



EPN 2024 RI

EUROPLANET 2024 Research Infrastructure

H2020-INFRAIA-2019-1

Europlanet 2024 RI has received funding from the European Union's Horizon 2020 Research and Innovation Programme under

Grant agreement no: 871149

Deliverable D8.12

Deliverable Title: Geologic Mapping Integration Report and Published Data
Due date of deliverable: 30/11/2023
Actual submission date: 30/11/2023
Nature:1 R
Dissemination level² PU
Work package: WP8
Lead beneficiary: UNIPD
Contributing beneficiaries: Constructor, WWU, CBK-PAN, UNICH

Document status: Final

Start date of project: 01 February 2020. **Duration:** 54 months
Project Co-ordinator: Prof Nigel Mason, University of Kent

1. **Nature:** R = Report, P = Prototype, D = Demonstrator, O = Other

2. **Dissemination level:**

PU	PP	RE	CO
Public	Restricted to other programme participants (including the Commission Service)	Restricted to a group specified by the consortium (including the Commission Services)	Confidential, only for members of the consortium (excluding the Commission Services)

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- **List of acronyms and abbreviations**

Table 1: Acronyms and abbreviations

Acronym	Description
ASP	Ames Stereo Pipeline

CRS	Coordinate Reference System
DFG	Deutsche Forschungsgemeinschaft
DoA	Description Of Action
GUI	Graphical User Interface
ISIS	Integrated Software for Imagers and Spectrometers
IRSPRA	Istituto Superiore per la Protezione e la Ricerca Ambientale
JRA	Joint Research Activity
NA	Networking Activity
MOST	Ministry Of Science and Technology
USGS	United States Geological Survey
VA	Virtual Access

- **Introduction**

The GMAP VA activities (see DoA, D8.1) include the following tasks:

- Task 8.1 - Coordination
- Task 8.2 - Community mapping projects
- Task 8.3 - 2D/3D Geological mapping
- Task 8.4 - Geological Mapping Integration
- Task 8.5 - Sustainability

The various tasks, individually and collectively, based on inputs and developments of the JRA (e.g. D9.2, Rossi et al., 2022; Rossi et al., 2023, D9.10) have started, and several deliverables have been produced¹.

The COVID-19 situation, as documented in the previous report (Y2) caused some shifts in deliverable timing.

The second GMAP VA Call coincided with the 2nd GMAP Winter School and resulted in several community mapping projects, the subject of a specific deliverable in the reporting period (D8.5), detailed in later sections and listed on the GMAP wiki². Some of the community mapping projects have been presented at the 3rd GMAP Winter School^{3,4}. There will also be the opportunity to present a community mapping project at the 2024 (4th) Winter School.

Activities Performed (per task) in the Reporting Period

Activities performed on the GMAP Data Integration Portal include:

- Homogenisation of metadata and interaction with USGS / Astropedia (see e.g. Hare et al., 2014, 2018)
- Addition of geo-metadatas for products for easier discovery)
- Improving interoperability through GMAP / USGS et al.
- Include for relevant datasets VESPA entries of GMAP products, similarly to PLANMAP⁵.

GMAP Data Portal Architecture

Within the GMAP geological data integration portal (Rossi et al., 2020, D8.2), a set of services have been set up in order to provide public dataset access to the GMAP and broader communities. Based on mapping standards (See Nass et al., 2020; D9.1), preparation of partial products, and associated metadata (Rossi et al., 2020; Nass et al., 2020; D9.1, and appendix therein) – described in the preceding deliverables, data is made publicly accessible through the portal.

In the overall idea of FAIRness (see also Brandt et al., 2020), besides the attributes directly associated to the meta/datasets for an optimal use of the data, the software component is equally important, in order to provide an easy, intuitive workflow at the final stage for both data producers/providers (i.e. geologic mappers) and users.

For data publishing, we upgraded the custom-made solution developed at the beginning of the project⁶ to a professional, Open Source, industry-standard solution provided by CERN: Invenio Research Data Management (Invenio-RDM). Invenio is the software behind Zenodo, and it was released stable in August 2021 in its version 6, suitable for production⁷.

¹ <https://wiki.europlanet-gmap.eu/bin/view/Main/Deliverables/>

² <https://wiki.europlanet-gmap.eu/bin/view/Main/community%20mapping%20projects/>

³ <https://www.planetarymapping.eu>

⁴ <https://indico.obs.cern.ch/event/1713/timetable/#20230130.detailed>

⁵ <https://epn1.epn-vespa.jacobs-university.de>

⁶ https://github.com/europlanet-gmap/data_site

⁷ <https://inveniordm.docs.cern.ch/releases/versions/version-v6.0.0/>

Invenio-RDM provides the same interface as Zenodo, which is beneficial to our users' experience. Another important aspect for the choosing of Invenio was the possibility to customise the metadata of the publication itself, which will allow us to provide custom search capabilities to our planetary data, as well as cross-linking to other geologic map (or basemap) repositories and publication venues.

Invenio is composed of an app that handles the web-gui (graphical user interface) as well as the programmatic API (application programming interface), available at <https://data.europlanet-gmap.eu> and <https://data.europlanet-gmap.eu/api>, respectively. A set of services are deployed around the app to handle the data internals – data archive, database, free-text search – as well as load-balancing on multiple-users requests. Figure 1 presents the whole architecture responsible for the service.

Summary of Published Data

Data published so far includes legacy PLANMAP data (See Rossi et al., 2020; D8.2) and published datasets from PLANMAP/GMAP community mapping projects (see e.g. Qian, Y., et al. 2020; 2021).

Exemplary entries are included in Table 2, as well as their individual access URL.

Table 2: exemplary entries on the GMAP Data Integration Portal⁸.

