MarsSI

Martian surface data processing application

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rdatadev session , 15 November 2019, Grenoble

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Service overview

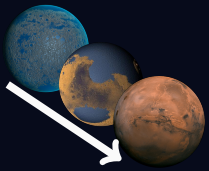
Context

Planetology research in Lyon

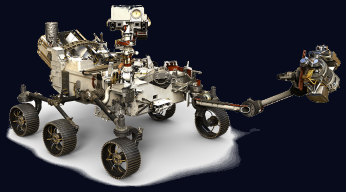
e-Planets

Fields of interest

Geological Evolution of Mars



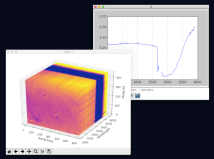
Future landing missions



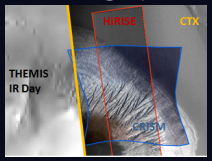
Scope statement

Geological investigation requirements

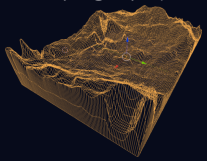
Composition



Imagery



Topography



For a martian data service

- Geographical search
- Index agencies catalogs
- Data-specific pipelines
- Automated processing
- GIS-ready products
- Results available for all

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

History

2011 - 2016: e-Mars ERC project

- MarsSI birth: developped by L. Lozach, C. Quantin-Nataf
- Demoed at EPSC 2015, LPSC 2016
- Quantin-Nataf et Al. 2018 in *Planetary and Space Science Vol 150*

2016 - present: Planetary SUrface Portal (PSUP)

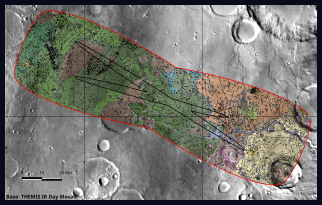
- Promoted to CNRS national observation service
- Permanent engineer attached to the project (M. Volat)

Noteworthy uses

2015: Mark Watney's Epic Trek on Mars

Follow Watney's intended path from Acidalia Planitia to Schiaparelli with NASA's Mars Trek[1] *web tool!*
The topology was computed using MarsSI.

2018: MarsSI helps surveying Exomars landing site candidates

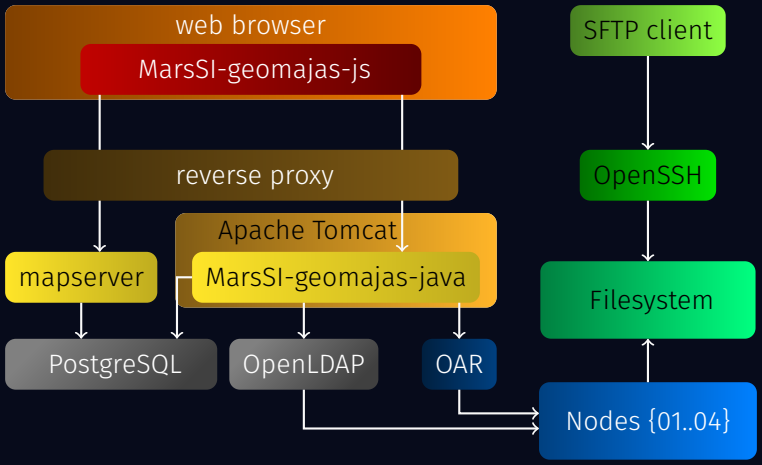


MarsSI was also used to provide data to the scientists surveying the Oxia Planum landing site that was selected. It was also used by Thales engineers to review navigability in both proposals.

[1] https://trek.nasa.gov/mars/

The platform

A closer look to the infrastructure



Working with the OGC standards

The Open Geospatial Consortium (OGC)

An international not for profit organization committed to making quality open standards for the global geospatial community.

`http://www.opengeospatial.org/`

Why use those in planetary science?

