



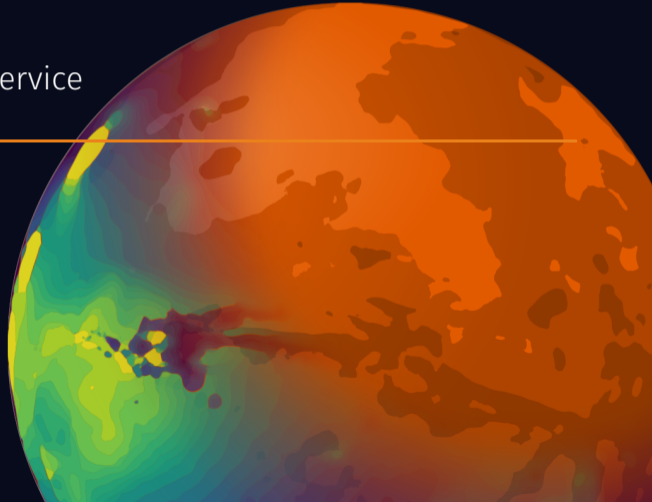
MarsSI

Martian surface data processing service

Matthieu Volat¹ Cathy Quantin-Nataf¹

JCAD 2023, Reims, 02/10/2023

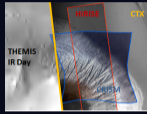
¹Observatoire de Lyon, Université de Lyon



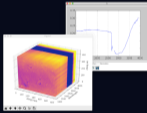
Introduction

Scope statement

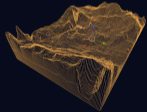
Mars geological investigations **requirements**



