http://www.cdpp.eu/

Overview of CDPP activities in space physics

N. André, V. Génot, C. Jacquey, M. Bouchemit, E. Budnik, Q. Brzustowski, M. Gangloff, F. Pitout, A. Rouillard, I. Plotnikov, N. Dufourg, D. Boucon, J. Durand, D. Heulet, M. Gangloff, B. Cecconi

IHDEA meeting, 21 October 2020

CDPP

Plasma Physics Data Centre

- Established in 1998 from a CNES/CNRS collaboration for natural plasma data distribution and archiving : from the ionosphere to the heliosphere; about 5-8 FTE, engineers and scientists, main base in Toulouse, south of France

- Since 2006, CDPP is strongly involved in the development of data analysis and visualization tools including simulations

- CDPP expertise in data handling resulted in the participation to several EU and ESA projects aiming at enlarging data distribution via standards (Virtual Observatory concept) including simulations

- Mission support activities : quicklook visualization tool for the Rosetta Plasma Consortium team, role in discussion for Solar Orbiter, Bepi-Colombo and JUICE.

- These activities help promoting science (papers) and education (hands-on, tutorials)

CDPP

Plasma physics data center

http://www.cdpp.eu/

About | Data | Services | Resources | Mission support | EU/ESA projects

CDPP News

CDPP and ESA/SSA
Integrating the ESA space weather portal
Read more ...

A new web site !
Have a new look on CDPP
Read more ...

CDPP is involved in ESA/Athena
When plasma physics helps X-ray astronomy
Read more ...

All the news

The CDPP is the French national data centre for natural plasmas of the solar system.

Created in 1998 jointly by **CNES** and **INSU**, the CDPP assures the long term preservation of data obtained primarily from instruments built using French resources, and renders them readily accessible and exploitable by the international community. The CDPP also provides services to enable on-line data analysis (**AMDA**), 3D data visualization in context (**3DView**), **propagation tool** and **space weather tool** which bridges solar perturbations to in-situ measurements. The CDPP is involved in the development of interoperability, participates in several Virtual Observatory projects, and supports data distribution for scientific missions (Solar Orbiter, JUICE).

Direct access to our tools !