- Define fomats (raster, vector), processing, network protocols
- Multiples implementations to work with
- Subject closer to earth sciences than deep space observation
- Widly interoperable range of GIS products

TODOs

EPSG codes projections only: propose also using IAU codes

Available data sources

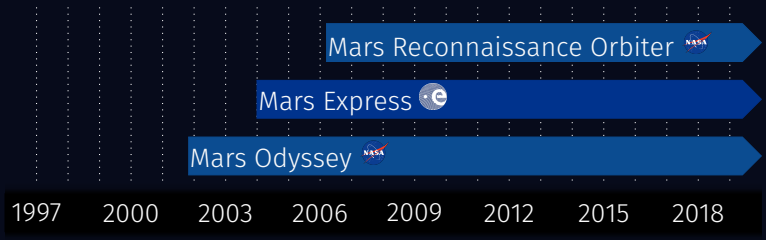
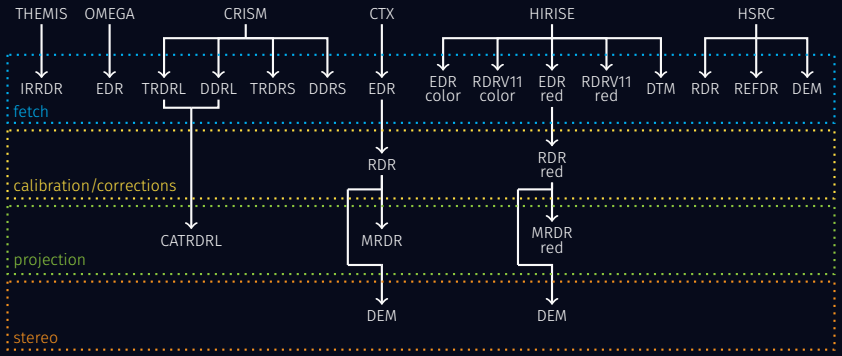


Figure: Missions we use orbital data from and their timelines

Data and pipelines



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

A few numbers regarding data

Database:

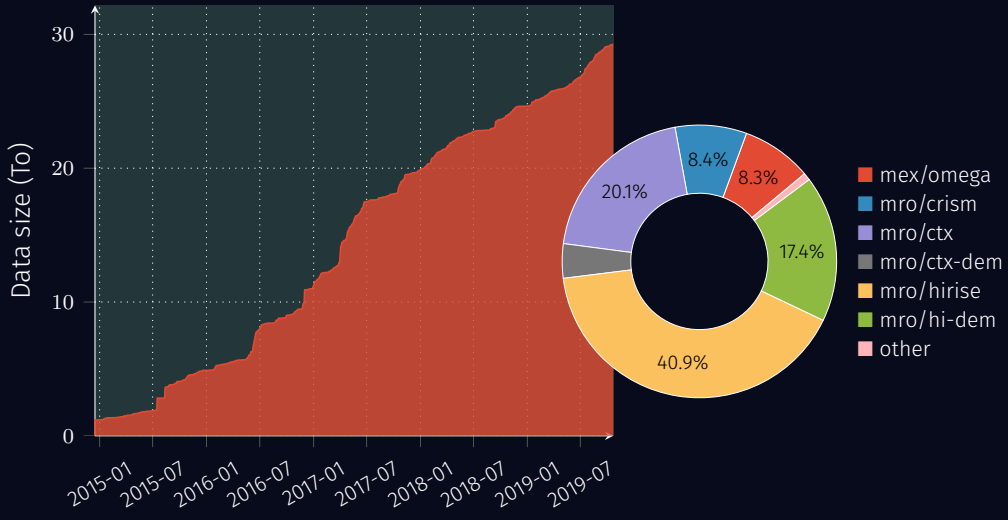
- 50k HRSC, 103k CTX, 119k HiRISE
- 9k HRSC-DEM, 110k CTX-DEM, 53k HiRISE-DEM, 592 HiRISETeam-DEM
- 27k OMEGA, 172k CRISM

Coverage for (potential) DEMs:

- CTX-based: 16.93%
- HiRISE-based: 0.27% (HiRISE team DTMs: 0.04%)

Configuration

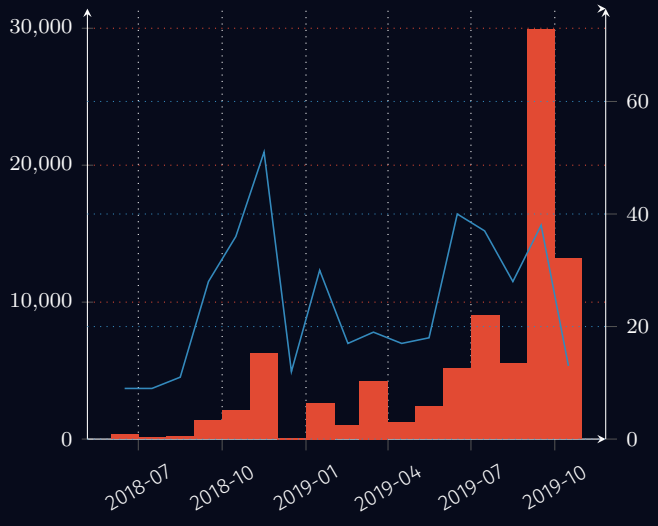
35TB raid nearline sas array + 35TB raid sas array