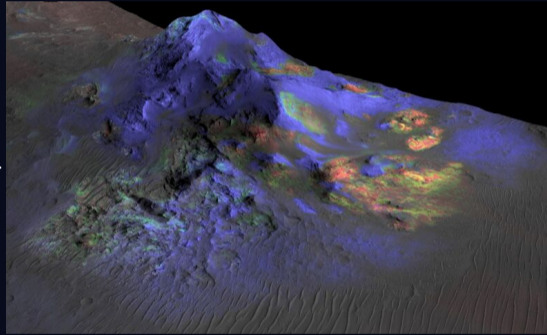
Imagery



Composition

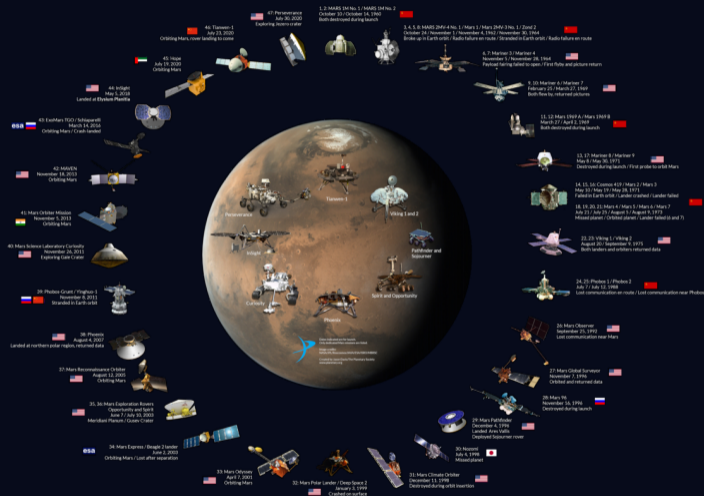


Topography

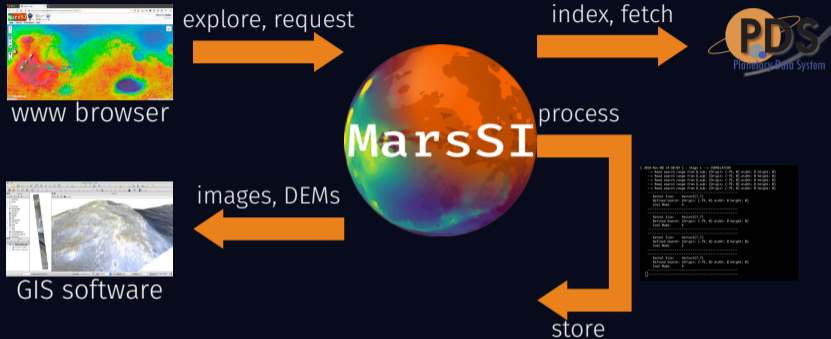


HiRISE DEM + CRISM parameters
central peak of martian crater

Mars exploration family portrait



MarsSI: A tool to help explore and process martian orbital data



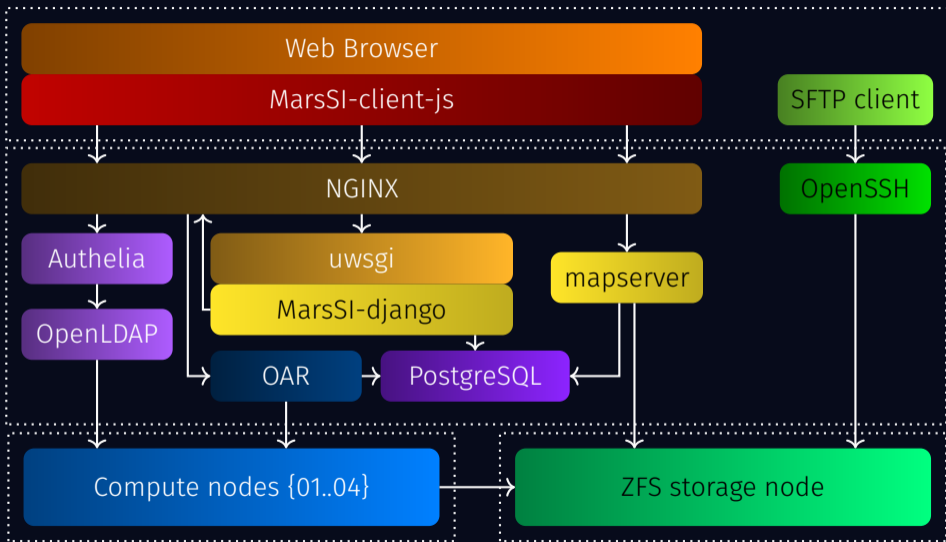
<https://marssi.univ-lyon1.fr/>

Part of PSUP¹

¹<https://psup.cnrs.fr/>, Labeled ANO5 by CNRS-INSU

The platform

A closer look to the infrastructure



Post-2018 evolutions

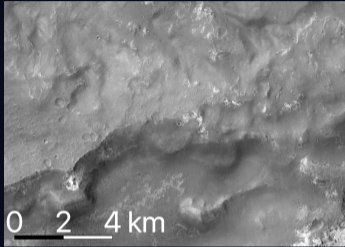
Component	Previous	New
Web client framework	Geomajas/GWT	Leaflet, DataTables
Web backend framework	Geomajas/Servlets	Django
OGC server	Geoserver	MapServer
User auth	Table in PostgreSQL	OpenLDAP+Authelia
Batch scheduler	Torque	OAR
Monitoring	PHD student	Nagios

Using the Open Geospatial Consortium (OGC) standards

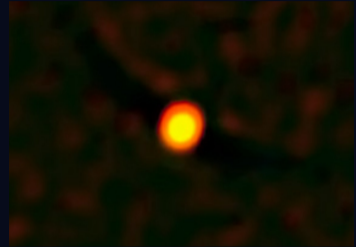
Earth, planetology and astronomy observations:



Earth, Sentinel-2B



Mars, CTX



HIP 65426b, SPHERE

We're in the "space exploration" category, but it's really more like earth observation

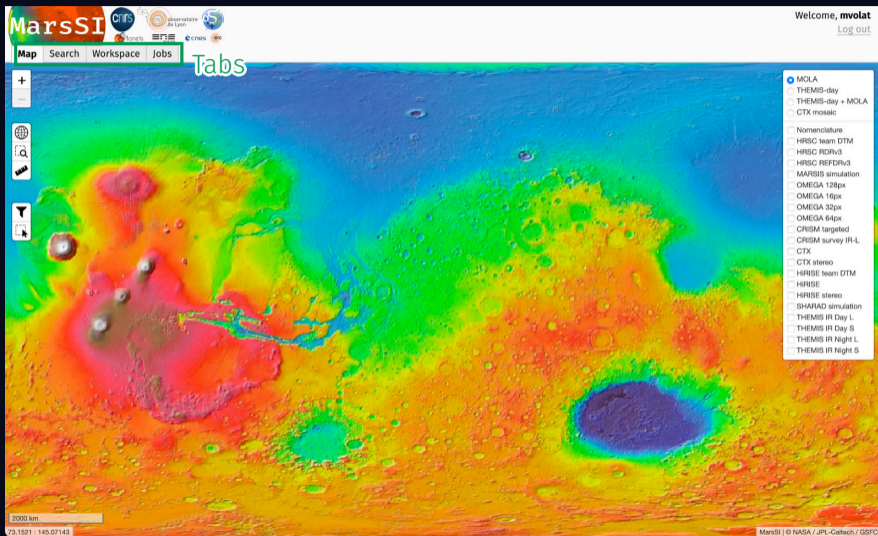
OGC (<https://www.ogc.org/>) is well suited for our needs:

