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Executive summary

The Planmap story map app and related documentation (data preparation, story map narrative data structure, etc.) has been updated. The initial set of story maps has been expanded and updated for each of the 3 relevant Solar System bodies for Planmap: Mars, Mercury, the Moon. Updated story maps are on Gale crater, including now recently published results. A new story map of Arsinoes Chaos has been produced, linked to PM-MAR-MS-Arsinoes. An easier authoring system has been put in place. Additional story maps following the same data structure will be produced, including Crommelin crater (Mars) and Copernicus (the Moon). We plan to promote our open source lightweight storymap concepts and tools for further use beyond the Planmap project.

List of Acronyms

Acronym	Description
DOM	Digital Outcrop Model
JSON	Java Script Object Notation
MSL	Mars Science Laboratory
NPM	Node.js Package Manager
OGC	Open Geospatial Consortium
PM_ID	Planmap IDentification code
SPA	South Pole-Aitken
URL	Uniform Resource Locator

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Introduction

Story maps have been chosen as a way to deliver results of Planmap to the public in a friendly interactive way, without the need to have specific knowledge or background of mapping systems, as well as the range of complexity of geologic mapping and modelling products (See D2.1-public, D2.2-public, D7.3-public, D5.1-public).

Planmap data (See D7.2-public, D7.4-public, D7.6-public) made use of story maps (e.g. Caquard and Fiset, 2014) as the choice for web-interactive projects for geologic mapping products deriving from Planmap as story maps. Accessible, high-quality and aesthetically appealing background maps were provided by OpenPlanetaryMap layers (See D8.11-public Rossi et al., 2019). They are in general used as map background for story maps, unless higher-resolution or more suitable basemaps are needed.

Planmap storymap app

The Planmap storymap app (D8.11-public, Brandt and Rossi, 2019) has been incrementally updated (see Planmap storymap repository - https://github.com/planmap-eu/storymaps). The look and feel of the web app are similar to the first version released (Figure 1).

Data structure

The data structure went through few iterations and the first version (see Planmap storymap GitHub repo, 2019) has been improved, e.g. adding specific fields for URLs in each step. Each story map has a set of chapters (stops) with optional steps, providing dynamical content.

Storymap configuration setup

Each story map relies on an individual json configuration file (D8.11-public), containing all relevant metadata and reference to layers, files, associated media. The same json-like structure or a slightly evolved version of it will be used for future interactive three-

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dimensional story maps. The first 3D content, in this version of the storymap app is offered as embedded Sketchfab (https://sketchfab.com) 3d models within the story narrative. The same content is also visible within the Planmap web site (e.g. https://planmap.eu/3d-geomodeling).

In next iterations stops within Sketchfab itself will be created as soon as more complex models will be produced and delivered

The creation of storymaps and iterations between partners/map producers has been lately improved and performed via Gitlab issues and templates. A sample storymap configuration excerpt is included below (figure 2, 3).

Storymap authoring

Authoring of storymaps (See D8.11-public) relies on a json file in order to store all needed information and feed into the web app at https://stories.planmap.eu/. In order to simplify author inputs and story map design, the Planmap consortium started using, in addition to the public GitHub repo, a private Gitlab repo and use of issues templates (see below) in simple markdown format (.md), for easy iterations while designing, developing and finalising the structure and narrative of a storymap (see Figure 2, 3).

```
> NOTES/COMMENTS like this one can be removed when you're done.

> Substitute/fill the values _in quotes_ below to submit the storymap for review/acceptance.
> If you get stuck, fill the section "Comments/doubts about this process" at the end of this template.

# "Story Title"

* authors: "list of author names"
* reference: "DOI, URL or BibCode"
* planmap-id: "Planmap-Id related to the story"

# Chapters
> Add here as many _chapters_ (aka, sections) you want following the template below:

## Chapter "number"
```

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* title: "chapter title"
* text: "panel/text content"
* view: (OPTIONAL)
  * extent:
    * latitude: ["min", "max"]
    * longitude: ["min", "max"]
* media: (OPTIONAL)
  * path: "filename",
  * caption: "caption text",

layers: (OPTIONAL, can be more than 1)
  order: "number" (IF multiple 'layers' are given, _order_ control their _drawing order_)
  path: "URL or filename",
  credits: "Laboratory/Project/Author name of the layer"

Comments/doubts about this process

> If something went wrong, confusing or somehow you fill like commenting/asking
> for something regarding this process, address it here.