Map title	GMAP access URL
Geomorphological map of Sputnik Planitia Pluto	https://data.europlanet-gmap.eu/records/a8493-pz977
Geomorphological map of the Valentine Domes in the Moon	https://data.europlanet-gmap.eu/records/qhfs3-mvt50
Geological Map of Copernicus Crater	https://data.europlanet-gmap.eu/records/724xs-gex64
Geological model of Yutu's GPR data on Chang'e III landing site	https://data.europlanet-gmap.eu/records/yvj8x-tg211
Apollo Basin Northern South Pole-Aitken Basin	https://data.europlanet-gmap.eu/records/sdcd5-q5v16
Geological Map of the Apollo 12 Landing Site in Oceanus Procellarum	https://data.europlanet-gmap.eu/records/b3893-e3663
Spectral Units in Apollo South Pole-Aitken Basin	https://data.europlanet-gmap.eu/records/nbm9h-0at25
Spectro-morphological map centred on Apollo basin in northeastern South	https://data.europlanet-gmap.eu/records/9a9yx-y7y04

⁸ <https://data.europlanet-gmap.eu/search?q=&l=list&p=1&s=10&sort=newest>

Pole-Aitken basin Moon	
Spectral Units in South Pole-Aitken Basin	https://data.europlanet-gmap.eu/records/hv4pf-av420
Geological Map of the Apollo 11 Landing Site in Southwestern Mare Tranquillitatis	https://data.europlanet-gmap.eu/records/d2f9n-md686
Geological map of the Hokusai Quadrangle (H05) Mercury	https://data.europlanet-gmap.eu/records/e67rb-ysz92
Geologic Map of the Rembrandt basin Mercury	https://data.europlanet-gmap.eu/records/t74kd-b5422
Geological Map of the Derain (H10) Quadrangle Mercury	https://data.europlanet-gmap.eu/records/ps7p7-3mv57
Geologic Map of the Victoria Quadrangle (H02) Mercury	https://data.europlanet-gmap.eu/records/fap8b-mpg23
H05-8 colour and spectral indices mosaics	https://data.europlanet-gmap.eu/records/q1hdv-nv746
3 Class Geological Map of H-14 (The Debussy Quadrangle) of Mercury	https://data.europlanet-gmap.eu/records/tjv2y-77j30
Geologic Map of the Lermontov crater Mercury	https://data.europlanet-gmap.eu/records/df31y-63x91
Spectral indices map of the Rembrandt basin Mercury	https://data.europlanet-gmap.eu/records/9dnp9-3g309
3D geomodel of Rembrandt structures and basin infilling	https://data.europlanet-gmap.eu/records/1gnvk-4at49
Geological map of the Hokusai Quadrangle (H05) Mercury	https://data.europlanet-gmap.eu/records/sqt7q-48y61
Geologic Map of the Rembrandt basin Mercury	https://data.europlanet-gmap.eu/records/y248j-3st39
Geological map of the Derain (H10) quadrangle Mercury (5cc)	https://data.europlanet-gmap.eu/records/d2hvs-sx184
5 Class Geological Map of H-14 (The Debussy Quadrangle) of Mercury	https://data.europlanet-gmap.eu/records/9hdaj-p7f54
Geological maps of Beethoven Basin	https://data.europlanet-gmap.eu/records/3935t-9hf25
Geostratigraphic map of Rachmaninoff crater and Nathair Facula in the	https://data.europlanet-gmap.eu/records/v2157-e4h31

Hokusai Quadrangle (H05) of Mercury	
H05 Spectral units map	https://data.europlanet-gmap.eu/records/0bd9v-r4767
3D Models of the Kimberley area	https://data.europlanet-gmap.eu/records/9p2nc-2gx44
SIG and 3D data of the Jezero area	https://data.europlanet-gmap.eu/records/hvdjz-t4e14
Hydrated minerals in Arsinoes Chaos	https://data.europlanet-gmap.eu/records/y0y1j-25t79
Digital Outcrop Model (DOM)	https://data.europlanet-gmap.eu/records/8ezam-3mv97
Geo-stratigraphic map of NW sector of the Crommelin crater central bulge (Mars)	https://data.europlanet-gmap.eu/records/4tg6p-3zc87
Geological Map of Arsinoes and Pyrrhae Chaos Mars	https://data.europlanet-gmap.eu/records/w3x6n-dgg78
3D subsurface geomodel of western Crommelin crater Mars	https://data.europlanet-gmap.eu/records/7hgz8-4g312
SIG and 3D data of the Oxia Planum area	https://data.europlanet-gmap.eu/records/z7708-x9t15
Spectral Map to highlight colour or compositional variation	https://data.europlanet-gmap.eu/records/7mw9w-b3998
Geological Map of the Crommelin Crater Mars	https://data.europlanet-gmap.eu/records/d5724-tyh95
Mars Viking Colorized Global Mosaic 232m v2	https://data.europlanet-gmap.eu/records/hkhk4-qab49
Mercury MESSENGER MDIS Basemap Enhanced Color Global Mosaic 665m (64ppd)	https://data.europlanet-gmap.eu/records/mxzdd-gds58
Geologic Map of Io SIM 3168	https://data.europlanet-gmap.eu/records/ryy57-6dw61
Mars 15M Geologic Map GIS Renovation	https://data.europlanet-gmap.eu/records/0xcsp-qpc20
Mercury 5M GIS Conversion v2	https://data.europlanet-gmap.eu/records/fw3rn-8vj31
Global Geologic Map of Ganymede	https://data.europlanet-gmap.eu/records/

SIM3237	gmap.eu/records/Oa6jlk-nks74
Unified Geologic Map of the Moon 1:5M 2020	https://data.europlanet-gmap.eu/records/pizwa-q4d62

Exemplary Published Entries

The range of possible entries are described in more detail in further sections. The following samples, extracted from Table 2, are provided in order to exemplify the range of data that are and can be made available/discoverable via the GMAP Portal.

Exemplary: Figure (layout map)

Geomorphological map of Sputnik Planitia and its surroundings. This is a young and geological active zone in Pluto, which is the result of a convective process of ice happening inside the basin.