Amda | Propagation Tool | SpaceWeather Tool | 3DView | SIPAD | TREPS

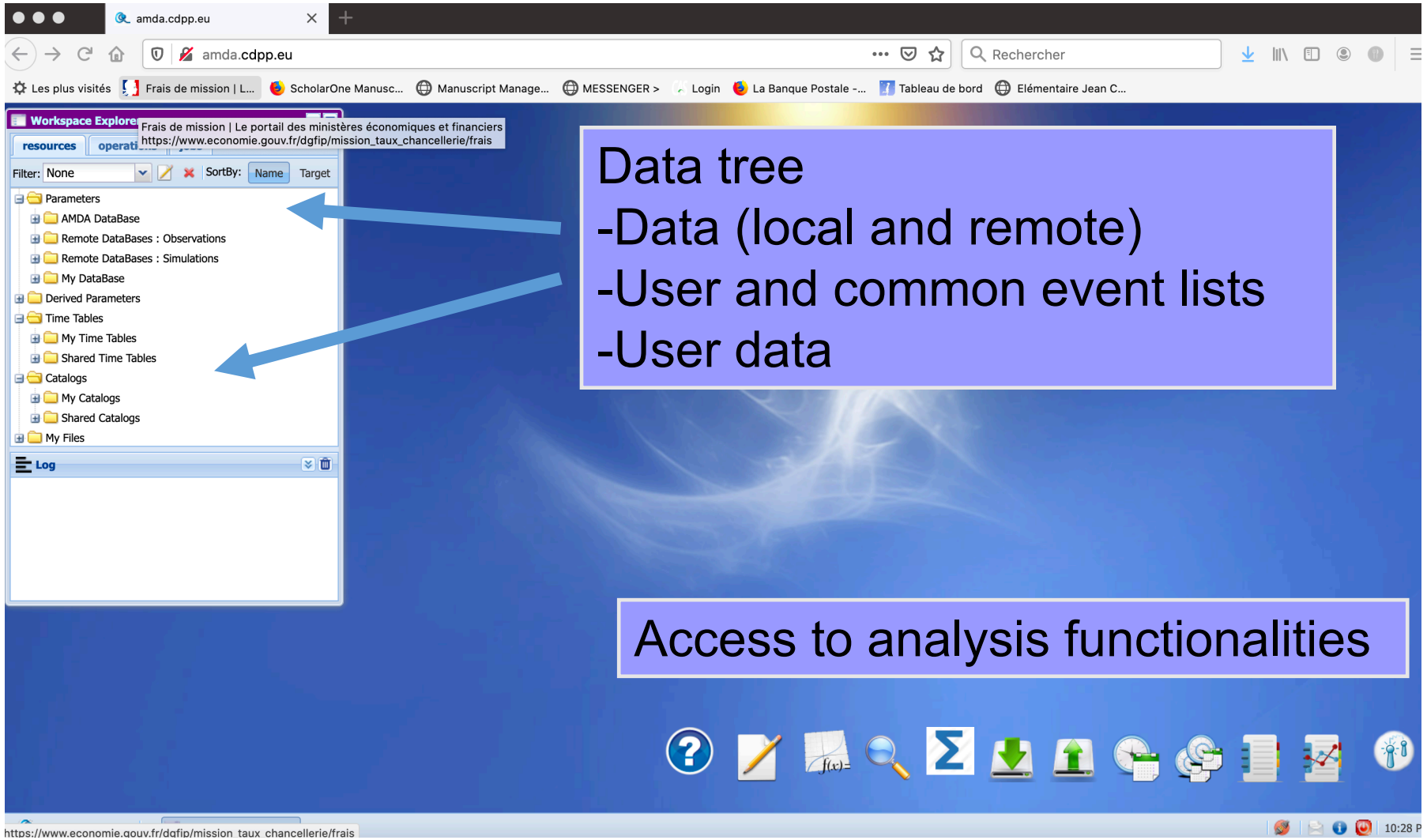
http://amda.cdpp.eu/

- **A data analysis tool in your browser**
  - ***physical parameters not files !***
- **Data are**
  - **replicated from ESA/Cluster Science Archive, NASA/PDS**
  - **or accessed remotely : CDAWeb, simulation and model databases, …**
  - **public or restricted to communities**
  - **can be exported in companion tools (SAMP)**
  - **or uploaded by the user**
  - **can be accessed via web-services (SOAP/REST)**
  - **Are internally kept in netCDF**

- **Sessions are saved (*so it's better to register !*)**
  - ***register at amda@irap.omp.eu***