Figure 1: Storymap entry page at https://stories.planmap.eu.

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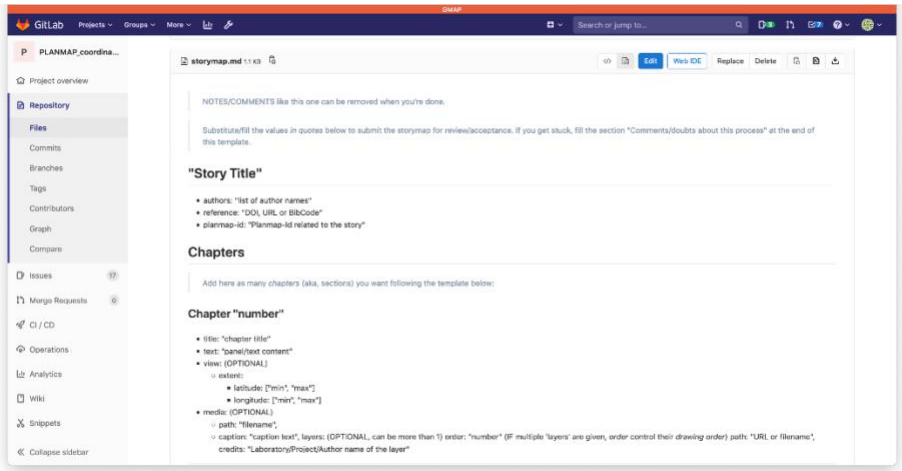

Figure 2: Storymap simplified authoring interface

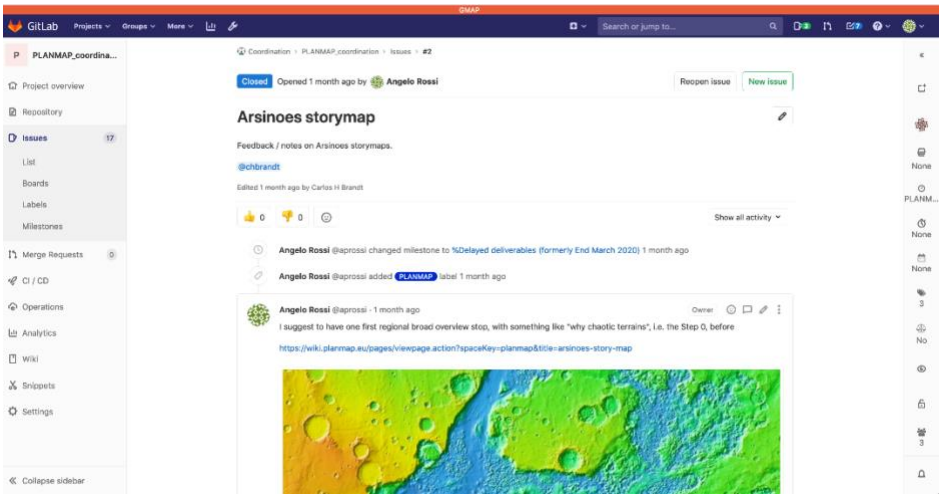

Figure 3: Exemplary storymap development issue. The combined use of templates and threads over GitLab issues allows easier storymap development as well as tracking.

