INTERNATIONAL CATALOG OF PLANETARY MAPS 1600–2017. H. I. Hargitai[1], M. Pitura[2], [1] Eotvos Lorand University 1088 Budapest Múzeum krt. 6-8, Hungary, hargitaih@caesar.elte.hu [2] University of Wroclaw, Institute of Geological Sciences, Department of Structural Geology and Geological Mapping, Cybulskiego 32, 50-205 Wroclaw, Poland, mateuszpitura@gmail.com

Introduction: We have compiled a catalog of over 2200 standalone planetary maps published between 1600 and 2017 internationally, including the USA, Soviet Union/Russia and European countries. The motivation for the creation of this catalog is that recent advancement in international cooperation and national space programs outside the United Stations led to a proliferation of planetary maps that are published uncoordinated, without a central repository or search engine. Several of these recently produced planetary maps are not even available online. Our catalog aims to inform the planetary community about the recently completed maps worldwide, in order to aid planetary geologists in finding the appropriate previously published maps for their analysis. This database stems from the Integrated Database of Planetary Features in which we collect, renovate and make published and peer-reviewed feature catalogs GIS-ready and available online [1] .

Rationale: The USGS is still the single publisher for peer-reviewed, professionally edited planetary geologic maps that are published in a coordinated manner since 1961 [2]. The production of USGS planetary maps are supported by NASA's different elements of the Planetary Science Research Program where individual researchers or groups of researchers produce maps that are edited and published by USGS. In Europe, ESA is not supporting planetary mapping unless it is part of an ongoing mission or the planning of a future mission. Even if workers find support, European planetary researchers do not have any publishing house that would take the responsibility to coordinate or publish European-produced planetary maps. This has led to map publications distributed in a variety of journals, online platforms, creating difficulties in finding the published maps and a variety of standards, formats, and qualities of works. Standalone mapping efforts have become more common in recent years and the number of published major (large-size) planetary geologic maps in journals are now (as of 2017) comparable to those released by USGS [3]. International cooperation within single space missions, such as Dawn and Cassini, resulted in mapping tasks distributed over groups in different nations, according to the origin of suppliers of cameras or other instruments aboard the spacecraft [11]. The need to quickly publish geologic maps during the active missions also generated geologic maps outside the slow peer-review process [4,5]. European plans for landing or flying their missions also resulted in the publications of various geologic and geomorphic maps [6]. Chinese scientists, on the other hand, using their own lunar data, have begun producing their own lunar maps, including photomaps, topographic maps and geologic maps [e.g., 7].

Historic aspect: Although numerous works have been written about the history of planetary cartography, none of these could produce any quantitative data on the production of planetary maps historically or recently. Our catalog contains data that can be filtered to authors, publication year, country, scale, etc., which can reveal long-term trends in planetary mapping and in general, planetary science activities [10]. Although this is mostly of historical interest, this catalog also can keep track of recent dramatic changes in planetary map production internationally.

An overview of planetary maps published in 2017: The year 2017 brought a variety of new planetary maps that were distributed online and produced for online use. We classified recent planetary images of cartographic characteristics into the following categories: Web Map Services (WMS), geologic maps, base maps and citizen maps. WMS's and a number of new, citizen maps are new developments planetary mapping. WMS's are changing how we access, use and produce maps. These are online applications with map layers, which allow the user to analyze the terrain in detail. Highlights of the WMS category in 2017 are the MoonTrek Map by NASA/JPL/Caltech, the Solar Atlas System created by ESRI where large number of planetary bodies are presented, Space Maps unveiled by Google with original photomosaics, and the OpenPlanetaryMap (OPM), which is a first attempt to create a vector-based Mars basemap. Classic geologic maps with large-sized sheet layout completed in 2017 mostly represent the Martian geology [8, 9], however, there are also completed Mercury [6] and Ceres projects [5]. Additionally, in 2017 there were also ongoing projects of other celestial bodies (Moon, Charon, Europa) that remain to be finished in the future. New Horizons, Dawn and Cassini spacecrafts provided materials for new base maps of Pluto, Ceres, and Mimas. End products include the Pluto color photomosaic image, while Ceres and Mimas are shown in classical cartographic sheets, produced at DLR in Germany. The largest group of maps produced in 2017

came from citizen scientists. This group shows ingenious modifications of currently existing images and datasets. The most impressive example is an unusual map of Venus by Eleanor Lutz connecting cartography and art. There are also more traditional projects of Mercury from an artist named atlas-v7x where the topography colors are manipulated and displayed with crater names and nomenclature.

