MarsSI

Martian surface data processing service

Matthieu Volat [1] Cathy Quantin-Nataf [1]

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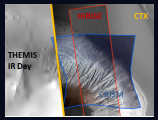
[1]Observatoire de Lyon, Université de Lyon

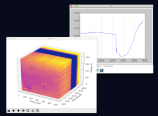
Introduction

Scope statement

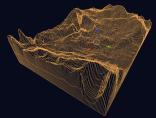
Mars geological investigations requirements



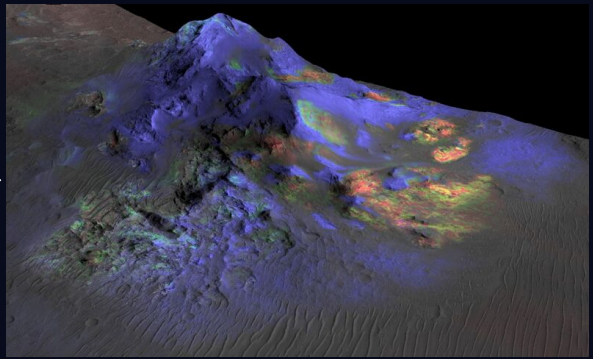
Imagery



Composition

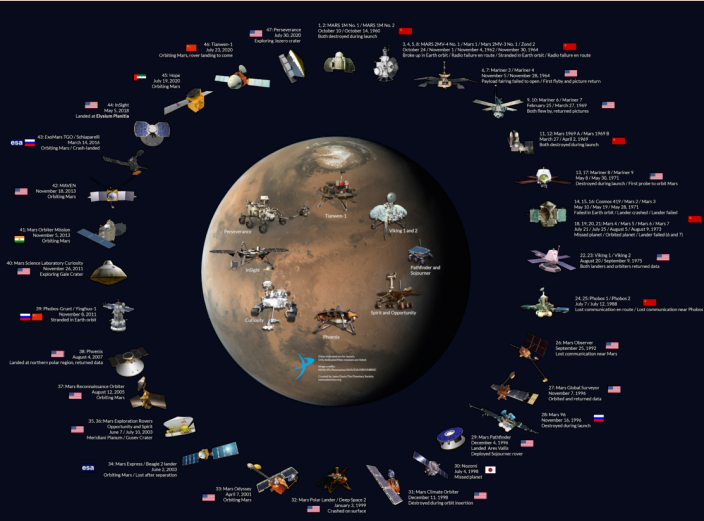


Topography

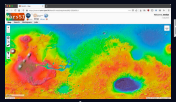


HiRISE DEM + CRISM parameters
central peak of martian crater

Mars exploration family portrait

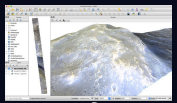


MarsSI: A tool to help explore and process martian orbital data



WWW browser

browse, request



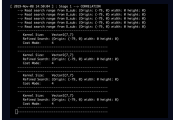
GIS software

images, DEMs

index

process

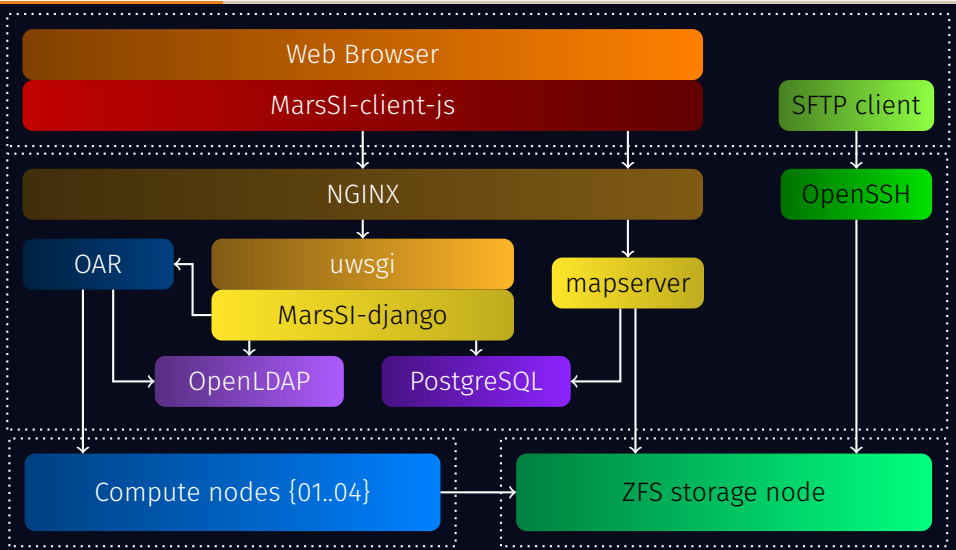
store



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

The platform

A closer look to the infrastructure



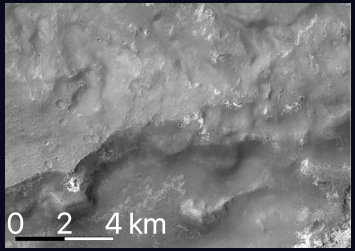
Post-2018 evolutions

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

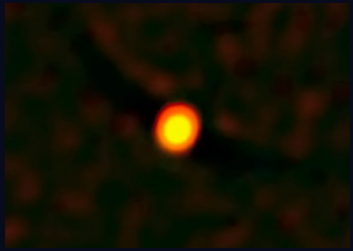
Using the Open Geospatial Consortium (OGC) standards