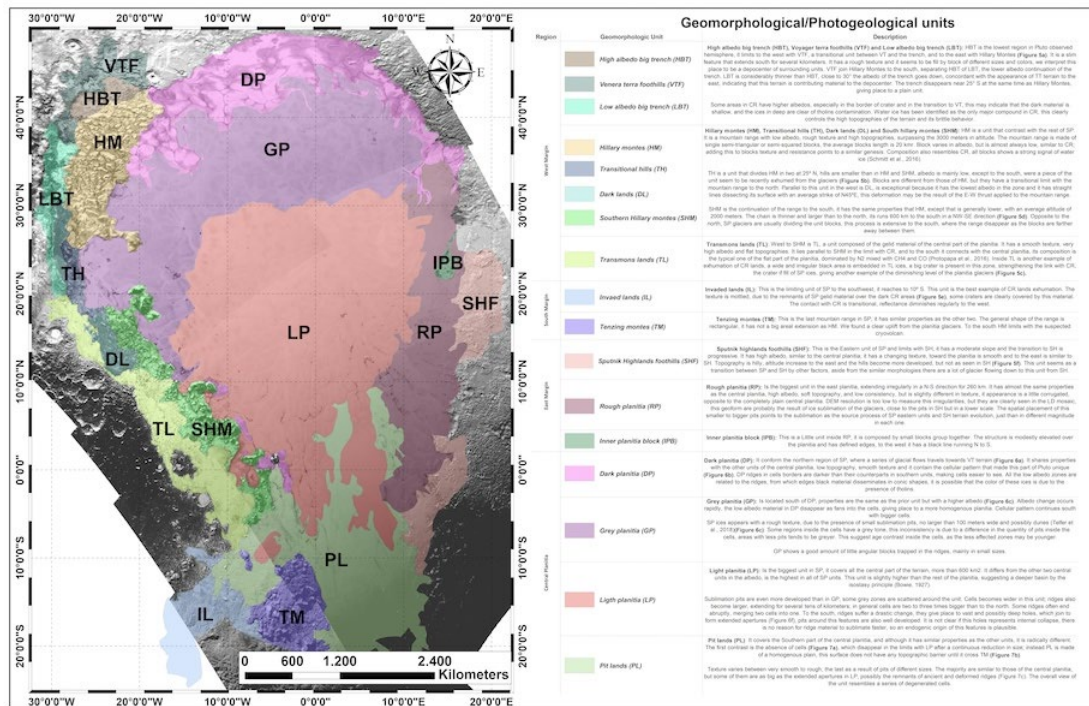


Figure 1: Quicklook of GMAP <https://data.europlanet-gmap.eu/records/a8493-pz977> entry

Exemplary: Deliverable

Excerpt from PLANMAP deliverable description:

This deliverable provides the outputs of the 3D geomodelling of the layered deposits on the Chang'e 3 landing site and Yutu rover path in Sinus Iridum on the Moon based

on Yutu rover GPR data. The data has been entirely produced by using open-source tools to enhance replicability of the whole processing steps.

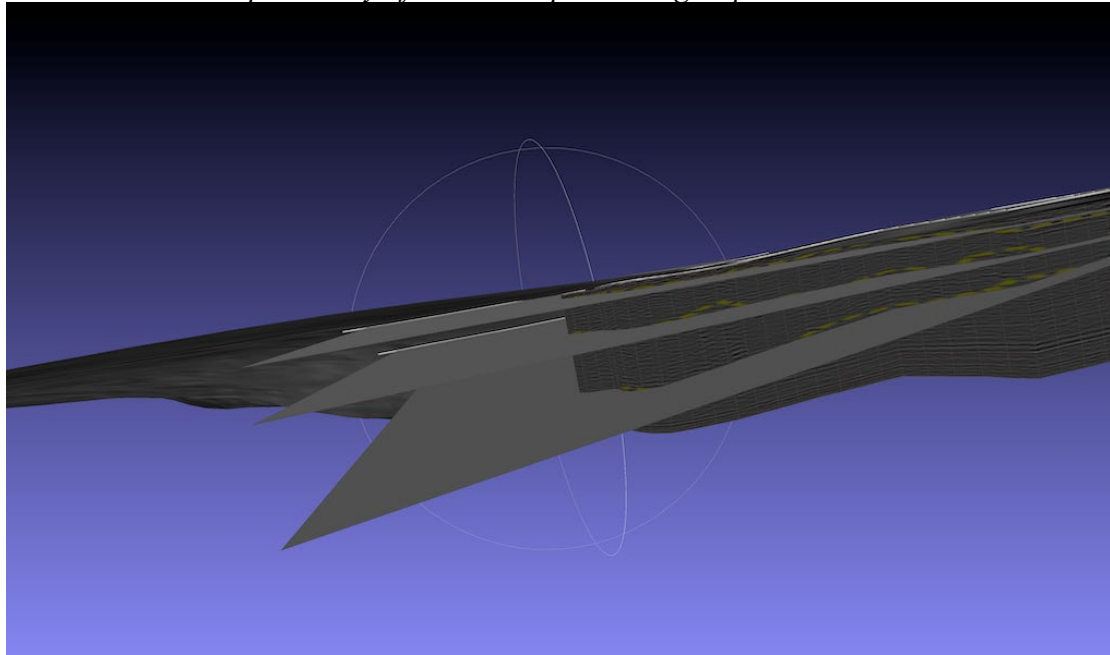


Figure 2: Quicklook of GMAP <https://data.europlanet-gmap.eu/records/yvj8x-tg211> entry, the view is generated using the original data from PLANMAP⁹

Exemplary: Geologic Map

Excerpt from map description:

Mercury's Debussy Quadrangle (H14) lies between 0-90° E and 22.5-65° S. We used MESSENGER data to produce a geologic map of this quadrangle at a scale of 1:3,000,000, based on linework completed at a scale of 1:300,000. We distinguish crater units and plains units. For compatibility the first global geological map, there are craters classified using a 5-class system. We distinguish additional crater units for the materials related to the Rembrandt impact basin. We subdivide the plains between the craters into three units: Smooth, Intermediate and Inter crater Plains.