- **Public access w/o registration also available**

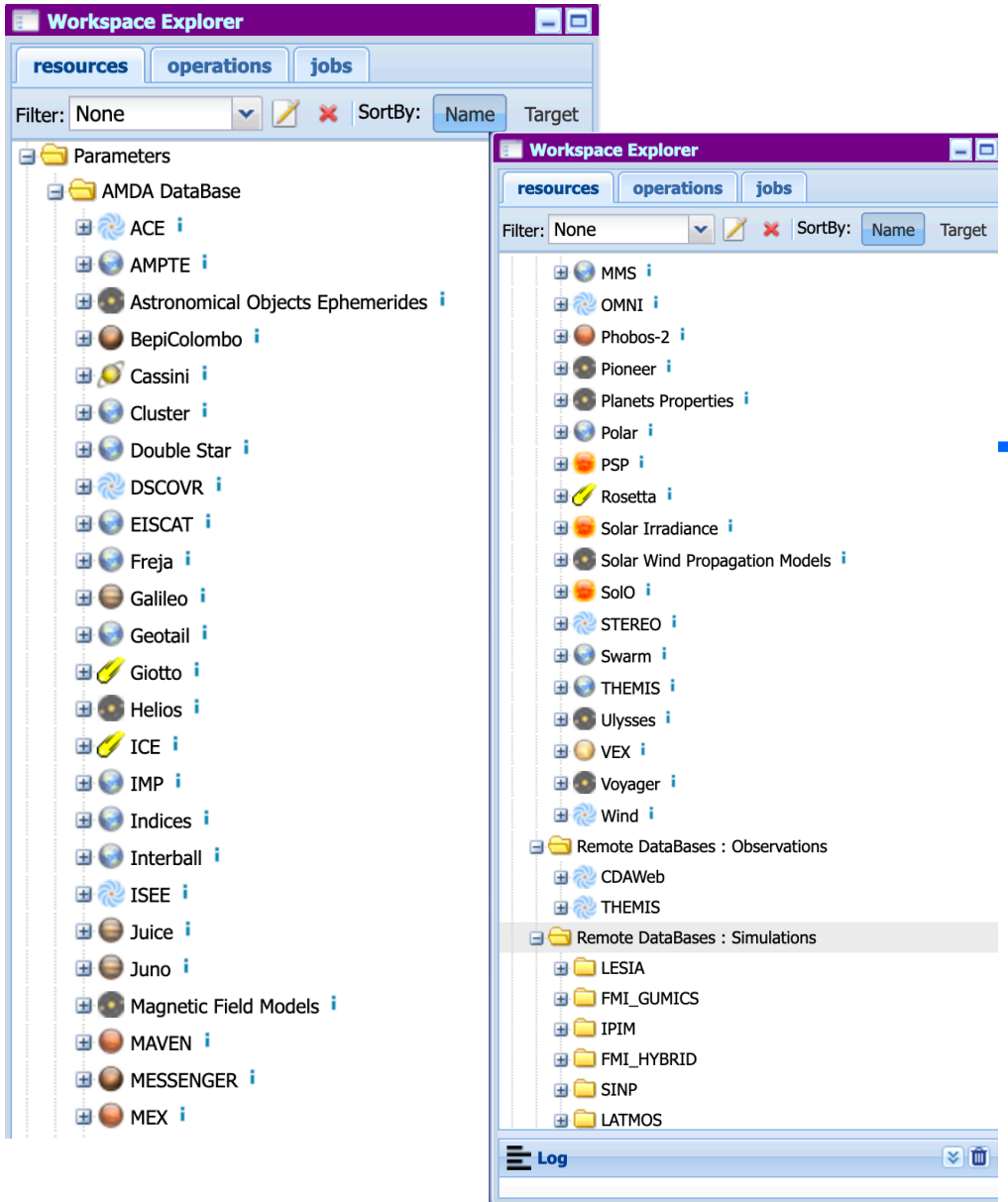
http://amda.cdpp.eu/



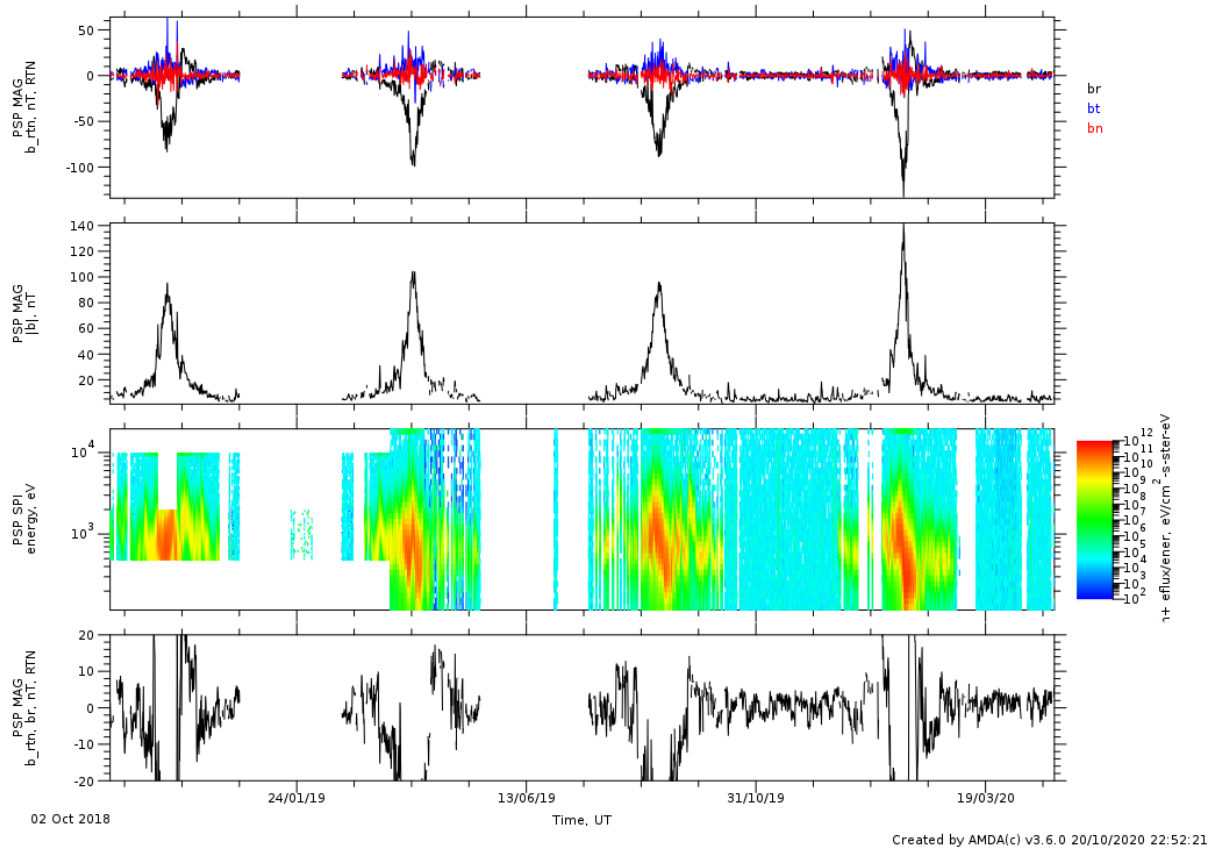
CDPP AMDA tool: new datasets at http://amda.cdpp.eu

- First public Solar Orbiter in situ data (MAG, PAS, EPD)
- First Parker Solar Probe in situ data (MAG, SWEAP, ISIS)
- STEREO energetic particles (HEP, SEP)
- ULYSSES particles (SWOOPS, SWICS)
- Helios (MAG)
- AMPTE magnetic field & plasma
- Interball magnetic field & plasma
- **Freja magnetic field & electron**
- Cluster electron (PEACE)
- MMS
- Phobos 2 magnetic field & plasma (MAG, ASPERA)
- Solar wind propagation 1D MHD at planets and spacecraft