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Second release of story maps and updates: Mercury, Moon, Mars

The first storymap produced and accessible via the Planmap Story Map App (https://stories.planmap.eu/) included one for each planet, and are based on published materials on the Planmap data directory (https://data.planmap.eu) and Planmap OGC endpoints (https://geoserver.planmap.eu). All published storymap metadata are all stored and publicly accessible on the Planmap storymap app repo (Brandt and Rossi, 2019), in the (meta)data subdirectory (https://github.com/planmap-eu/storymaps/tree/master/storymap_data). Data visualised on the app derive from what is already available on the Planmap data portal (Brandt et al., 2019, D7.2-public, https://maps.planmap.eu/) or the data directory (https://data.planmap.eu/), OpenPlanetaryMap basemaps, including Planmap contribution, such as Mercury basemap (https://www.openplanetary.org/opm/basemaps) or additional data hosted on the Planmap web and data directory.

Mercury

Hokusai story map - update

The Hokusai story map is related to Planmap products M-MER-MS-H05_3cc and M-MER-MS-H05_5cc as well as its companion paper (Wright et al., 2019). Minor fixes have been applied to the storymap entry for the map.

Moon

SPA Apollo story map - update

The SPA Apollo Basin story map concentrates on the morphostratigraphic units of the SPA Apollo Basin map (Ivanov et al., 2019) and its related PM_ID PM-MOO-MS-SPAApollo. The latest update includes an image mosaic, overlaying the OpenPlanetaryMap Moon basemap (Figure 3). The morphology of the units is now visible for each stop.

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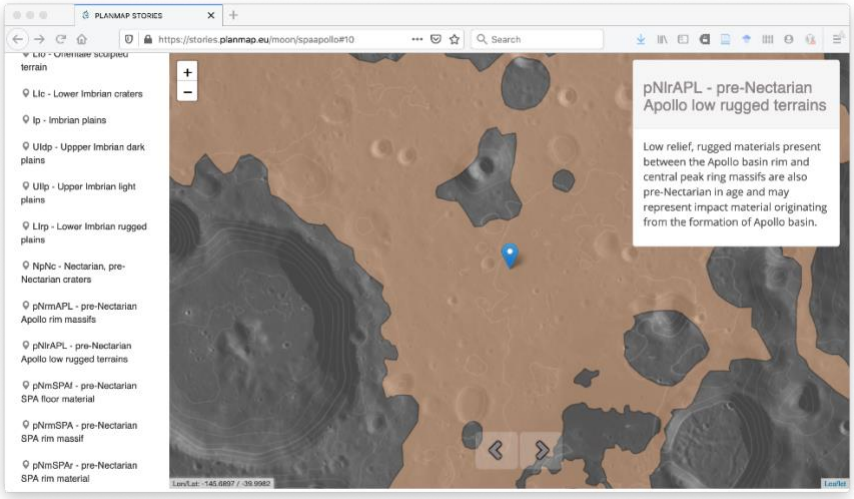

Figure 3: Updated SPA Apollo Basin story map over the geologic map and the LROC WAC mosaic as background (served from Planmap data servers).

Mars

Arsinoes story map

A new storymap has been produced, linked to work (Luzzi et al., 2019; 2020), describing one of Mars' chaotic terrains (Figure 4).