Challenges. The year 2017 brought several dozens of cartographic planetary maps representing a wide diversity of content and production methods (Fig. 1). Observable is an evolution of planetary mapping from traditional static (print) layouts to forms more adjusted to the digital, dynamic Internet medium. Fortunately, traditional, peer-reviewed works are still on the horizon, and the number of planned projects allows to look confidently into the future. At the same time, technologically, it is evident that we live in a transition period where static maps that characterized the last 400 years may soon become extinct and new, dynamic digital map services and GIS layers for scientific use could, or already did, replace them. This has high consequences on the art aspect of cartography in which online applications provide new opportunities. The catalog will be available through the website of the ICA Commission on Planetary Cartography [9] .

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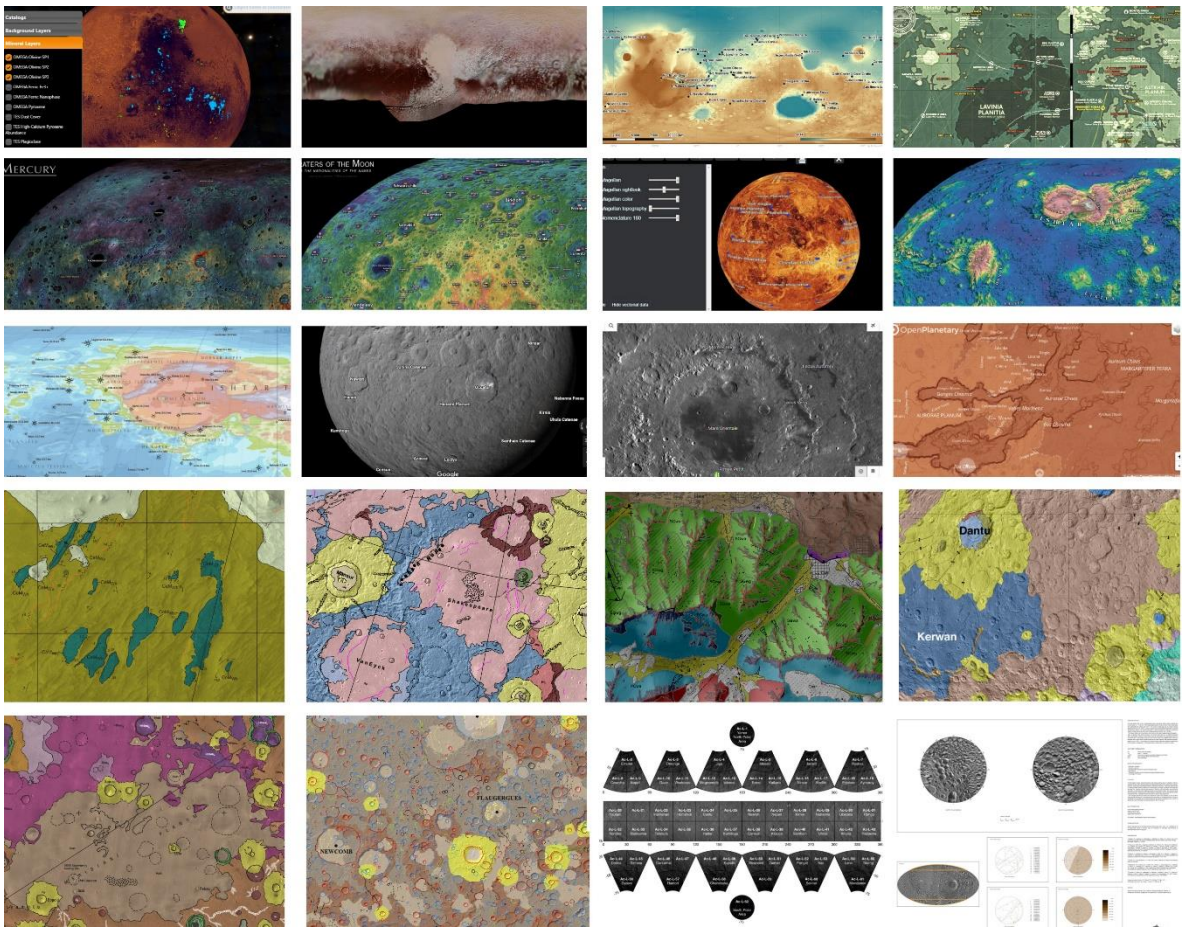

Fig. 1. A compilation of details of planetary maps and map services published in 2017. See details at [9].