Datasets available in the online tool CDPP/AMDA



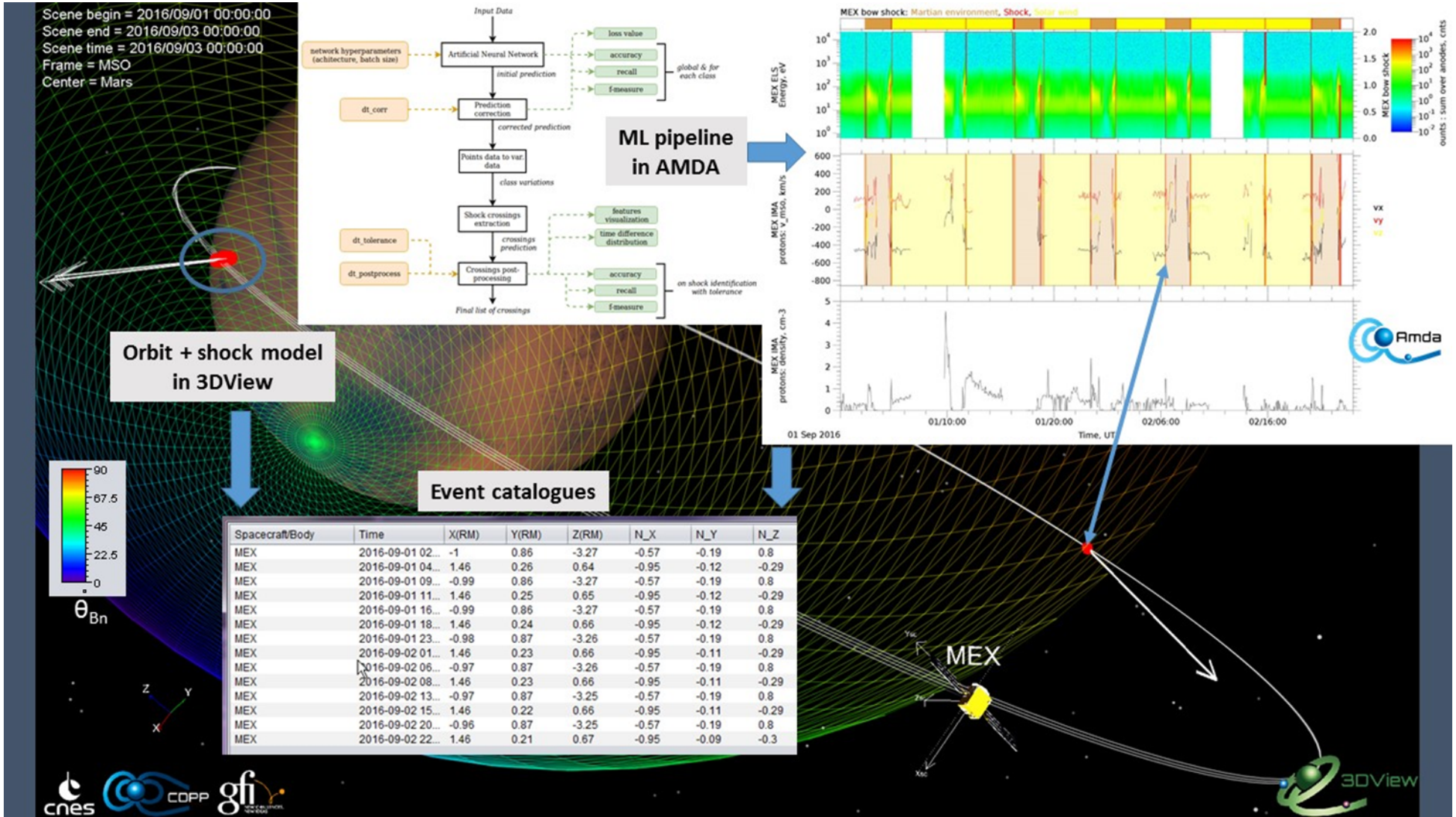
PSP



- Plot
- Data mining and combination
- Cataloguing (event lists)
- Upload / download (CDF, netCDF, VOTable, ASCII)
- Statistics (long term analysis)

