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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)

Executive Summary / Abstract:

A status report as of June 2023 on the GMAP Community Mapping projects is provided. A variety of individual mapping projects started, some deriving from earlier projects, some newly started or kick-started from the 2021 and 2022 GMAP Winter Schools. Current information on GMAP community mapping projects is available from the GMAP wiki.

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- **List of acronyms and abbreviations**

Table 1: Acronyms and abbreviations

Acronym	**Description**
CUGB	China University of Geosciences Beijing
FAIR	Findable, Accessible, Interoperable and Reusable
GMAP	Geologic MApping of Planetary bodies
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 Work Package (WP8) engaged with the community through various activities, such as the yearly Winter School, reaching out across three years to almost a thousand individuals, with documentation (see Rossi et al., 2022a, 2022b, and ref. therein) and standards (Naß et al., 2020; 2023, D91., D9.7). Actions were also based on inputs and guidance from the overall VA Review Board (e.g. Raugh et al, 2020, 2022).
Community mapping projects are a key component of the GMAP activities, in which individuals and groups are engaged in specific geologic mapping efforts on Solar System bodies of their choice.

3. Community mapping involvement

Different engagement levels for project results exist for GMAP: users of VA are heterogeneous, ranging from those using training materials, to participants, to Winter/Summer schools and workshops, to mappers, more or less actively engaged in GMAP activities.

The list of the exemplary levels of engagement includes (by increasing level of engagement see (see also D8.5, Rossi et al. 2020)):

- **Level 0** - Occasional users at the very beginning of their career, but curious about planetary geology, casual participants to informal monthly calls, active on social and relaunching GMAP content.
- **Level 1** - Participants to yearly / periodic schools and workshops, users of GMAP materials, e.g. registered on the GMAP website to access Winter School videos, GitHub users (e.g. via stars, forks, other measurables) and casual participants to informal monthly calls.
- **Level 2** - Geologic mappers with published maps that make them discoverable via the GMAP portal (i.e. maps hosted and published elsewhere but linked/listed from the portal (**no datasets** on repo upon publication or earlier).
- **Level 3** - Geologic mappers with published papers or other products who share data on the GMAP Portal / Zenodo, using the portal but not complying to all standards (**dataset** on repo upon publication or earlier).
- **Level 4** - Geologic mappers with or without published papers who engage with GMAP and develop their project (from scratch or from a certain point) with GMAP, adhering to standards and joining calls/seminars where relevant/possible (**dataset** on repo upon publication or earlier).

The community involved at level 0 is represented by the activity documented in the virtual winter school social accounts.
The community involved at level 1 is reported in the VA yearly report within the description of each Geology and Planetary Mapping Winter School edition. For details of the first two Winter Schools see Rossi et al. (2023).

The community mapping projects on the following Table 2 are currently from level 2 to 4, although the ones for level 3 and 4 are in variable stages of development, some just started.

- **Current community mapping projects**

An updated list of current community mapping projects is recorded on the GMAP wiki[1]. A summary with links to individual mapping projects, at various stages of maturity, is included in Table 2.

[1] https://wiki.europlanet-gmap.eu/bin/view/Main/community%20mapping%20projects/

Table 2: Summary of community mapping projects, as of June 2023

Mapping project title	***Project lead***	***GMAP contacts***	***Details***
China's Chang'e-5 landing site: Geology, stratigraphy, and provenance of materials (2021) EPSL 561, 116855.	*Yuqi Qian*	*WWU: van der Bogert, Hiesinger*	*A geological map of the Chang'e-5 lunar landing site for use in interpretation of the returned samples*
Geology of the Hypanis outlet region	*Agnese Caramanico*	*UdA: M. Pondrelli*	*Geologic and stratigraphic studies of the Hyspanis fan-delta system*
Geology of the Tyras Vallis area	*Davide Defilippis*	*UdA: M. Pondrelli*	*Map of the depositional environments of the Tyras Vallis paleolacustrine system using recent datasets.*
Chronostratigraphic reconstruction of Eastern Tharsis volcanism	*Pierre-Antoine Tesson*	*CBK PAN: P-A Tesson, D. Mège, J.Gurgurewicz*	*Lava flow mapping at regional scale.*
A 1:600K Geological Map of the Sibelius Crater, Mercury	*Marc Canale*	*INAF: Luca Penasa*	*A geological map of spectral and geomorphological features of the Sibelius Crater on Mercury using MESSENGER MDIS imagery.*