The cluster

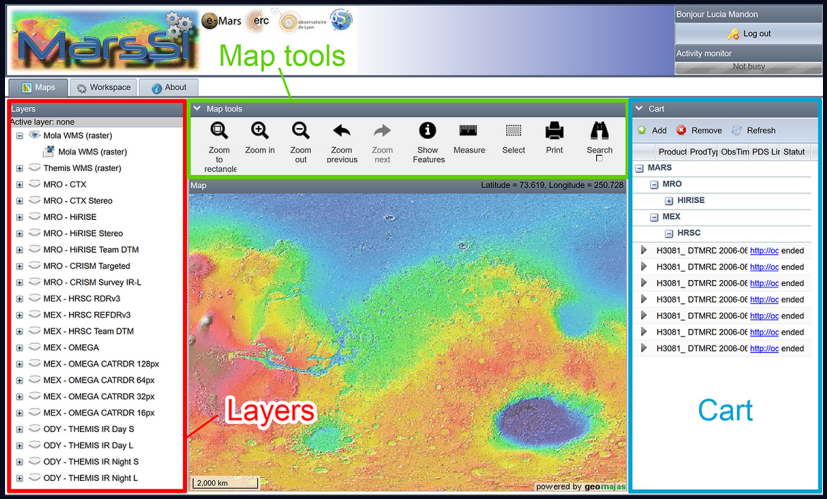
Hardware & Operating system

4*20 = 80 cores (Westmere), InfiniBand QDR, CentOS 6



User interface

Map view: exploring & selecting data



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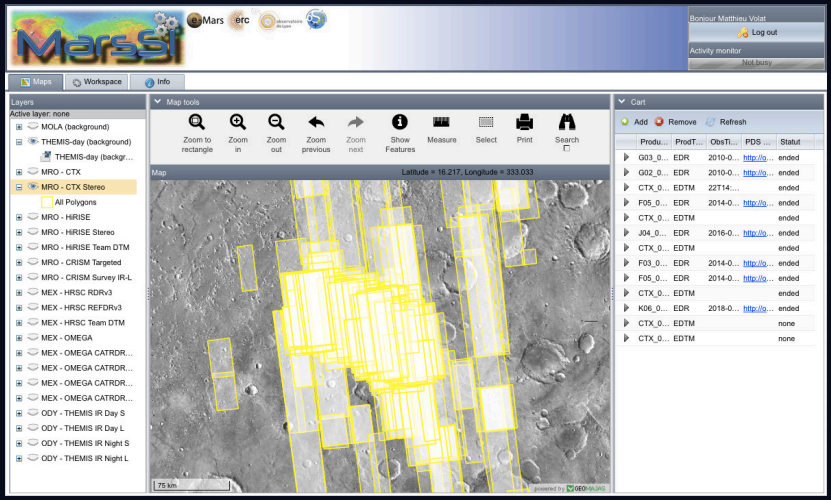