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

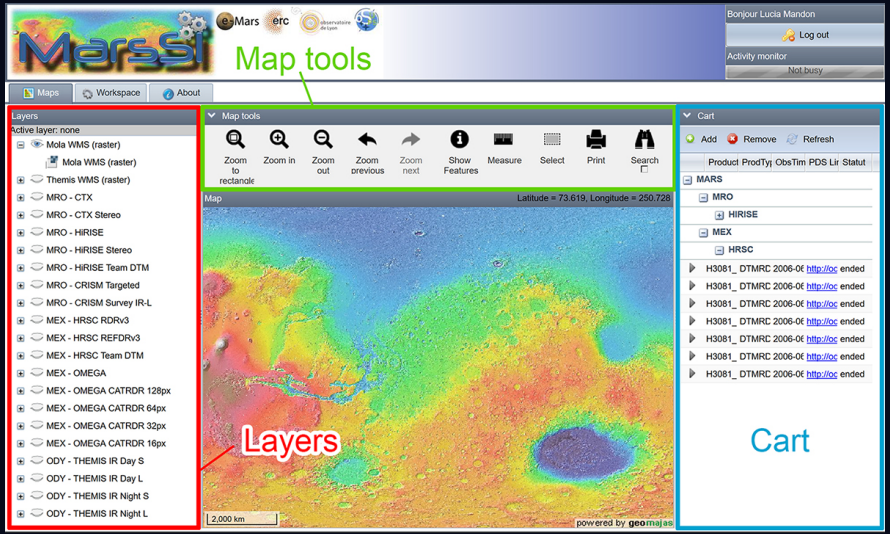
OGC (`https://www.ogc.org/`) is well suited for our needs:

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

OGC® Making location count.

The service

Map view: exploring & selecting data



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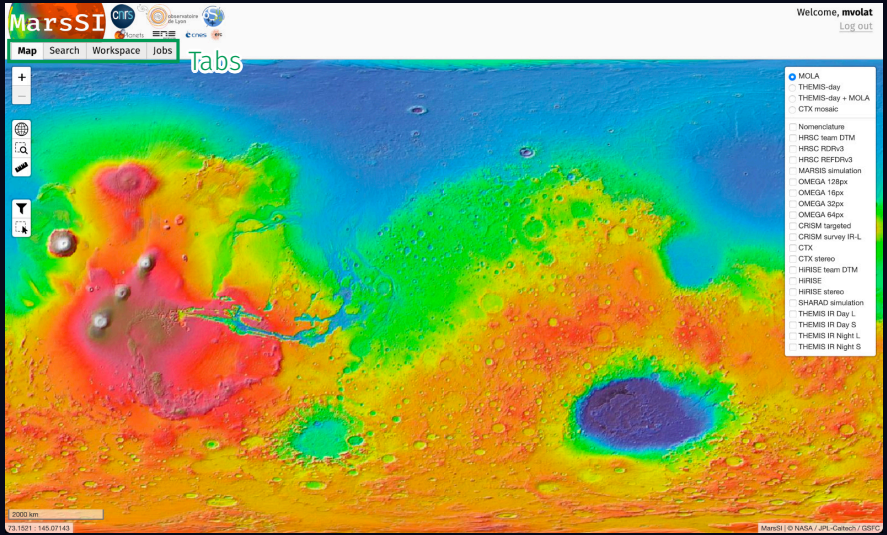