Structural map of Noctis Labyrintus region on Mars	*Mayssa El Yazidi*	*UNIPD: Matteo Massironi*	*This will provide a quantitative framework for a better characterisation of the extensional history of the region*
Characterisation of La Corona lava field planetary analogue at Lanzarote island (Spain)	*Ilaria Tomasi*	*UNIPD: Matteo Massironi*	*Comprising mapping and 3D laser scanning of an extended lava tube, which represent a good analogue for lava tubes on the Moon or Mars*
Geologic mapping and landing site characterization in Copernicus Crater (the Moon)	*Filippo Tusberti*	*UNIPD: Matteo Massironi*	*Mapping aims to evaluate this region as landing site for exploration and sampling*
Cerberus Fossae, Mars	*Trishit Ruj*	*UNIPD: Riccardo Pozzobon*	*Structural mapping of the huge fractures system*
Holden crater	*Monica Pondrelli*		
Geologic and structural mapping of chaotic terrains	*Mauro Spagnuolo (University of Buenos Aires)*	*JacobsUni: Angelo Pio Rossi*	*Mapping focused to reconstruct the history of selected chaos-hosted layered deposits*
Mars Double Impact Crater Lithostructural Virtual and 3-D Model Evaluation	*Wayne Barnett*	*UNIPD: Matteo Massironi* *UNIPD: Riccardo Pozzobon* *JacobsUni: Angelo Pio Rossi*	*Virtual reality mapping of the double impact crater on Mars, and 3D modelling of the lithostratigraphy*

Lunar LCROSS Impact Ice Study	*Wayne Barnett*	*UNIPD: Matteo Massironi*	*Virtual Reality mapping of the LCROSS location*
		UNIPD: Riccardo Pozzobon	
Geo-stratigraphic map of the North Polar Layered Deposits close to Olympia Rupes (Mars)	*Nicole Costa*	*UNIPD: Matteo Massironi*	*Stratigraphy of a restricted area close to Olympia Rupes on the Northern Polar Cap*
The geologic map of Sinus Iridum	*Teng Hu*	*CUGB: Zhizhong Kang (MOST)*	
The geologic map of Zhurong landing site	*Teng Hu*	*CUGB: Zhizhong Kang (MOST)*	
High-res descent map Chang'e 5 landing site map	*Teng Hu*	*CUGB: Zhizhong Kang (MOST)*	
Geological map of the Rima Bode region, Moon	*Sascha Mikolajewski*	*WWU: Hiesinger, van der Bogert, Poehler*	*Geological mapping of the Rima Bode region of the Moon in preparation for a lunar mission*
Geologic and compositional characterization of the Tsiolkovskiy crater, Moon	*Gloria Tognon*	*UNIPD: Gloria Tognon, Matteo Massironi*	*Geologic, colour-based and spectral mappings aimed at characterizing the lunar far side Tsiolkovskiy crater and laying the groundwork for a landing site evaluation*

Geologic mapping of the H-9 Eminescu quadrangle, Mercury	*Gloria Tognon*	*UNIPD: Gloria Tognon, Matteo Massironi, Mayssa El Yazidi* *INAF-IAPS: Valentina Galluzzi, Lorenza Giacomini*	*Geologic map of the equatorial H-9 Eminescu quadrangle on Mercury*
Geologic mapping and interpretation of a Fractured-Floor Crater in Ladon Basin - Mars	*Diandra Cardinali*	*UNIPD: Matteo Massironi*	
Morphostratigraphic mapping of Valentine Domes on the Moon	*Javier Suarez*	*JacobsUni: Javier Suarez*	*Mapping of the intrusive Valentine Domes on the moon.*
Mapping of Martian geoforms as an input to construct an analogue environment in Colombia	*Javier Suarez*	*JacobsUni: Javier Suarez*	*A necessary prior step to the construction of a rock garden in an analogue station in Colombia.*
Morpho-stratigraphic mapping of Mikumi crater, northern Meridiani Planum, Mars	*Beatrice Baschetti*	*UNIPD and INAF-IAPS: Beatrice Baschetti* *INAF-IAPS: Alessandro Frigeri, Cristian Carli, Francesca Altieri*	*Morpho-stratigraphic mapping of layered phyllosilicate and sulphate rich sedimentary units within Mikumi crater. The map is needed to support stratigraphic investigation and interpretation.*
Mapping Planetary Skylights on Mars using Deep Learning	*Giacomo Nodjoumi*	*JacobsUni: Giacomo Nodjoumi*	*Mapping Planetary Skylights on Mars using Deep Learning*

