TOWARDS A NEW FACE FOR PLANETARY MAPS ON THE WEB. N. Manaud¹, A. Nass², S. van Gasselt³, T. Hare³, A.P. Rossi³, M. Lewando⁶, ¹SpaceFrog Design, Toulouse, France (nicolas@spacefrog.design), ²German Aerospace Center, Institute of Planetary Research, Berlin, Germany (andrea.nass@dlr.de), ³National Chengchi University, Taipei, Taiwan (svg@nccu.edu.tw), ⁴U. S. Geological Survey, Astrogeology Team, Flagstaff, USA (thare@usgs.gov), ⁵Department of Physics and Earth Sciences, Jacobs-University Bremen, Bremen, Germany (an.rossi@jacobs-university.de), ⁶Independent Technologist, Cardiff, United Kingdom (info@mylelewando.com).

Introduction: In the context of the OpenPlanetaryMap project, we are creating planetary basemaps designed to enhance the overall user experience of a wide range of web mapping applications.

The OpenPlanetaryMap (OPM) project is an community-driven initiative to build the first Open Planetary Mapping and Social platform for planetary scientists, space enthusiasts, educators and storytellers [1]. The main goal of this project is to make it easy to create and share location-based knowledge and maps of Mars and other planets of our Solar System.

The underlying concepts we elaborated upon are valid for any other planetary body and might be applicable in the same or at least very similar way.

An easily accessible global picture of Mars might be represented by one or more of its three global characteristics: (1) the typical red Mars colour (hue), (2) the characteristic distribution of variations of lightness values, also known as surface albedo features, i.e., the reflectance of surface materials, and (3) the global topography with its characteristic dichotomy separating highlands from lowlands and rougher-surface areas from smoother ones.

All of these features are discernible and distinguishable on larger as well as smaller map scales alike.

We use a combination of (1) MOLA derived topographic data products, including a hillshade raster dataset as qualitative basic relief representation with main illumination from the top-left, contours and topography vector dataset based on a reduced resolution topography raster model, (2) TES derived albedo vector dataset classified into 3 classes, and (3) nomenclature dataset based on International Astronomical Union (IAU) gazetteer, which was later adjusted and refined by the USGS [3].

Implementation and Usage: Using CARTO [4] as our geospatial datasets storage and visualisation platform and CartoCSS as styling language, we have been able to implement key elements of our cartographic concept and to produce the first vector-based basemap for Mars (see sample screenshots in Figure 2).

A dedicated CARTO Map API can then be used to serve these maps as basemap raster-tiles (following standard XYZ tiling scheme) that can be easily used in web applications using mapping javascript library (see Leaflet example below).

```javascript
var layer = new L.tilelayer('https://cartocdn.gusc.global.ssl.fastly.net/opmbuilder/api/v1/map/named/opm-mars-basemap-v0-2/0,1,2,3,4/{z}/{x}/{y}.png',
{
  zoom: 3,
  tms: false,
}).addTo(map).setZIndex(0);
```

Figure 1. Overview of the OpenPlanetaryMap platform and ecosystem of users and third party applications.

We present here an overview of a new cartographic approach of creating a web basemap for Mars, and the first implementation of a web basemap reflecting the common understanding and picture that laymen as well as professionals might have about Mars [2]. We discuss the next steps for improving our basemaps, and getting feedback and contributions from the community.

Cartographic Concept and Data Model: We have developed a cartographic concept built on a number of key questions: (1) what kind of information do we want to communicate, i.e. which picture do we want to draw of Mars, (2) who are the recipient and target audience, and (3) how can we maximize functionality and aesthetics with as few datasets as possible.
We will also assess Mapbox and Maptiler as a tool to design our future vector-rendered basemaps.

As we aim to provide valuable services to the planetary science community, we will explore ways of making the creation of our basemaps more collaborative. In particular, we would like to enable map makers to apply their own style to a common open data model (similarly to the OpenMapTiles Vector Tile Schema [6]).

Our basemaps are intended to be initially used for the future web and mobile interfaces of following projects: VESPA [7], PLANMAP [8], and MOCCAS [9], and we hope to attract more users.


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