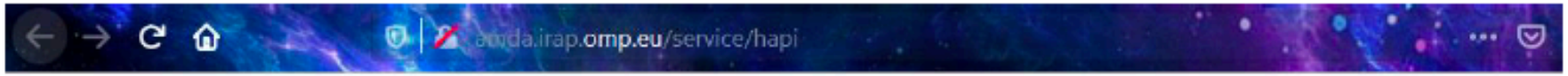
Recent activities in AMDA

Machine learning: enhancing data visu & analysis



AMDA and HAPI

http://amda.irap.omp.eu/service/hapi

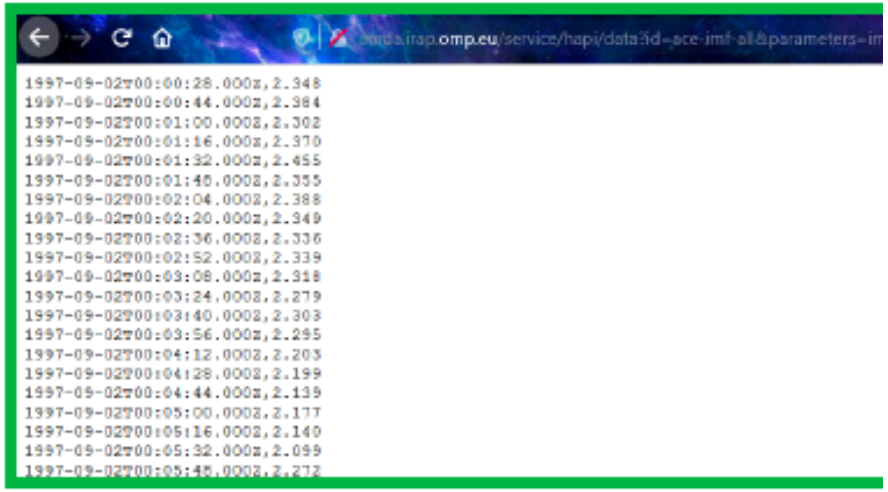


HAPI Server for amda datasets

This server supports the HAPI 2.0 API specification for delivery of time series data.

The server responds to GET requests to the following HAPI endpoints:

- `capabilities` - list the API version and output options
- `catalog` - list the datasets that are available (499 total) *Now 649*
- `info` - list information about parameters in a dataset, e.g,:
  - ./hapi/info?id=ace-imf-all
  - ./hapi/info?id=ace-mag-real
  - ./hapi/info?id=ace-swe-all
  - ./hapi/info?id=ace-swepam-real
  - ./hapi/info?id=ace-swp-all
- `data` - stream data for parameters in a dataset. Examples for first dataset:
  - ./hapi/data?id=ace-imf-all&parameters=imf_mag&time.min=1997-09-02T00:00:12Z&time.max=1997-09-03T00:00:12.000Z
  - ./hapi/data?id=ace-imf-all&parameters=imf&time.min=1997-09-02T00:00:12Z&time.max=1997-09-03T00:00:12.000Z
  - ./hapi/data?id=ace-imf-all&parameters=imf_gsm&time.min=1997-09-02T00:00:12Z&time.max=1997-09-03T00:00:12.000Z



Contact: amda@irap.omp.eu

Run Validation Tests

- http://3dview.cdpp.eu/
- In development for about 10 years (JAVA application, GPLv3)
  - Took a lot of inspiration from NASA/VISBARD
- Contractant: GFI, with CNES and EU project supports (IMPEx, Europlanet, …)
- From an orbit viewer (NAIF/SPICE kernel) to a space physics data rendering system
- It now includes **access to** several **databases** (CDAWeb, ESA/CSA, Madrigal,…), and offers 3D representations for **data** and **model**, **statistics** capabilities, movies …
- See *Génot et al.*, 2017, PSS for a full functionality description

gfi cnes

Missions
- Show All Missions

Science Programme
- Cosmic Vision 2015-2025
- Future Missions Department
- Collaborative Missions
- Director's Desk

Community Areas
- Astrophysics
- Fundamental Physics
- Solar System

Resources
- News Archive
- Multimedia gallery
- Publication Archive
- Status Reports Archive
- Calendar of Events

EXPLORING PLANETARY PLASMA ENVIRONMENTS FROM YOUR LAPTOP

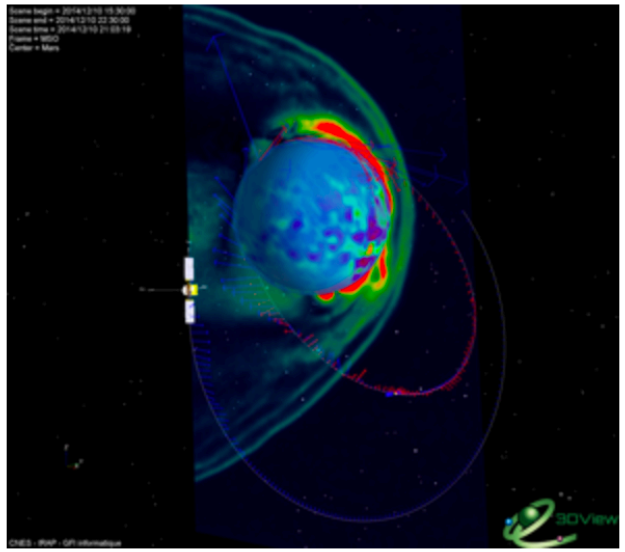
14 June 2018

A new database of plasma simulations, combined with observational data and powerful visualisation tools, is providing planetary scientists with an unprecedented way to explore some of the Solar System's most interesting plasma environments.

This digital space exploration story starts with the Integrated Medium for Planetary Exploration (IMPEx), a collaborative project to create a common data hub for space missions.

While planetary missions are crucial to understand how the solar wind interacts with the magnetospheres of planets and moons in our Solar System, numerical models are, in turn, essential to fully comprehend the measurements and improve our knowledge of planetary plasma environments.

The IMPEx project brought together experts from Austria, France, Finland and Russia to find a common language to combine data from various simulation models and to compare these numerical results with observational data collected by space missions across the Solar System.