- Projections, formats (raster, vector), network protocols
- Multiple implementations
- Interoperability with GIS



The service

Map view: exploring & selecting data



Map view: exploring & selecting data

The screenshot displays the MarsSI web application interface. At the top left, the 'MarsSI' logo is accompanied by logos for 'CNRS', 'Observatoire de Lyon', and 'OSU'. Below the logo is a navigation bar with 'Map', 'Search', 'Workspace', and 'Jobs' tabs. The main area shows a topographic map of Mars with a color scale from blue (low elevation) to red (high elevation). A vertical toolbar on the left contains icons for zooming, panning, and other map functions. A legend on the right, titled 'Layers (expanded)', lists various data layers with checkboxes. The 'MOLA' layer is selected. A scale bar at the bottom left indicates 2000 km, and the coordinates '73.1521 - 145.07143' are shown. The bottom right corner contains the text 'MarsSI | © NASA / JPL-Caltech / GSFC'.

Map tools

Layers (expanded)

Welcome, mvolat
[Log out](#)

MarsSI
CNRS
Observatoire de Lyon
OSU

Map Search Workspace Jobs

2000 km
73.1521 - 145.07143

MarsSI | © NASA / JPL-Caltech / GSFC

- MOLA
- THEMIS-day
- THEMIS-day + MOLA
- CTX mosaic
- Nomenclature
- HRSC team DTM
- HRSC RDRv3
- HRSC REFDRv3
- MARSIS simulation
- OMEGA 128px
- OMEGA 16px
- OMEGA 32px
- OMEGA 64px
- CRISM targeted
- CRISM survey IR-L
- CTX
- CTX stereo
- HIRISE team DTM
- HIRISE
- HIRISE stereo
- SHARAD simulation
- THEMIS IR Day L
- THEMIS IR Day S
- THEMIS IR Night L
- THEMIS IR Night S

Map view: exploring & selecting data

The screenshot displays the MarsSI web application interface. At the top left, there are logos for MarsSI, CNRS, Observatoire de Lyon, and OSU. Below these are navigation tabs for 'Map', 'Search', 'Workspace', and 'Jobs'. The main area is a map of Mars with several yellow rectangular selection boxes overlaid. A small dialog box in the center of the map contains the text 'Add selection to workspace' and 'Clear selection'. On the right side, there is a data table for the selected area, titled 'HI_041422_1985_051839_1985'. The table lists various metadata fields and their values.

Field	Value
gid	619737
centerlat	18.1561
centerlon	-24.036839
maxlat	18.2326
minlat	18.079574
eastlon	-23.983
westlon	-24.09085
emangle	
inangle	
phangle	
sollong	
npolestate	
spolestate	
target	MARS
productid	HI_041422_1985_051839_1985
datasetid	
insthostid	MRO
instid	HIRISE
utcstart	
utcend	
pdsvoid	
prodtype	DEM
createdate	
shpsource	
exturl	
ext2url	
ext3url	
produrl	
filesurl	
labelurl	

Instruments we use data from and their timelines



ODY : Themis²

MEX : HRSC¹, OMEGA³

MRO : CRISM³, CTX¹, HiRISE¹

¹Regular grayscale/color imagery

²Infrared imagery

³Hyperspectral imagery

Workspace view: request data & processing

The screenshot displays the MarsSI workspace interface. At the top, there are navigation tabs for Map, Search, Workspace, Jobs, and Wiki. The 'Workspace' tab is active. A green box highlights the 'Action' dropdown menu, which includes options: 'Remove selected', 'Process selected', and 'Copy selected'. A green arrow points from the text 'Select products, choose action & Go' to the 'Go' button. Below the menu is a table with columns: INSTRUMENT, OBSERVATION TIME, PRODUCTS, FOOTPRINT, and TO MAP. A red box highlights the 'PRODUCTS' column, which lists subproducts: DEM, EDR,RDR,MRDR, RDRV11, EDR,RDR,MRDR, DDR, TRDR, and DEM. Below the table, the text 'State of (sub)products' is displayed, followed by 'product processing status: need-processing, queued, running, completed, failed' and a link to 'Manage workspaces'. The bottom right shows 'Showing 1 to 7 of 7 entries' and navigation buttons for 'Previous' and 'Next'.