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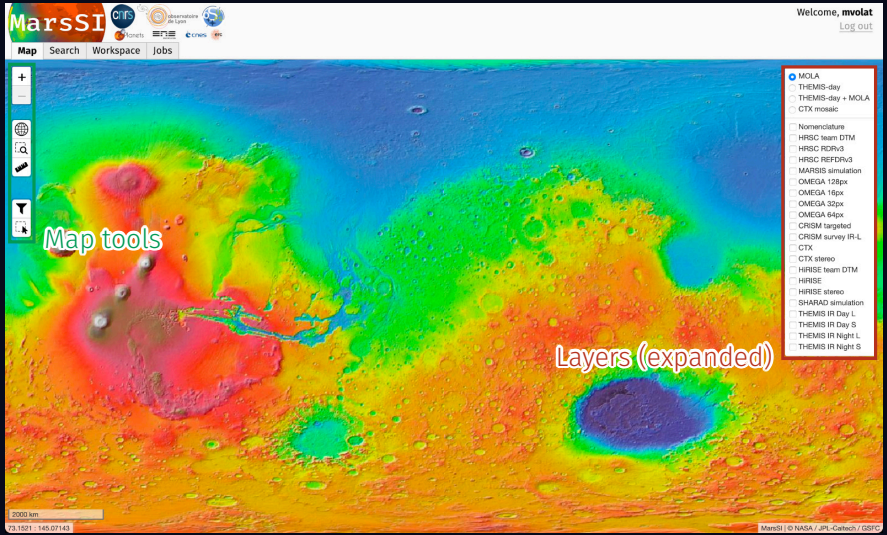

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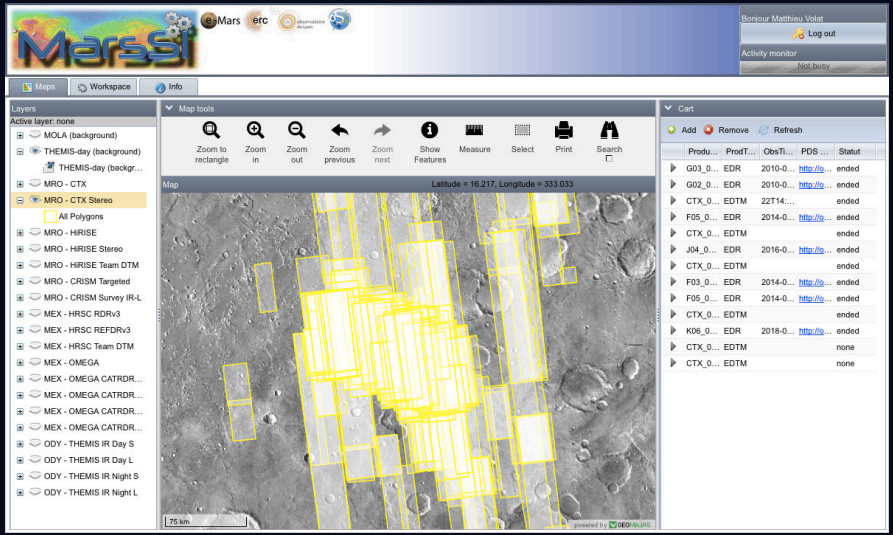

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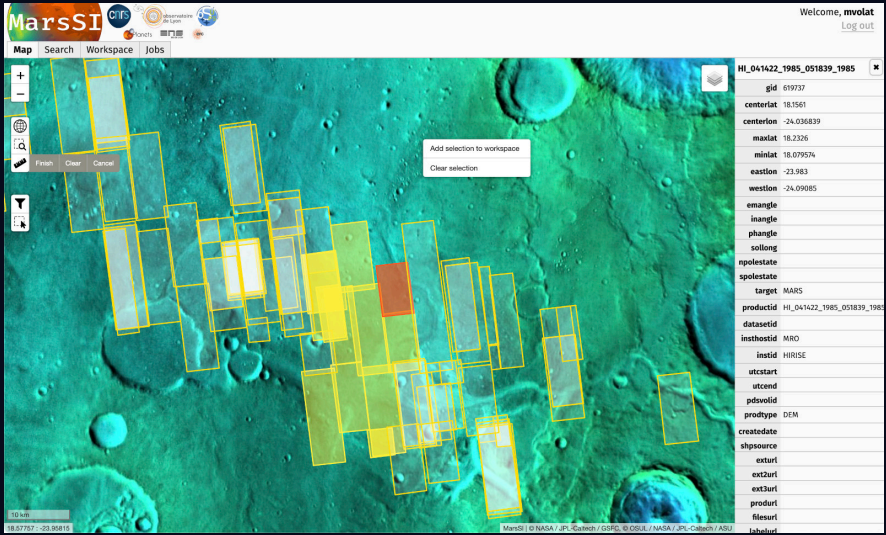
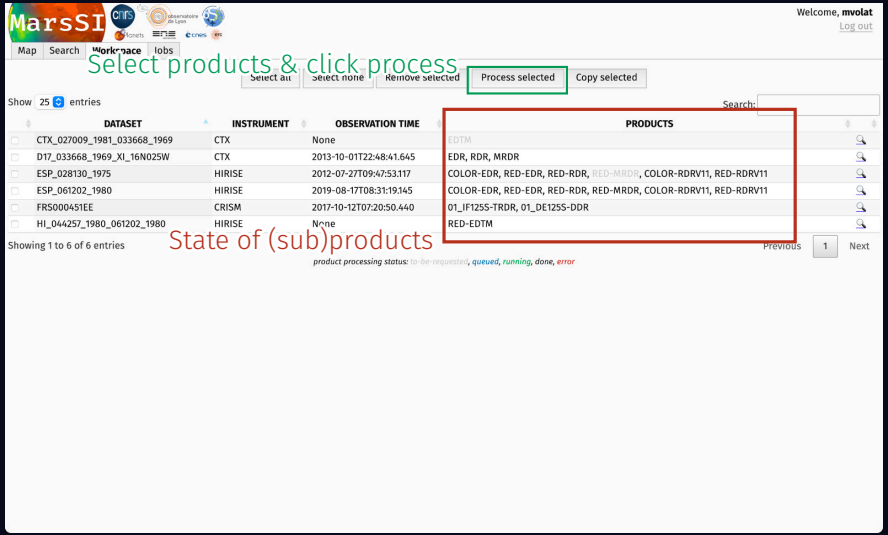