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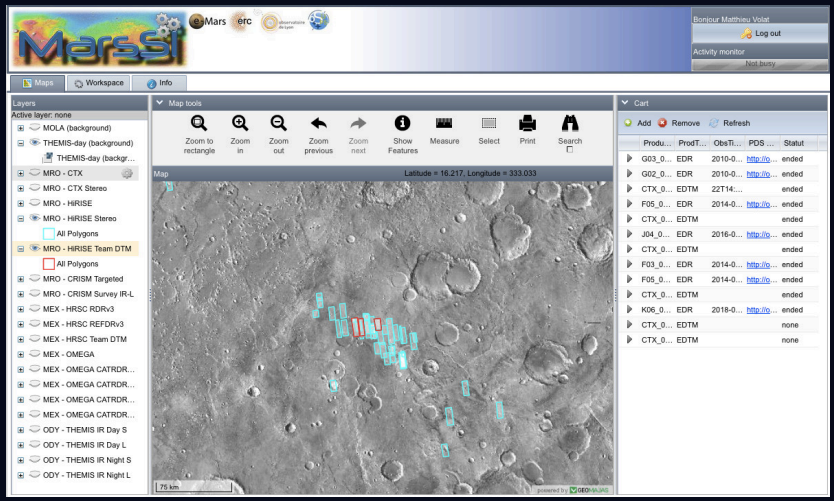
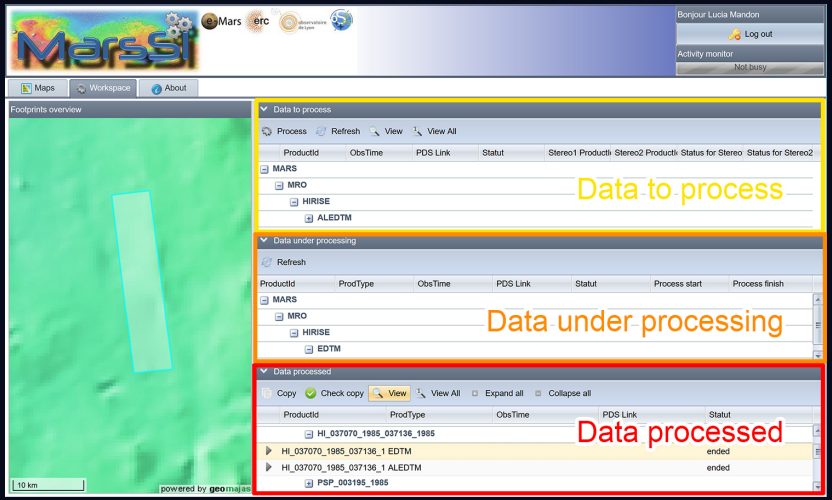
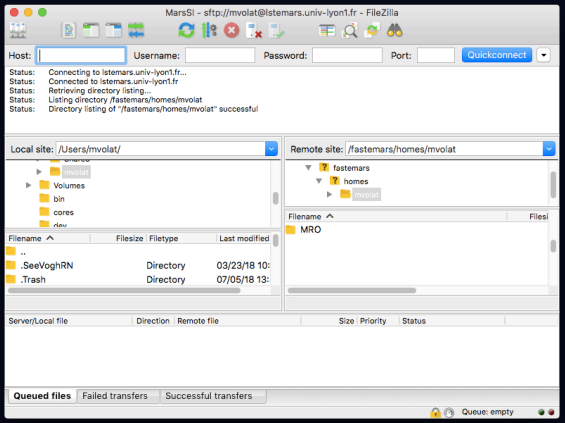


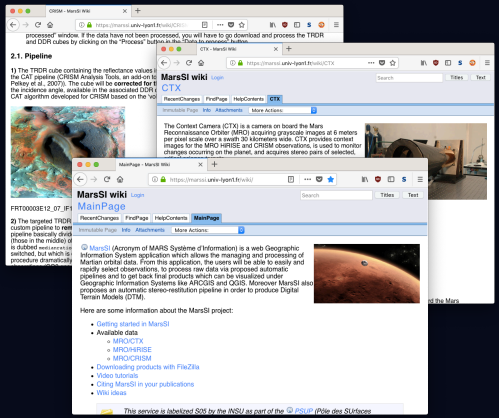
Workspace view: request data & processing



Retrieving the products



Documentation/Help/Tutorials



Originaly a 23 pages PDF manual...
Now a wiki:

- Navigable
- Searchable
- Collaborative effort

Ongoing work

Hardware evolutions

Moving the platform

Now hosted at LGL, moving to ENS-Lyon next year:

- Power supply management
- Fire suppression system
- Link upgrade (100Mb/s to 1Gb/s)

New main server (under deployment/test)

32-cores AMD Zen v1-based, 128GB of memory

New storage server (no funding yet)

JBOD based ZFS, no more harware RAID, hello snapshots

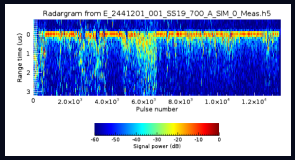
Software evolutions

Operating system migration (long overdue)

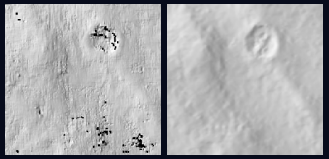
CentOS 6 -> Devuan 2.0 (Debian 9) yeah.

Pipelines updates

- Radar simulation (IPAG partnership)
- DEM workflow/parameters rewrite



(a) A radargram



(b) Hillshade from current/new DEMs

Software evolutions (continued)

Geomajas-based web interface

Geomajas design issues, going nowhere[2], increasingly buggy with newer browsers. Also java.