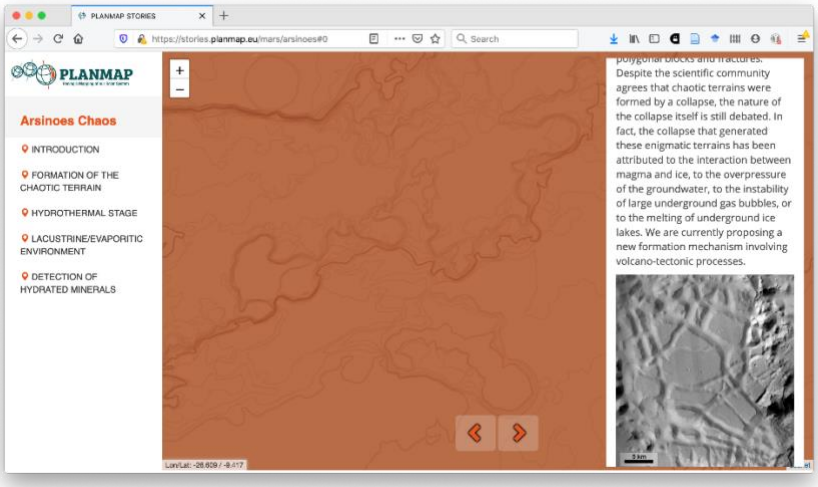

Figure 4: Storymap of Arsinoes Chaos, newly added to Planmap Stories, at https://stories.planmap.eu/mars/arsinoes.

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Gale story map - update

The Gale crater storymap has been improved with additional stops and materials meanwhile published (De Toffoli et al, 2020; Caravaca et al., 2020). The storymap now features additional imagery related to these recent publications (Figure 5). Moreover, 3D content has been embedded, , as a first example/prototype of what is going to be done in future storymaps as well, within the narrative (Figure 6, see also https://stories.planmap.eu/mars/gale#8).

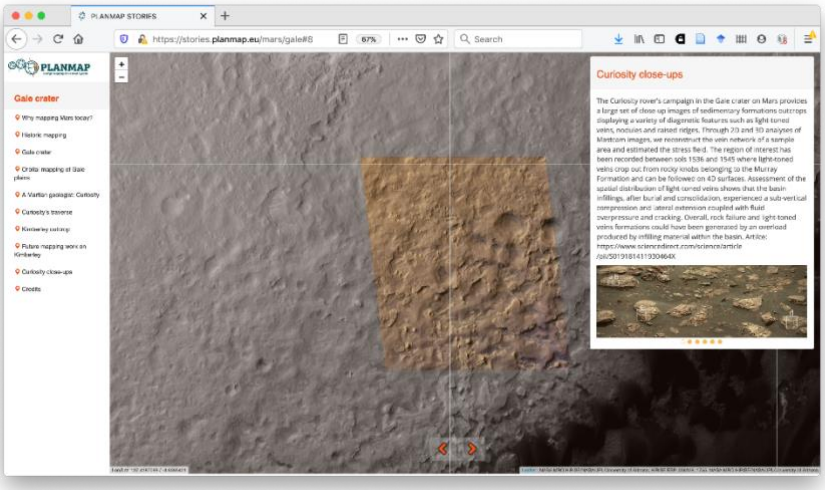

Figure 5: Storymap of Gale Crater: additional stop and description of recently published Planmap results (De Toffoli et al., 2020).

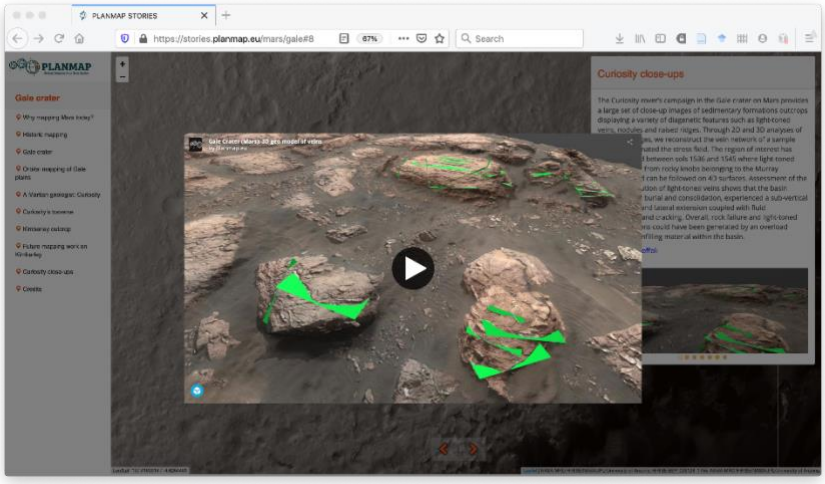

Figure 6: Storymap of Gale Crater: Sketchfab 3D viewer is embedded in the story map stop allowing the user to interact with the model. The model is hosted on https://sketchfab.com/3d-models/gale-crater-mars-3d-geo-model-of-veins-494482a9bc124dbc887ce85e1a51c98a