Instruments we use data from and their timelines

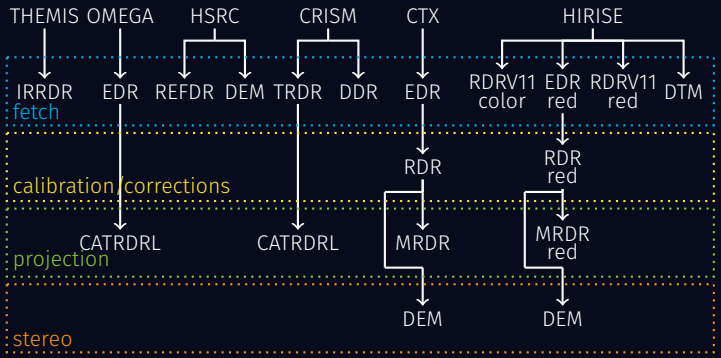
ODY	:	Themis[2]
MEX	:	HRSC[1], OMEGA[3]
MRO	:	CRISM[3], CTX[1], HiRISE[1]

[1] Regular grayscale/color imagery
[2] Infrared imagery
[3] Hyperspectral imagery

Workspace view: request data & processing



Data and pipelines



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

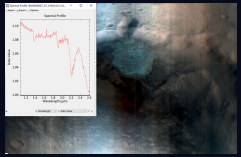
A bit more about our processing

CRISM (hyperspectral data cubes)

Use Hopkin CRISM Analysis Toolkit for:

- Calibration
- Atmosphere, destripe, despike
- Map-projection

Compute Spectral parameter maps



Spectrum & parameter map used in silica search, Pan et al. 2020

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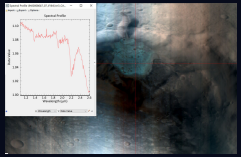


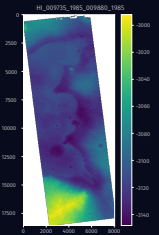
Spectrum & parameter map used in silica search, Pan et al. 2020

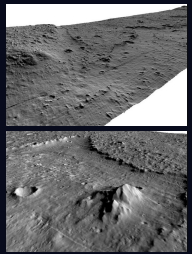
DEMs (CTX & HiRISE, updated in 2020)

Stereophotogrammetry using ASP:

- 2 step workflow
- output aligned to MOLA

Mosaics of DEM/orthoimages were used in ESA's Exomars 2022 mapping exercise of Oxia Planum.



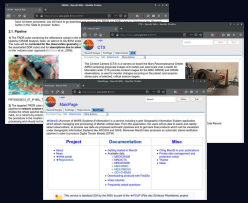


Some more information

Idea of the scale

- 450 users
- 58.1To of data (we compress)
- 6825 CTX DEMs, 865 HiRISE DEMs already done

Documentation/Help/Tutorials



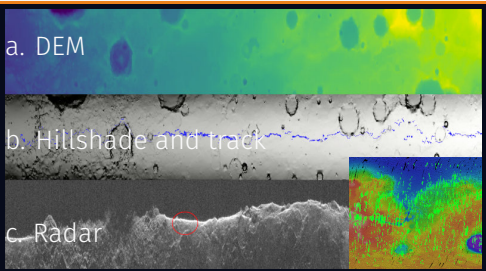
We use a wiki:

- Navigable
- Searchable
- Collaborative effort

And some tutorial videos to get you started!

Perspectives, conlusion

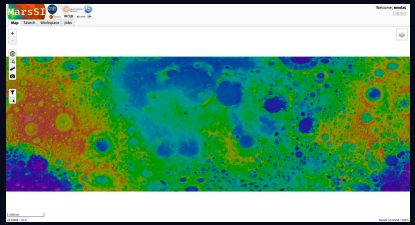
Perspectives



Surface clutter simulation

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

Partnership w/ Y. Rogez, A. Herique[1]



Other planets/moons

Allow to display the moon, titan or venus?

[1] Institut 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 what you used

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/