⁹ <https://data.planmap.eu/pub/moon/PM-MOO-D-YutuGPR/>

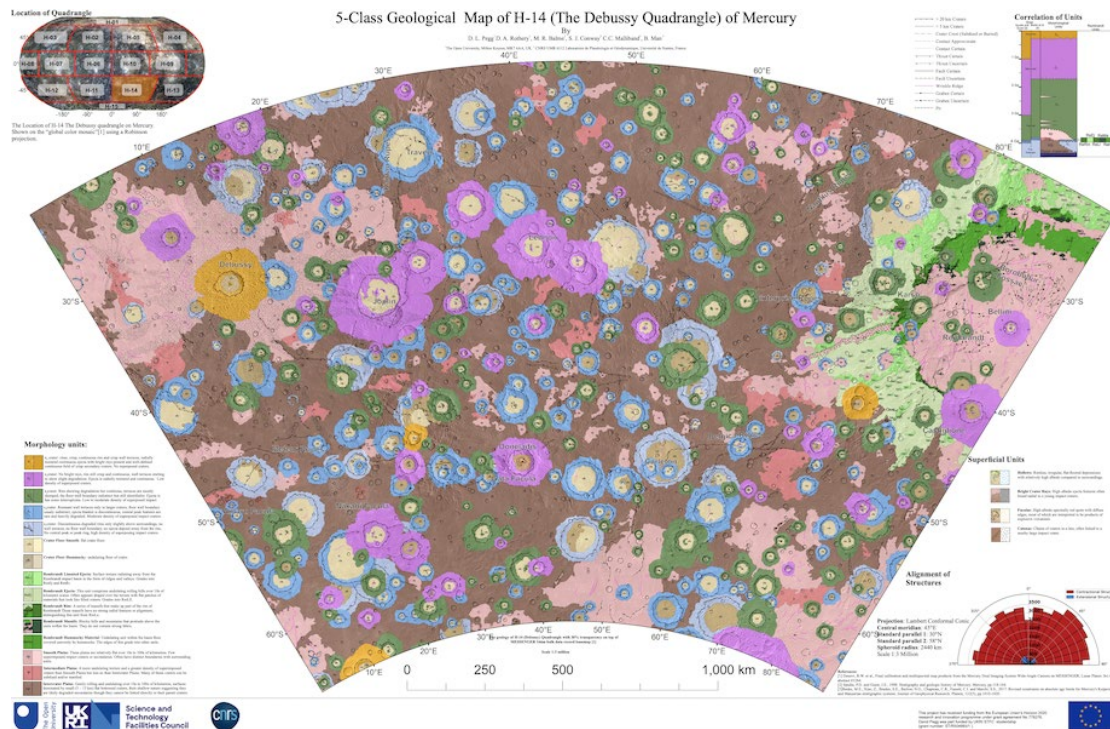


Figure 3: Quicklook of GMAP <https://data.europlanet-gmap.eu/records/9hdaj-p7f54> entry.

Exemplary: USGS Astropedia entry

Excerpt from USGS Astropedia:

This new work represents a seamless, globally consistent, 1:5,000,000-scale geologic map derived from the six digitally renovated geologic maps (see Source Online Linkage below). The goal of this project was to create a digital resource for science research and analysis, future geologic mapping efforts, be it local-, regional-, or global-scale products, and as a resource for the educators and the public interested in lunar geology. Here we present the completed mapping project as unit contacts, geologic unit polygons, linear features, and unit and feature nomenclature annotation. The product overlies shaded-relief products derived from SELENE Kaguya terrain camera stereo (equatorial, ~60 m/pix) and LOLA altimetry (north and south polar, 100 m/pix). These data are not included with this download due to size considerations, but a readme in the "Lunar_Raster" folder provides the download links. This download page includes a PDF of the geologic map (right-side) with a brief Description of Map Units and Explanation of Map Symbols, as well as a JPG of the map for quick access viewing.

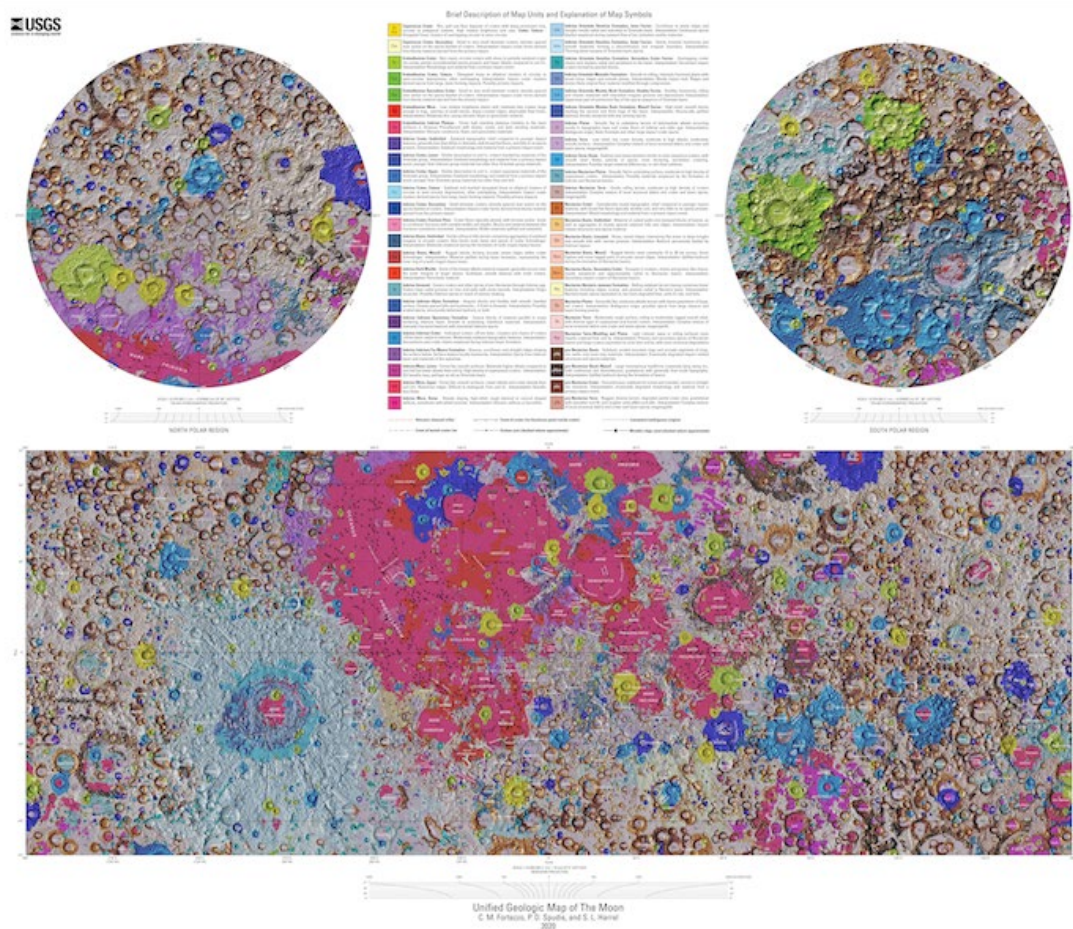


Figure 3: Quicklook of GMAP <https://data.europlanet-gmap.eu/records/pjzwa-q4d62> entry; the view is generated using the original data from USGS Astropedia¹⁰, cross-discoverable via the GMAP portal.

Data Publishing Guide

The data publishing workflow for the portal is documented on the GMAP wiki¹¹, and summarised here as well.

Sharing Mapping Products

Mapping products, optimally hosted on FAIR repositories can be added and made discoverable on the portal. Additionally, Zenodo communities exist^{12,13}.