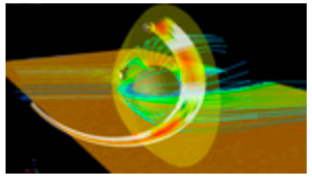
Visualisation of Mars' plasma environment. *Credit: CNES/IRAP/GFI informatique; LatHyS; 3DView*

Search here

20-Oct-2020 21:02 UT

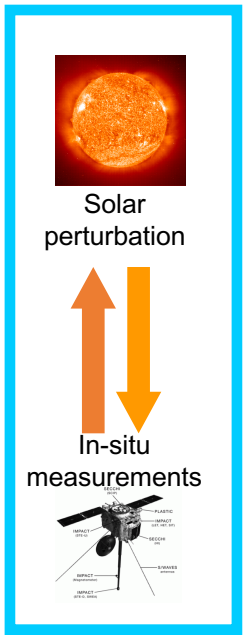
Shortcut URL
https://sci.esa.int/s/ApEdDGw

Images And Videos



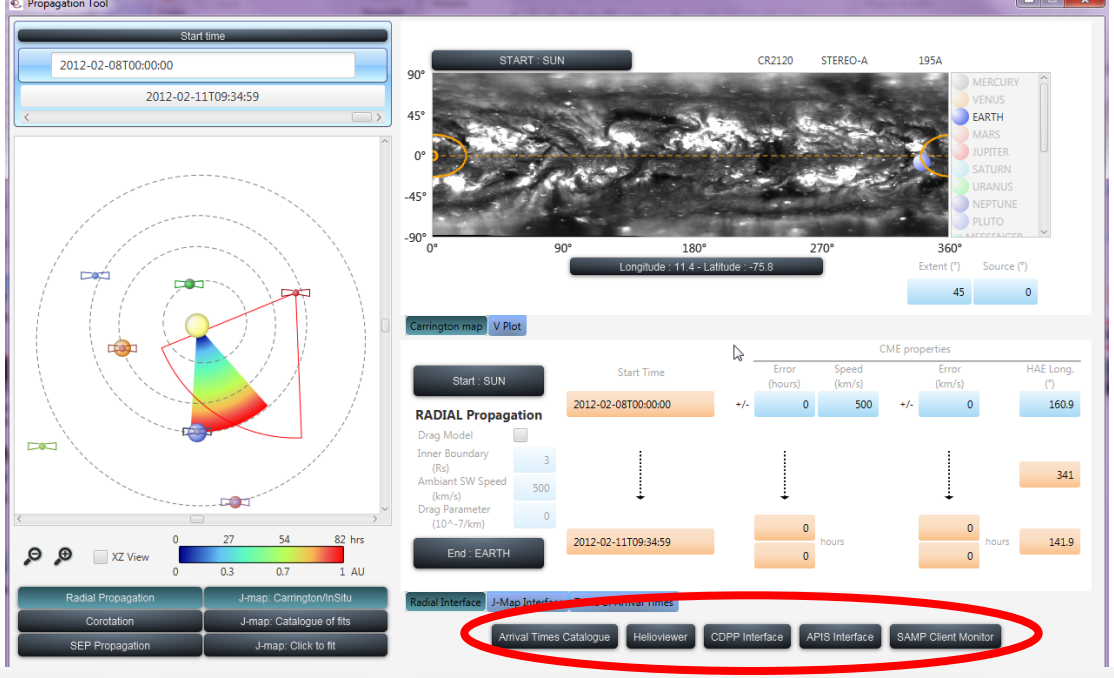
- Animated simulation of Mercury's plasma environment
- Animated simulation of Mars' plasma environment
- Visualisation of Mars' plasma environment
- Visualisation of the ionised environment of Ganymede

The Propagation Tool



- http://propagationtool.cdpp.eu/
- Computes timing for radial propagation of CME (inc. Drag model), co-rotation (CIR), and SEP propagation
  - ***linking in-situ and remote observations***
- First version : 2013 (JAVA application, GPLv3)
- Contractant: GFI, with CNES and EU project supports (Europlanet)
- Designed by A. Rouillard, B. Lavraud and the STORMS team at IRAP based on a FP7 HELIO initial concept
- Used to distribute STEREO catalogues obtained during the FP7 HELCATS projects http://www.helcats-fp7.eu/
- Gives access to J-Maps (real and simulated), Carrington maps, catalogues, …
- Connects to external tools and databases for further analysis