[2] see FOSS4G 2016 presentation

Software evolutions (continued)

Geomajas-based web interface

Geomajas design issues, going nowhere[2], increasingly buggy with newer browsers. Also java.

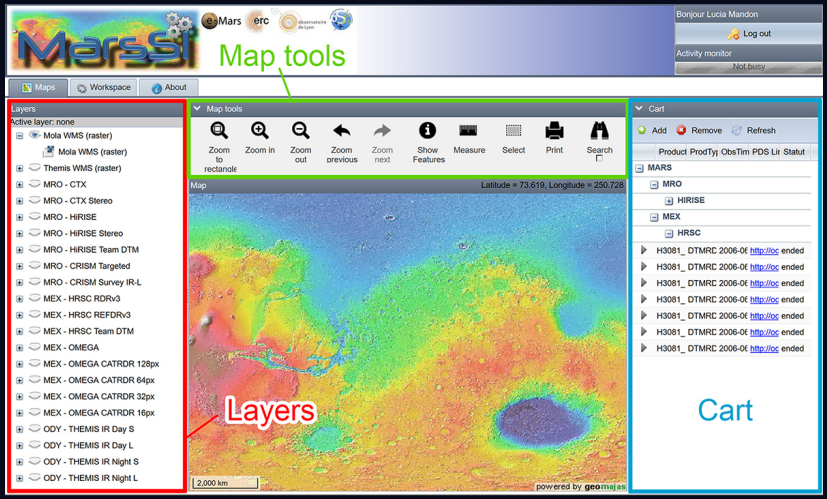
New web interface

Using Django (Python web framework):

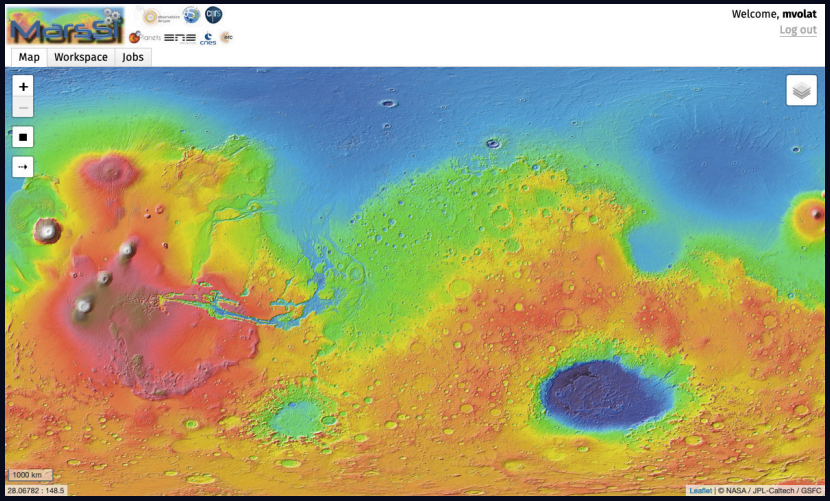
- Very stable/mature, helpful plugins
- Customizable, we won't follow its model too close
  - Url mapping, templating
  - Models, but not too much
- Mixed with javascript (Leaflet for maps)
- Production configured with uwsgi (nginx as http frontend)