Structural Mapping of Aristarchus plateau and Marius Hills in Oceanus Procellarum (Moon)	*Giacomo Melchiori*	*UNIPD: Riccardo Pozzobon*	*Structural mapping of contractional features (i.e. wrinkle ridges) in the region between the Marius Hills shield and Aristarchus plateau in Oceanus Procellarum*
Geologic map of the eastern sector of Ladon basin (Mars)	*Daniel Mège*	*CBK: Daniel Mège, Joanna Gurgurewicz UNIPD: Matteo Massironi, Riccardo Pozzobon*	*Geologic map of the eastern portion of Ladon basin (Mars).* *In this map, the potential of ExoMars TGO/CaSSIS colour image dataset is exploited for geological interpretation, and show that it is particularly effective for geologic mapping in combination with other datasets such as HiRISE, CTX, and CRISM. The study area displays dark lobate flows of upper Hesperian to early Amazonian age which were likely extruded from a regional extensional fault network.*

Geological map of an unnamed crater in Arabia Terra (Mars)	*Alessandra Piscopo*	*UDA: Monica Pondrelli*	*The area is centred 1,6°N-8,8°W, in the southern part of Arabia Terra. The aim of this project is to map the light-tone layered deposits that are present in the crater as well as in the nearby intercrater plains.* *The map will be developed using CTX imagery and CTX-derived DEMs, but HiRISE data, including HiRISE-based DEM, will support the unit description, definition, and stratigraphic contacts characterization.*
Mineral composition of Gale Crater and geological context	*Fatima-Ezzahra Jadid*	*INAF: Beatrice Baschetti, Cristian Carli*	
Geological map of the Apollo 14 landing site	*Wajiha Iqbal*	*WWU: Hiesinger, van der Bogert, Borisov*	*New detailed map of the Apollo 14 landing site for updating the lunar cratering chronology*
Timing and origin of compressional tectonism in Mare Tranquillitatis	*Thomas Früh*	*WWU: Hiesinger, van der Bogert*	*Tectonic mapping of wrinkle ridges in Mare Tranquillitatis*
Possible sites for a Chinese International Lunar Research Station in the lunar south polar region	*Teng Hu*	*CUGB: Zhizhong Kang (MOST)* *WWU: van der Bogert, Hiesinger*	*Geological maps for potential landing sites at Amundsen and Malapert craters*

Geological mapping for landing sites in Apollo basin, Moon	*Csilla Orgel*	*WWU: van der Bogert, Hiesinger*	*1:50K geological maps for two potential landing regions in the Apollo basin, Moon*
Geological mapping of Grimaldi basin, Moon	*Kirby Runyon*	*WWU: van der Bogert, Hiesinger*	*Part of a project mapping lunar basins to better understand their formation and evolution*
Geological map of the Deuteronilus Mensae region	*Lennard Pauw*	*WWU: Hiesinger, van der Bogert*	
Geological mapping NW of Ismenius Cavus, Deuteronilus Mensae	*Lukas Wüller*	*WWU: Hiesinger, van der Bogert*	
Integration between geology and multispectral information for the Ingenii basin, Moon	*Gloria Tognon*	*UNIPD: Gloria Tognon, Matteo Massironi, Riccardo Pozzobon* *INAF-IAPS: Francesca Zambon, Lorenza Giacomini, Federico Tosi, Giulia Salari, Giovanna Rinaldi, Sergio Fonte* *PSI: Jean-Philippe Combe*	*In this project, a morpho-stratigraphic map integrating multispectral information was produced for characterising the geology of the Ingenii basin on the Moon and the composition of the different materials, laying the ground for an in-depth spectral analysis of the area. Datasets used for this project are the LROC-WAC mosaic, Clementine UVVIS Warped Colour Ratio mosaic, LRO-LOLA/Kaguya-TC DEM merge.*

Examples of mapping projects (See also Rossi et al. 2020; 2022c) are included below:

Mikolajewski et al., (2022a,b) e.g., (see Table 2). Some projects are starting, and initial sketches or maps are visible as graphics output on the GMAP wiki, see e.g. Tesson et al. (2020), as visible in Figure 1.