¹⁰

https://astrogeology.usgs.gov/search/map/Moon/Geology/Unified_Geologic_Map_of_the_Moon_GIS_v2

¹¹ <https://wiki.europlanet-gmap.eu/bin/view/Main/Documentation/data%20sharing%20guide/>

¹² <https://zenodo.org/communities/gmap/>

¹³ <https://zenodo.org/communities/europlanet/>

Geologic map data is intended here in a broad sense, including any kind of geology-related surface mapping. Examples include:

- basemaps (e.g., image mosaics)
- vector geologic and geomorphologic maps
- spectral index map, classification maps.

The dataset can be shared on the portal in different ways, depending on your preference:

1. If a dataset is already published in a paper or in any other DOI-granting repository, one can create a metadata-only entry in the GMAP Data Integration Portal that will provide a title and a description of the dataset, together with the relevant links to make the dataset, as well as the related DOI, discoverable.
2. If a dataset is a work-in-progress, or if a map is not going to be published elsewhere (in a journal or long-term preservation repository), it is possible to create an entry and upload the data package on the portal itself. In this case, it is still strongly suggested to store important data in a long-term repository such as OpenAire's [Zenodo](#), or any other infrastructure, optimally DOI-granting.

Geologic maps compared to other deposited datasets have some geographic metadata, among others, that could be specifically added (see [GMAP wiki](#)).

Materials (including datasets) Published Elsewhere (with a final DOI)

Such materials exist but might not be optimally discoverable. Therefore, having them listed might increase the impact of performed mapping work.

- Material already published, e.g. with data attached as annex or ancillary material on a peer-reviewed paper (i.e. linking to an existing paper DOI and having as much geo-metadata as they are available).
- Material developed within training courses (e.g. Winter School, graduate mapping lab courses) and shared on any DOI-granting repository
- Maps, either in progress or finalised, shared on the repo with a dataset
- Final geologic maps published on any DOI-granting repository (with or without an accompanying paper)

Materials Published on the GMAP Portal (preliminary, without DOI)

- Geologic map (vector, basemaps, etc) materials uploaded on the GMAP data portal by mappers at various development stages of their map.

It is - again - strongly suggested, for those who want to share geologic maps (vector files, layout, basemaps, etc.) on the GMAP portal, once they are final, to be deposited onto a DOI-granting repository (eg. Zenodo), and update the entry on the GMAP portal.

● Examples

Few examples on which kind of data, tools, products and documents could be part of the GMAP portal (some already in, some soon). While it is preferred to have tools published as Zenodo datasets/code, occasionally GitHub/Gitlab repos could be added to the GMAP portal:

- **Abstracts**
 - <https://zenodo.org/record/5095261#.YxhOcJdBz1I>
- **Relevant project deliverables**
 - mapping-related deliverables can be added. External repository (similar to the USGS case below) could also be added as metadata-only entries
- **Geologic maps from an external repository (e.g. USGS Astrogeology)**
 - <https://data.europlanet-gmap.eu/records/a0vqv-jtg54> - original source: https://astrogeology.usgs.gov/search/map/Io/Geology/Io_SIM3168_Database

- **Training material packages/basemaps**
 - <https://zenodo.org/record/5109567#.YxhOd5dBz1I>
 - <https://zenodo.org/record/6695546>
 - <https://zenodo.org/record/6695546#.YxhPZpdBz1I>
- **Tutorials / walkthroughs**
 - <https://zenodo.org/record/6655289#.YxhPiZdBz1I>
- **Basemap(s)**
 - <https://zenodo.org/record/4773699#.YxhOfpdBz1I>
 - <https://data.europlanet-gmap.eu/records/73994-1qb65> - original source: https://astrogeology.usgs.gov/search/map/Mars/Viking/MDIM21/Mars_Viking_MDIM21_ClrMosaic_global_232m
- **Papers containing a geologic map or relevant mapping data (external DOI)**
 - <https://zenodo.org/record/5109567#.YxhOd5dBz1I>
 - <https://zenodo.org/record/5346571#.YxhPC5dBz1I>
- **Tools for geologic mapping**
 - e.g. mappy - <https://data.europlanet-gmap.eu/records/jqc7y-v5w87>
 - e.g. sharpy - <https://github.com/planmap-eu/sharpy>
 - e.g. deeplandfomrs - <https://zenodo.org/record/6819446#.YxhMDi0Rr1J>
 - e.g. docker-isis - <https://zenodo.org/record/6396321#.YxhMGS0Rr1J>
 - e.g. image processing utils - <https://zenodo.org/record/6247608#.YxhMKS0Rr1J>
 - e.g. MARSIS EDR/RDR reader - <https://zenodo.org/record/4548920#.YxhMOy0Rr1J>
- **In-progress maps**

● GUI Interface

1. Sign-up and Login

In the front page of the Data Portal, there are in the top-left corner of the page the buttons to *Sign-up* and *Login* or the *hamburger* icon, depending on the size of the user's browser window, as shown in Figure 5.

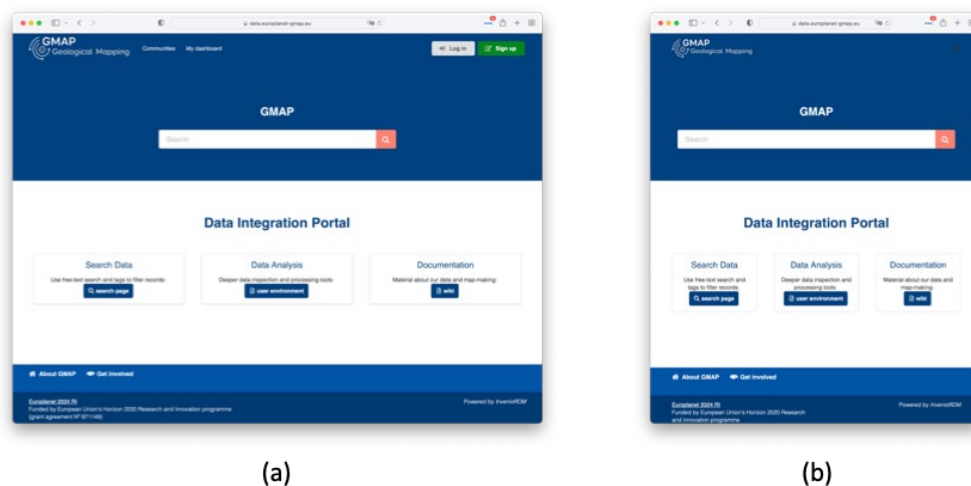


Figure 5: GMAP Data Portal landing page for two different window sizes. One the left (a), a bigger size where we can see all the buttons in the header, and on the right (b) the buttons are inside the hamburger button.