[2] see FOSS4G 2016 presentation

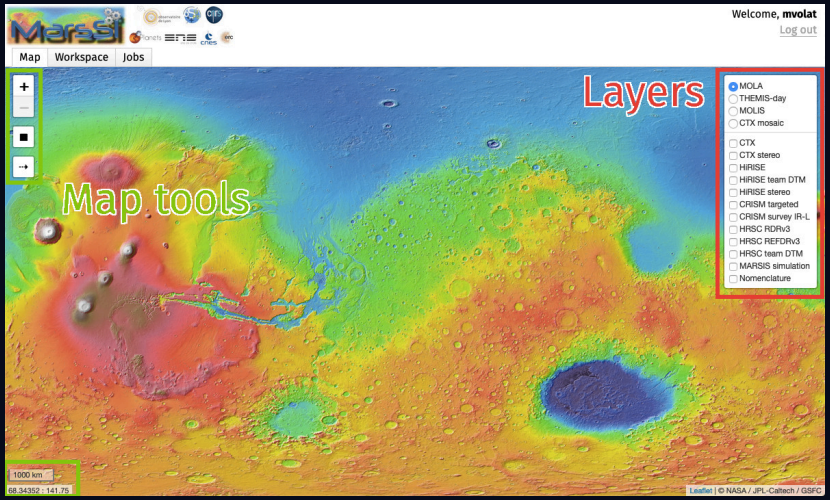
Back to map view



Back to map view



Back to map view



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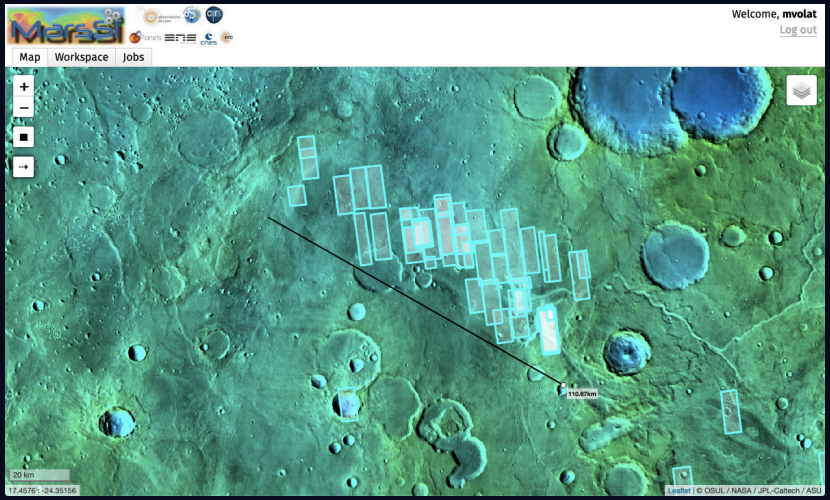
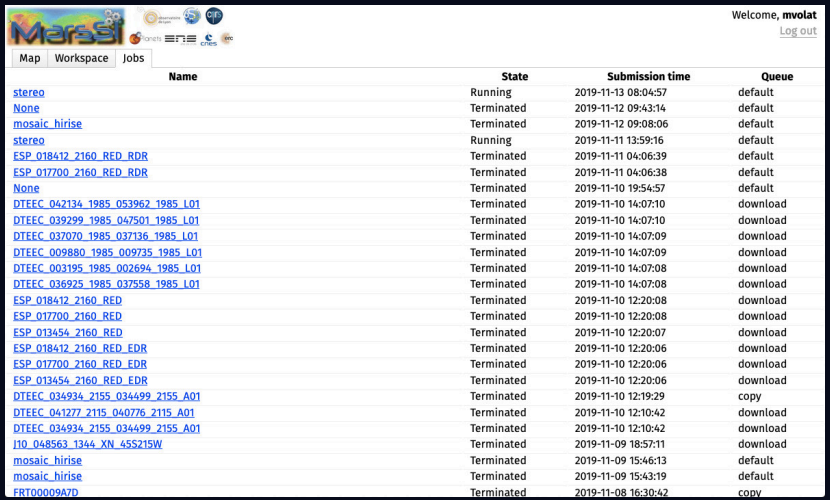


Back to workspace/job view



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mosaic_hirise	Terminated	2019-11-12 09:08:06	default
stereo	Running	2019-11-11 13:59:16	default
ESP_018412_2160_RED_RDR	Terminated	2019-11-11 04:06:39	default
ESP_017700_2160_RED_RDR	Terminated	2019-11-11 04:06:38	default
None	Terminated	2019-11-10 19:54:57	default
DTEEC_042134_1985_053962_1985_L01	Terminated	2019-11-10 14:07:10	download
DTEEC_039299_1985_047501_1985_L01	Terminated	2019-11-10 14:07:10	download
DTEEC_037070_1985_037136_1985_L01	Terminated	2019-11-10 14:07:09	download
DTEEC_009880_1985_009735_1985_L01	Terminated	2019-11-10 14:07:09	download
DTEEC_003195_1985_002694_1985_L01	Terminated	2019-11-10 14:07:08	download
DTEEC_036925_1985_037558_1985_L01	Terminated	2019-11-10 14:07:08	download
ESP_018412_2160_RED	Terminated	2019-11-10 12:20:08	download
ESP_017700_2160_RED	Terminated	2019-11-10 12:20:08	download
ESP_013454_2160_RED	Terminated	2019-11-10 12:20:07	download
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Conclusion

A stable service

- No simple, but maintained by 1 engineer
- 258 registered users
- 3k CTX DEM products, 412 HiRISE DEMs

Data expertise

Being an expert on everything looks hard: find collaborations

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

Thank you!