Welcome, [mvolat](#)
[Log out](#)

Map Search **Workspace** Jobs Wiki

Action: Remove selected Go

Remove selected
Process selected
Copy selected

Select products, choose action & Go

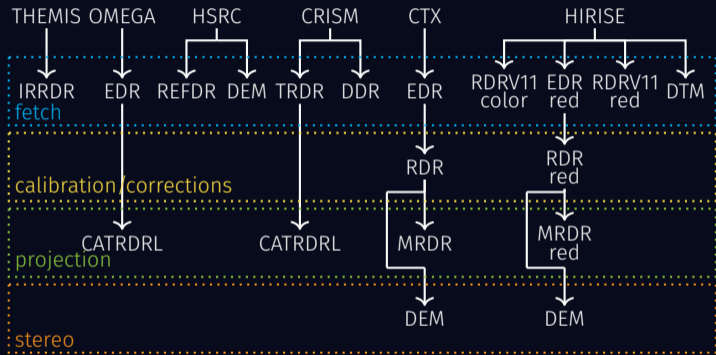
	INSTRUMENT	OBSERVATION TIME	PRODUCTS	FOOTPRINT	TO MAP
<input type="checkbox"/>	CTX	2013-10-01T22:47:36.304	DEM		
<input type="checkbox"/>	CTX	2013-10-01T22:47:36.304	EDR,RDR,MRDR		
<input type="checkbox"/>	HIRISE	2012-07-27T09:47:48.351	RDRV11		
<input type="checkbox"/>	HIRISE	2019-08-17T08:31:15.491	EDR,RDR,MRDR		
<input type="checkbox"/>	CRISM	2017-10-12T07:19:59.237	DDR		
<input type="checkbox"/>	CRISM	2017-10-12T07:19:59.237	TRDR		
<input type="checkbox"/>	HIRISE	2017-10-12T07:19:59.237	DEM		

Showing 1 to 7 of 7 entries

State of (sub)products
product processing status: *need-processing, queued, running, completed, failed*
[Manage workspaces](#)

Previous Next

Data and pipelines



CRISM processing: CAT, Optical calibration/projection: ISIS, DEM: Ames Stereopipeline

Some more information

Idea of the scale

- 501 users
- 70To of data (we compress)
- 6974 CTX DEMs, 702 HiRISE DEMs already done

Documentation/Tutorials



We use a **wiki**:

- Navigable
- Searchable
- Collaborative effort

User helpdesk



Gitea **issue** tracker:

- Not used for code management
- Issue submission easy

Perspectives, conclusion

Data versioning/archival

Some pipeline evolve (new version):

- Push processed products to **archive**
- Reset status
- Archived products should be available ...
- ...but not put forward



© Lucasfilm Ltd. All rights reserved.

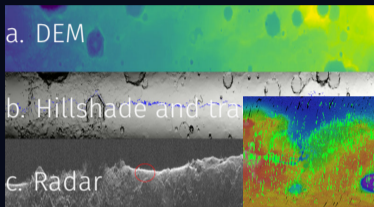
Digital Object Identifiers (or DOI-like)



Still at the beginning of the reflexion...

- Acquire and manage a DOI prefix?
- Go through another (national) institute?
- Do our own permanent identifier system?

Surface clutter simulation

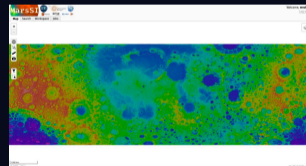


MarsSI would compute **surface clutter simulations**, useful to interpret real radar acquisitions.

Partnership w/ Y. Rogez, A. Herique²

Other planets/moons

The moon first, then...



¹Institut de Planétologie et d'Astrophysique de Grenoble

Conclusion

How can MarsSI help:

- Finding data in the mass of available products
- Process (not an expert? have no cluster?)
- Refer/point/share data

Challenges

- Expertise to handle other data types (collaborations!!)
- Keep and improve the platform
- Not being (re)viewed as an astronomy service



<https://marssi.univ-lyon1.fr/>

<https://mastodon.social/@MarsSI>