Sign-up, confirm the creation of the account, and one should now be able to *login* to the Data Portal. Once the user logs in, the previous (*sign-in*) buttons will be substituted by a menu of buttons like in *Figure 6*.

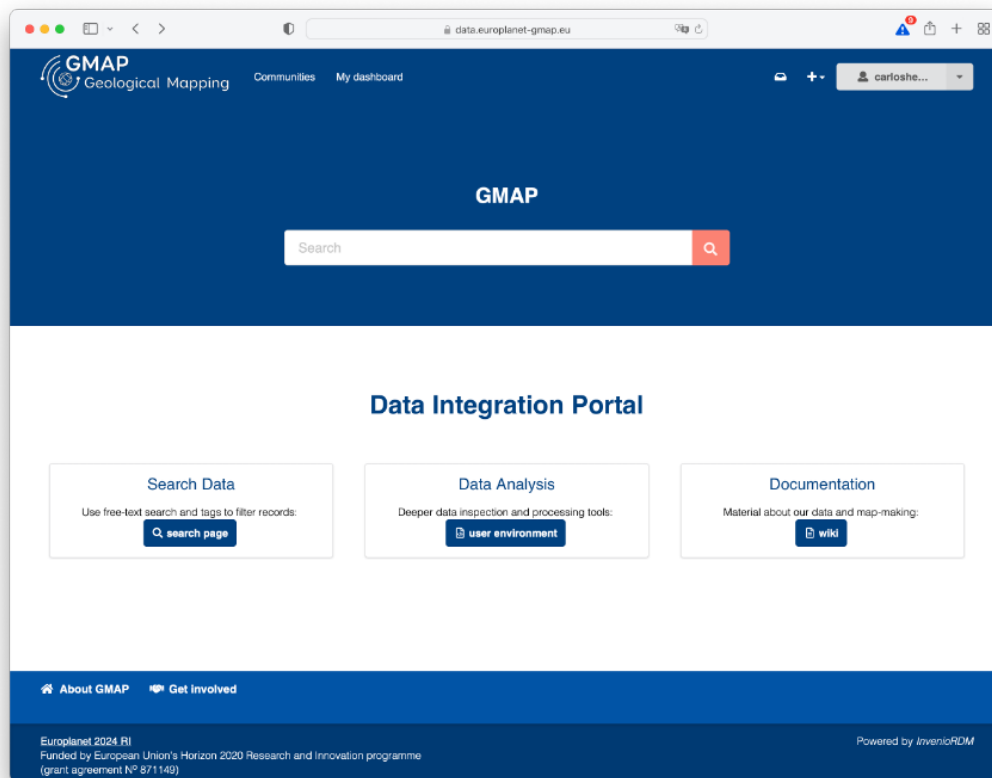


Figure 6: GMAP Data Portal landing page after login. Notice the button in the top-left corner.

The new menu buttons provide all functionalities available to the portal user: user profile, creation of records, and community notifications (more on that in the section “My Dashboard”).

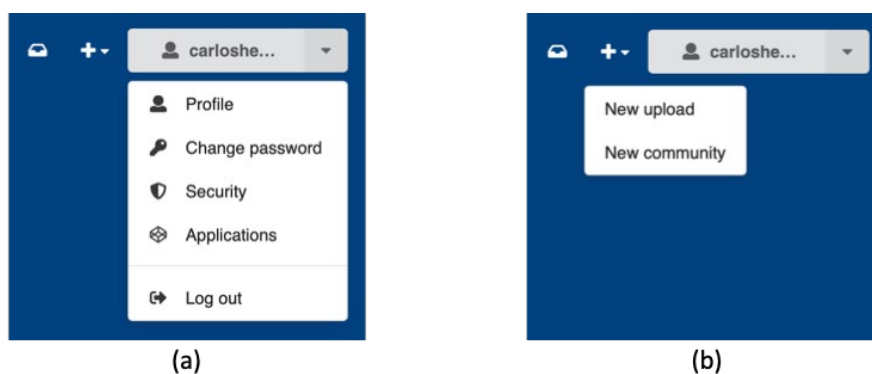


Figure 7: Header menu buttons after login, (a) user’s private information, (b) creation of records and communities (and inbox messages button on the left).

Applications

The *Applications* button in *Figure 7* provides *keys* (or *tokens*, unique to each user) necessary to interact with InvenioRDM through its REST API. All functionalities available in the GUI interface, such as search and creation of records, can be achieved programmatically through the API. For details on how to use the API see the corresponding documentation in Invenio official documentation.

A user can create as many *keys* as felt necessary, in order to organise the different applications one may have for using InvenioRDM API (see *Figure 8* below).

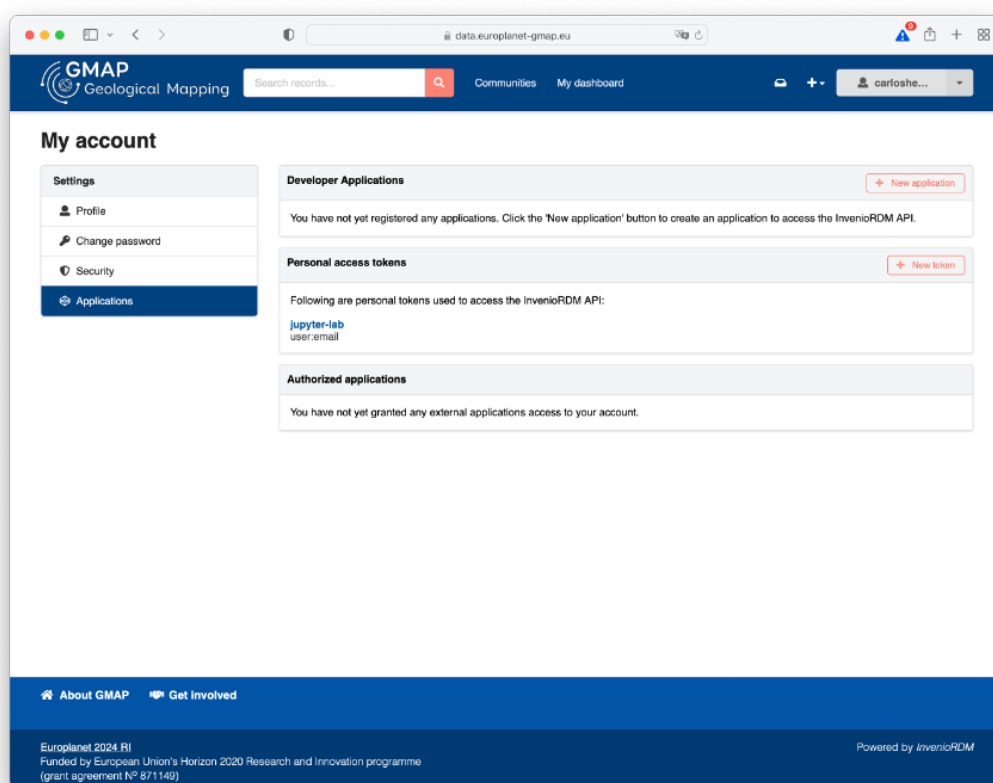


Figure 8: Applications page, where the user can register different keys/applications to access InvenioRDM programmatically through the REST API. Here, we can see one application labelled “jupyter-lab” is registered.