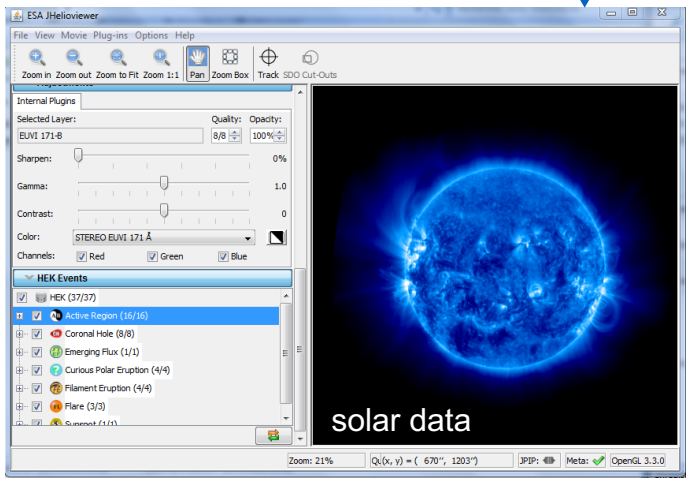
HELCATS catalogues propagated at a given source



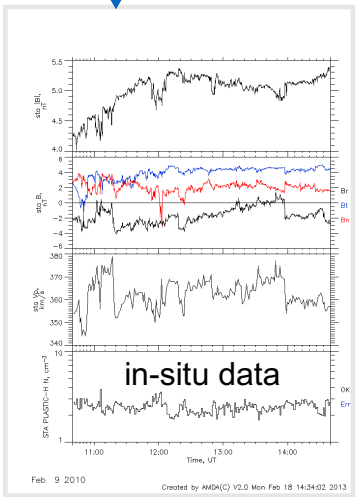
Data export to companion tools

Arrival Times Catalogue | Helioviewer | CDPP Interface | APIS Interface | SAMP Client Monitor