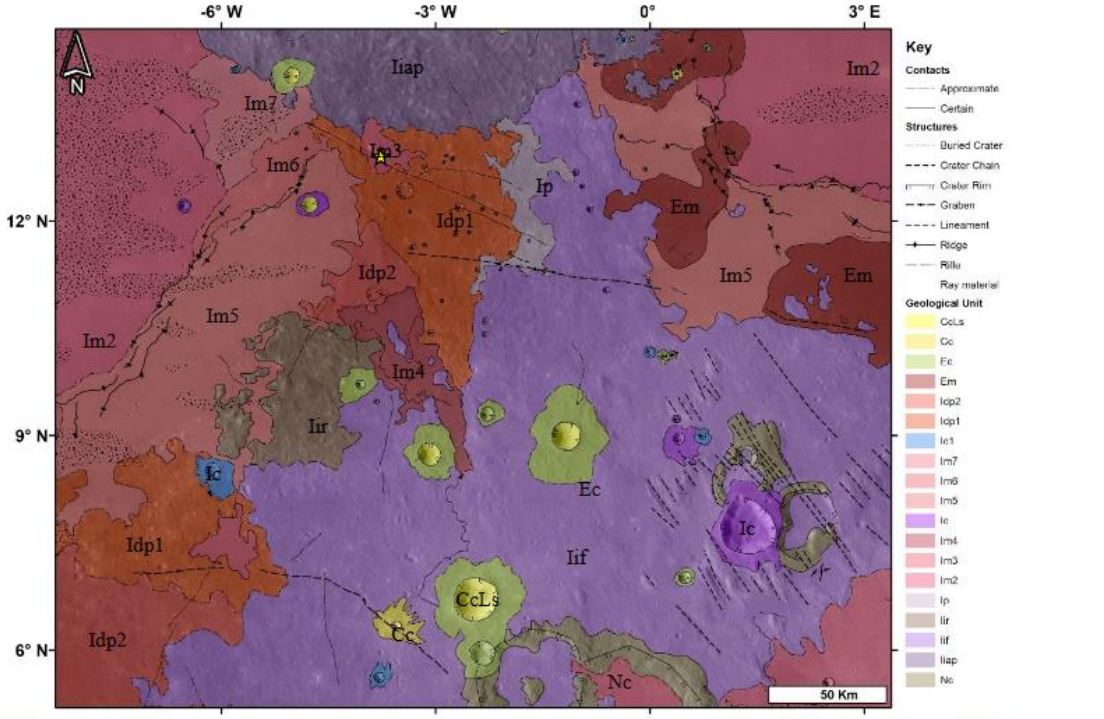

Figure 1: *Part of the geological map of the Rima Bode region. The yellow star marks the investigated landing site located near a vent. See [4] for descriptions of the geological units.*

Figure 1: Map output from the community mapping project "Geological map of the Rima Bode region, Moon" (Mikolajewski et al., 2022a,b)

By the end of Europlanet 2024 RI's funding period and beyond, datasets produced within community mapping projects will be discoverable via the portal and shared on FAIR repositories of choice, primarily Zenodo (in which a GMAP community[2] exists. and will be progressively populated), see e.g. Canale et al. (2023a,b).