My Dashboard

In the page header, there is a button called “My Dashboard”, this is the main page in the user space. Here the user can manage all their publications and drafts as well as create new records. *Figure 9* shows an example of the user dashboard where all their *uploads* (i.e., published records) are in view.

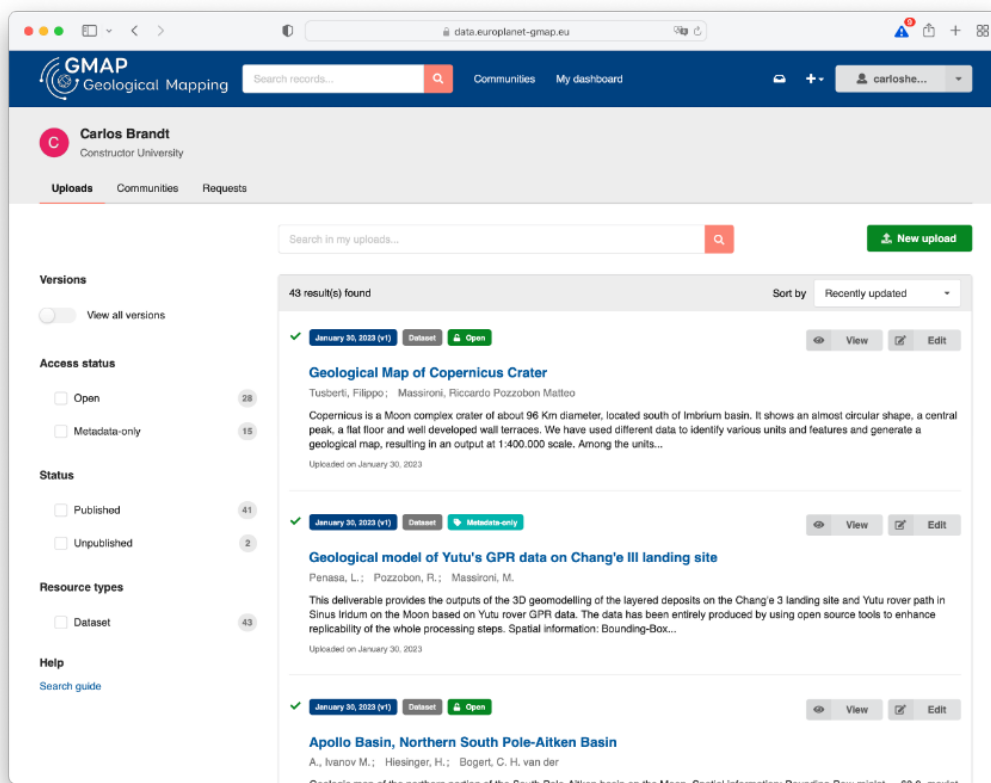


Figure 9: Example of "My Dashboard" page, where the user can manage their previously created records as well as create new ones.

Record Creation

To create a new record, one can click the 'New upload' button available in the user's *dashboard* (see section "My Dashboard") and a page like in Figure 10 will appear. You will notice that the total set of metadata attributes available is substantial, but we don't have to use all of them.

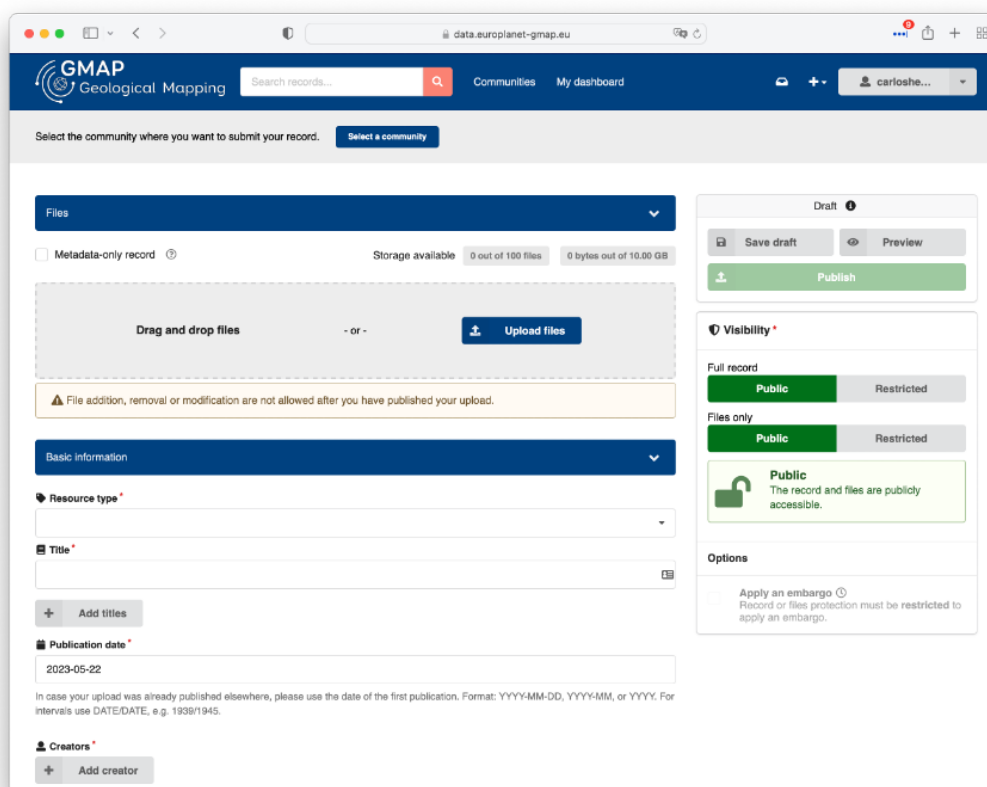


Figure 10: "New Upload" page. In the centre of the page, the metadata attributes form and the list of data files composing the record. On the right side, publication status and visibility controls of the record.

