model data and photomosaics. Due to the lack of significant human activity on planetary surfaces other than the Earth's, thematic variety and thus, thematic mapping and cartography, are rather limited.

In the planetary sciences 'mapping' has a number of different meanings attached to it. One aim of planetary mapping is related to engineering topics, and might refer to the identification of safe landing sites or surface activities. Another aim covers topics of fundamental research and is scientifically motivated. It might be related to the reconstruction of the planetary geologic history. Mapping can also refer to systematically observing a surface from orbital platforms and thus refer to the systematic retrieval of physical information. Finally, mapping might also refer to the process of information abstraction and compilation which is represented by the field of planetary cartography, i. e., the technical and artistic creation of map products.

Interpreted planetary maps differ considerably from Earth maps due to missing ground truth (except very local investigations in predominantly lunar and Mars exploration). With an expected increase of human activities on planetary surfaces in the future, more detailed information and advanced cartographic products might become popular and develop towards an indispensable tool for future exploration. Along with the availability of specific information, maps will also become more targeted and cover a wider range of topics.

In order to achieve higher degrees of specialization and variation, cartographic products require a consistent and extensive data basis accessible through an infrastructure. To develop such an infrastructure, formal coordination of organizational processes are required.

In the Earth sciences these topics have been growing organically and within individual state mapping campaigns (e.g., in the federal states of Germany and the US, the Italian *regions*), national approaches (such as the German 1:200,000 federal geology mapping project GÜK200 or the British 1:50,000 geology mapping project) and national infrastructures (such as AUSGIN, the Australian Geoscience Information network or the US National Geospatial Program) that were later reshaped by using improved technical concepts. These mapping approaches (might) differ from developments in the planetary sciences, and they present a great potential for a contribution as the planetary community can start thinking about structuring that sort of complexity to avoid similar problems and challenges right from the beginning. In the planetary sciences first efforts are being made to establish a spatial data infrastructure (SDI), and make data discoverable, accessible, interoperable, and usable by non-spatial data experts **[3]**.

Within this contribution we present a summary of current efforts and initiatives in the planetary sciences to make higher-level spatial information, such as conventional maps and cartographic products, available to the community. Platforms are among others the USGS for standardized geological maps **[4]**, *The Digital Museum of Planetary Mapping* **[5,6]**, and the *Astropedia Annex* which is a data portal integrated into PDS for registering and hosting derived geospatial products **[7]**. We introduce and discuss existing standards, as well as first initiatives (like MAPSIT (NASA), PlanMap (Horizon2020), VESPA (Europlanet)) in the planetary sciences.

Furthermore, we describe requirements for building a *Dynamic Spatio-Temporal Map and Information Library for the Planetary Sciences* and highlight efforts implemented for Earth data and their benefit for planetary cartography. We conclude with a set of recommendations for implementing selected procedures and involvements of the community. This overview will result in a first concept for a *Planetary Mapping Model* that will be "inspired" by the INSPIRE framework **[8]**, and based upon existing efforts in the planetary sciences described in **[9]**.

References: [1] PDS (2009) PDS3 Standards Reference, JPL D - 7669, Part 2, Version 3.8. [2] PSA (2019) European Space Agency. http://archives.esac.esa.int/psa [3] Laura J. R. et al (2017) *ISPRS Int. Jrn. Geo-Information*, 6(6), 181. [4] USGS (2019) Astrogeology Branch. *astrogeology.usgs.gov/maps* [5] The Digital Museum of Planetary Mapping (2019) *planetarymapping.wordpress.com*. [6] Hargitai (2018) EPSC, Vol. 12, #EPSC2018-258. [7] Hare et al., (2013) 44th LPSC, #2044 [8] INSPIRE (2019) Inspire Knowledge Base. i*nspire.ec.europa.eu*. [9] van Gasselt & Nass (2011). PSS 38(2):201-212.