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Future plans

Storymaps will be steadily added (e.g. Copernicus Crater, see also PM-MOO-MS-Copernicus, in D7.6-public, Rossi et al., 2020), Crommelin Crater, PM-MAR-MS-Crommelin, as well as 3D content (D6.1-public, Pozzobon et al., 2020).

References

Brandt, C. H., Rossi, A. P. and the Planmap consortium (2019) D7.2, Planmap Data Fusion Portal, Planmap deliverable, available online at D7.2-public, https://data.planmap.eu/ - https://maps.planmap.eu/

Brandt. C. H., Rossi, A. P. (2019) Story Map App GitHub repository, planmap-eu/storymaps: Stable set of stories, accessible at https://github.com/planmap-eu/storymaps, DOI: 10.5281/zenodo.3260174

Caravaca, G., et al. (2020) 3D digital outcrop model reconstruction of the Kimberley outcrop (Gale crater, Mars) and its integration into Virtual Reality for simulated geological analysis." Planetary and Space Science 182 (2020): 104808, DOI: 10.1016/j.pss.2019.104808

De Toffoli, B, et al. (2020) Structural analysis of sulfate vein networks in Gale crater (Mars)." *Journal of Structural Geology* (2020): 104083, DOI: 10.1016/j.jsg.2020.104083

Ivanov, M. A., Hiesinger, H., Bogert, C. H., Orgel, C., Pasckert, J. H., & Head, J. W. (2018). Geologic history of the northern portion of the South Pole-Aitken basin on the Moon. Journal of Geophysical Research: Planets, 123, 2585– 2612. https://doi.org/10.1029/2018JE005590

Caquard, S., and Fiset, J.-P. (2014) How can we map stories? A cybercartographic application for narrative cartography, Journal of Maps, 10:1, 18-25, DOI: 10.1080/17445647.2013.847387

Luzzi, E., Rossi, A. P., Pozzobon, R. (2019) Confined channels and collapse features in Arsinoes and Pyrrhae Chaos (Mars): hints for a volcano-tectonic origin." In Geophysical Research Abstracts, vol. 21. 2019.

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Luzzi, E., Rossi, A.P., Carli, C. and Altieri, F. (2020) Tectono-magmatic, sedimentary and hydrothermal history of Arsinoes and Pyrrhae Chaos, Mars, EarthArxiv,

Pozzobon, R., et al., (2020) D6.1-public, 3D geo-models based on multiple datasets of Mars (implicit or explicit modelling), Planmap deliverable, available online at D6.1-public.

Rossi, A. P., Penasa, L., Pozzobon, R., and the Planmap consortium (2019) D7.3-public, Data Management Plan, update 1, Planmap deliverable, available online at D7.3-public.

Rossi, A. P., Brandt, C. H., and the Planmap consortium (2019a) D7.4-public, Public data/code delivery, Planmap deliverable, available online at D7.4-public.

Rossi, A. P., Brandt, C. H., and the Planmap consortium (2019b) D8.11-public, Web-interactive story maps, Planmap deliverable, available online at D8.11-public.

Rossi, A. P., Brandt, C. H., and the Planmap consortium (2019a) D7.6-public, Public data/code dlivery, Planmap deliverable, available online at D7.6-public.

Wright, J., Rothery, D. A., Balme M. R., Conway, S. J. (2019) Geology of the Hokusai quadrangle (H05), Mercury, Journal of Maps, 15:2, 509-520, DOI: 10.1080/17445647.2019.1625821