The publication of a record does not have to be done at once: A user can enter some of the record fields – save the draft; Come back later, upload some files – save the draft; Until all required information is entered, and files necessary to publish the record are uploaded.

A draft will remain in the user's dashboard (hidden from the public) until one (i) publishes it, or (ii) deletes it. When one *publishes* a (draft) record, it becomes a publication. At this point, the record receives a *version* number and cannot be deleted anymore. This behaviour is in fact similar to that of Zenodo¹⁴, which shares a similar backend.

Possibly, you will want to *update* the publication (record), maybe add more files or edit some metadata value. This can be done. Whenever you do that, though, the idea of a "draft" exists no more, meaning the (little) modifications should be done at once and will become part of the new version of the (public) record as soon as you save/publish it.

Status and Type

A record can have a *draft* or a *publication* status (and their only difference is visibility from the public).

¹⁴ <https://help.zenodo.org/docs/deposit/create-new-upload/>

There are other attributes that impact the way external users search and see Invenio publications that GMAP uses to help distinguish packages on the portal.

Metadata-only

When a record contains no files, it is flagged as a *metadata-only* record. They are useful for referring to external resources, for example, on Zenodo or some scientific journal.

In the GMAP Data Portal, users are invited to use *metadata-only* records to link a publication or resource elsewhere in the portal, using the metadata model discussed in section “Metadata”. This way, the planetary data resource (article, geological map, dataset, software, etc.) will be indexed in the portal, serving as a planetary digital resources index, and as an additional data discovery option.

Resource Type

Resource type is a mandatory attribute of a record, it specifies the nature of the data in the record files or – in case of a *metadata-only* record – the nature of the linked resource data.

The type of resource is chosen from a list of predefined values. For planetary resources – GMAP -, it is recommended the use of one of the values listed below:

- *Dataset*: use it when multiple data files are linked to the record.
- *Image*: this is the resource type for single raster files (e.g., basemap mosaic).
- *Publication*: in case you are linking an article, a geological map, or document.
- *Software*: for when linking a script/application for planetary data processing.

Metadata Attributes

GMAP has its own metadata set (see appendix “*Error: Reference source not found*”) that is especially designed for planetary geological maps. To publish GMAP packages through InvenioRDM we want to map the metadata models (InvenioRDM <-> GMAP) so we get a proper representation of planetary data in a general-purpose data repository.

Table 3 describes GMAP metadata attributes and the mapping to the corresponding “InvenioRDM” fields.

Table 3: GMAP-to-InvenioRDM metadata attributes correspondence. In the left column are the attributes presented to us when creating a record; In the right column, the corresponding GMAP attributes.

InvenioRDM	GMAP
Creators	Authors
Publication date	
Resource type	Dataset
Title	Title of map
Additional descriptions	Original CRS Other comments Output scale Stratigraphic info Target body

	Units definition
Additional titles	Map name (GMAP_ID)
Alternative identifiers	DOI of companion paper
Contributors	
Description	Short description
Formats	
Funding references	Acknowledgements
Location	Bounding box
Publisher	
References	Heritage used Standards adhered to
Related identifiers	Data used Link to other data Related products
Rights/Licences	
Subjects	Aims
Version	Type

File Structure

When including multiple (data) files within a record, there are two preferred ways, both in the GMAP Data Portal, and in the GMAP community¹⁵ on Zenodo:

1. include the files directly, one-by-one
2. pack all files in a *zip* file, and *then* deposit the compressed file.

Both have advantages and disadvantages. In option “1”, InvenioRDM will provide a *preview* of the file content in the public records page if the file is of a compatible type (PDF, JPG, etc), and the users can directly download only the files they need from the record.

In the case files require a specific arrangement of directories *and/or* the files being included are big (> 100 MB), option “2” is the best way to include your data files.

For instance, for the publication of (GMAP) geological maps, it is recommended the use of directories to organise the different types of data composing a map, somewhat similar to PDS3 directory structures:

- *document/*
containing the final (PDF) map, *browse* (JPG) image and any other relevant document associated to the map (*e.g.*, scientific paper)

¹⁵ <https://zenodo.org/communities/gmap>

- *raster/*
containing the basemap raster (*e.g.*, TIF) file used in the map background and any other ancillary raster created during the development of the map
- *vector/*
containing the geometries (*e.g.*, SHP) file of the map
- *modell/*
in case of 3D data products, include them (*e.g.*, OBJ) in this directory.

GMAP Map-wide Metadata

Table 3 is a copy from the official [GMAP “Map-wide metadata” wiki page](#)⁷, it explains the meaning of each GMAP package metadata attribute.

Table 3: GMAP map-wide metadata

Attribute	Description
Acknowledgements	Free-text acknowledge (eg, funding)
Aims	Goal for this map
Authors	Semi-colon separated list of authors
Bounding-box - {Max,Min} {Lat,Lon}	Overall Latitude and Longitude, minimum and maximum coordinates
DOI of companion paper	DOI of linked publication
Data used	Semi-colon separated list of ancillary data
Heritage used	Map data heritage information
Link to other data	Links to external resources
Map name (GMAP_ID)	Unique package name: GMAP- <i>{target}</i> - <i>{type}</i> - <i>{label}</i> _ <i>{detail}</i>
Original CRS	WKT declaring map's CRS
Other comments	Free-text notes, errata, or warnings
Output scale	Map spatial scale
Related products	Ancillary geological maps
Short description	Free-text describing the map
Standards adhered to	Semicolon list of standards used in the map
Stratigraphic info	Description of stratigraphic elements in the map
Target body	Planetary body name (eg, Mars, Moon)
Title of map	Map title (eg, "Geologic Map of region X")
Type	"draft" or "released"

Units definition	Units colour definition, polygon styling (eg, 127,233,18)
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Plans and Outlook

The GMAP data portal is going to be available throughout the duration of the Europlanet 2024 Research Infrastructure. Arrangements are being made for the longer-term availability of the portal, within the broader Virtual Access (VA) activities and partners of Europlanet 2024 RI. The choice of a well-supported codebase¹⁶¹⁷ is instrumental to longer-term updates, availability and ease of re-deployment as needed.

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¹⁶ <https://github.com/europlanet-gmap/invenio-tools>

¹⁷ <https://github.com/europlanet-gmap/invenio-tools>

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