[2] https://zenodo.org/communities/gmap/?page=1&size=20

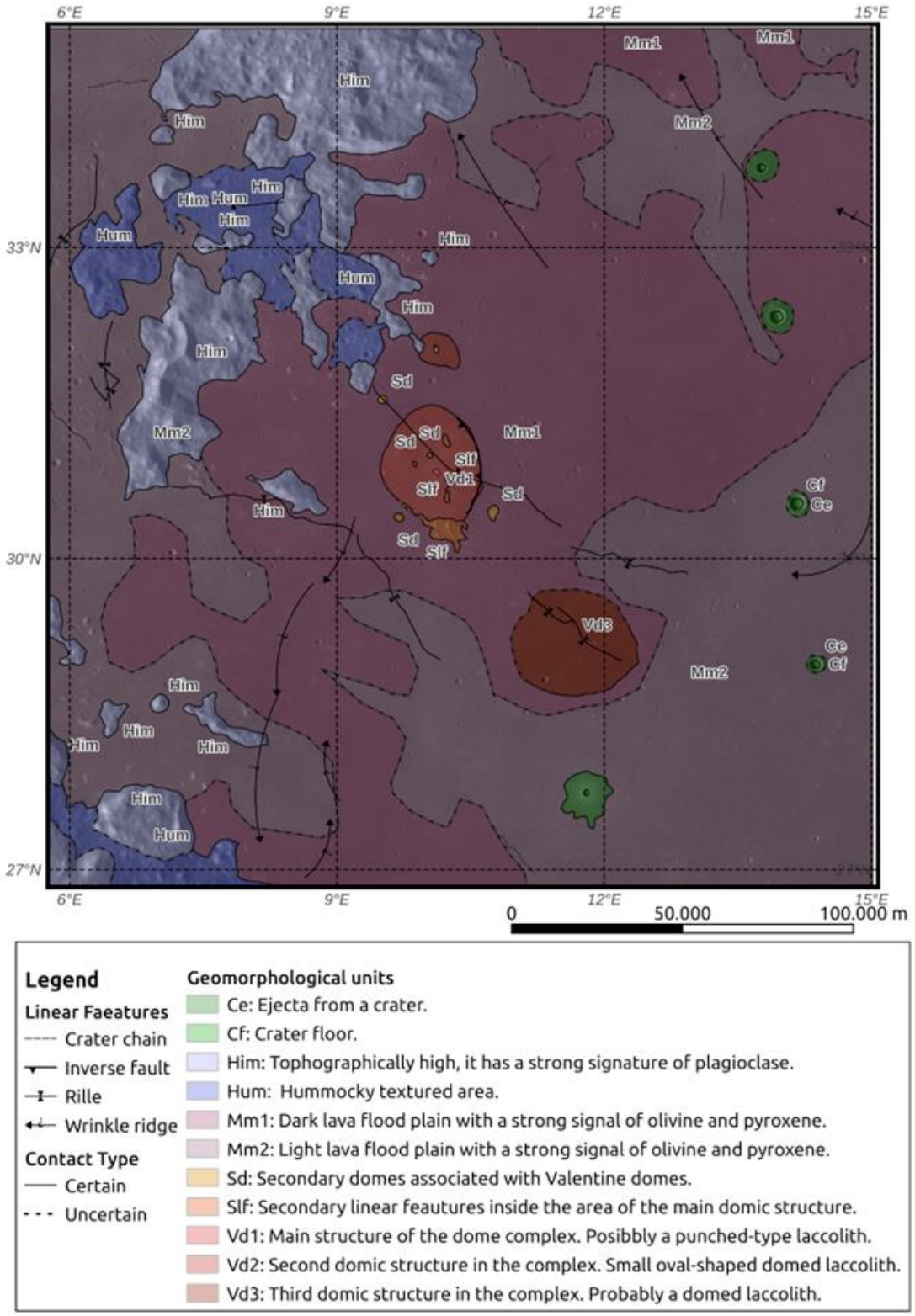

Figure 2: Morphostratigraphic mapping of Valentine Domes on the Moon (see Suarez-Valencia and Rossi, 2022, GMAP wiki).

Some projects involved participants in the 2021 edition of the GMAP Winter School (Marc Canale, Open University, Canale et al., 2023a,b). Also, several mapping projects from the Chinese partner MOST projects are present (projects from Z. Kang, CUGB).

- **Plans and outlook**

Currently more than 35 GMAP community mapping projects started or were embedded. We plan to expand the project base and help make more relevant planetary geologic mapping products and related data discoverable, visible to and reusable by the planetary geologic community.

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