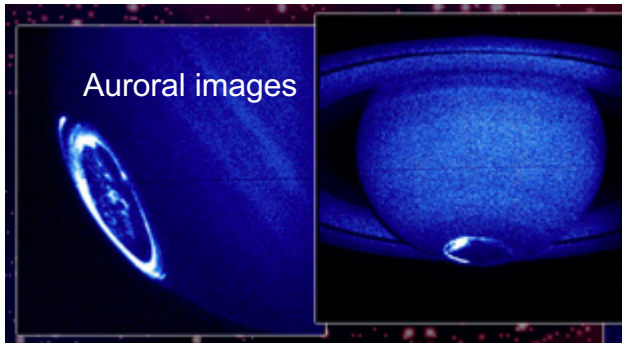
MEDOC database / JHelioviewer



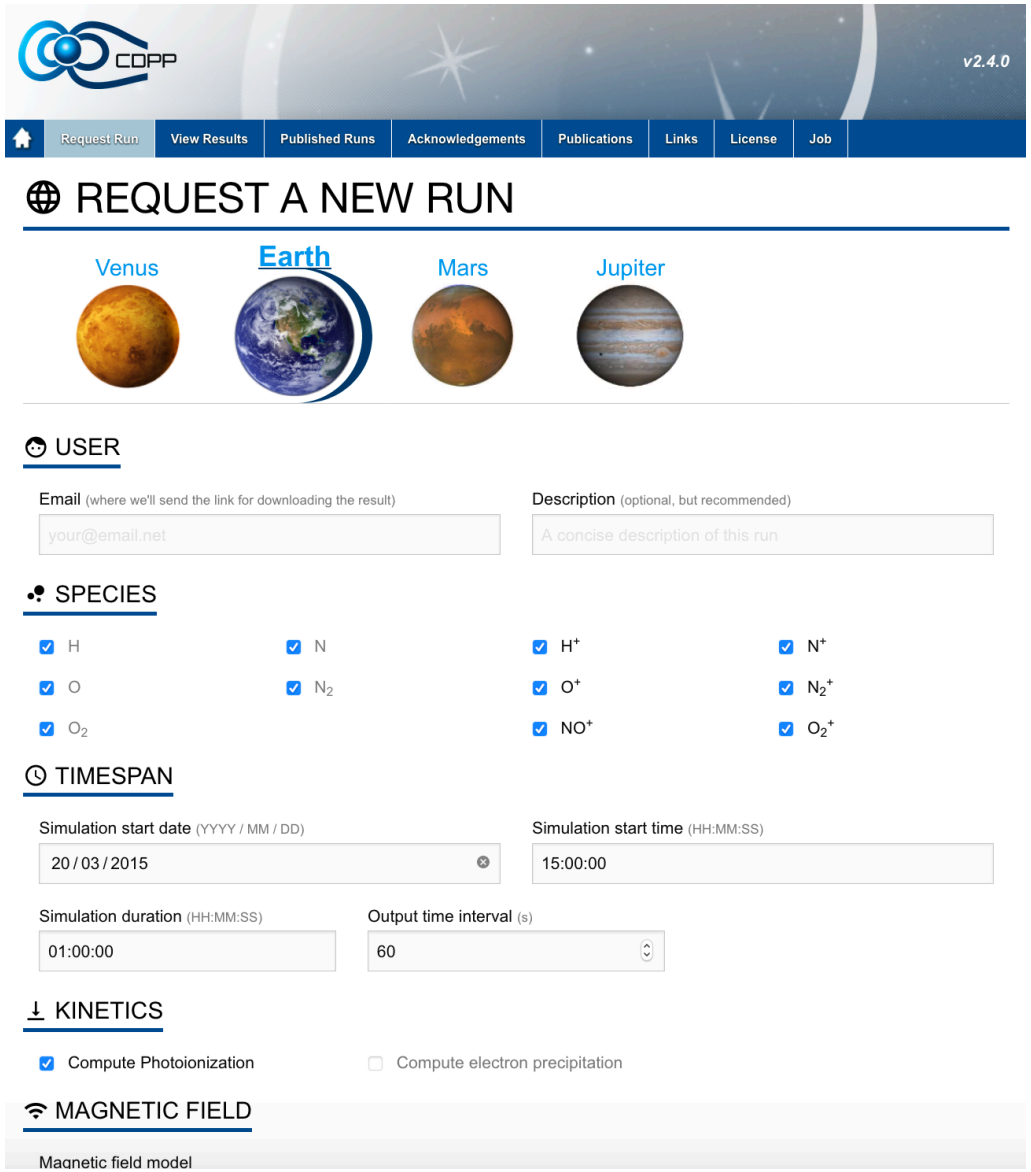
AMDA plot

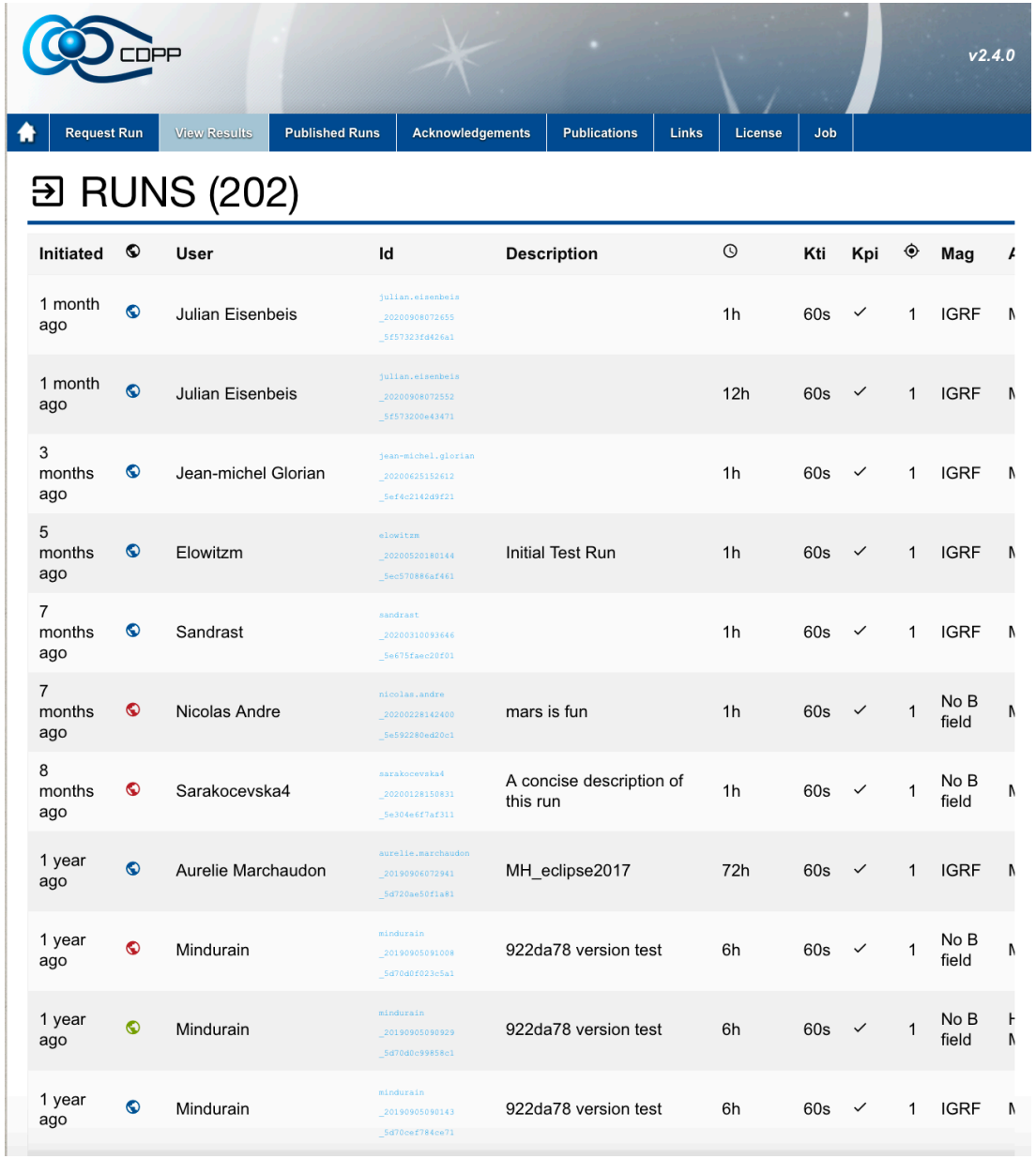


APIS



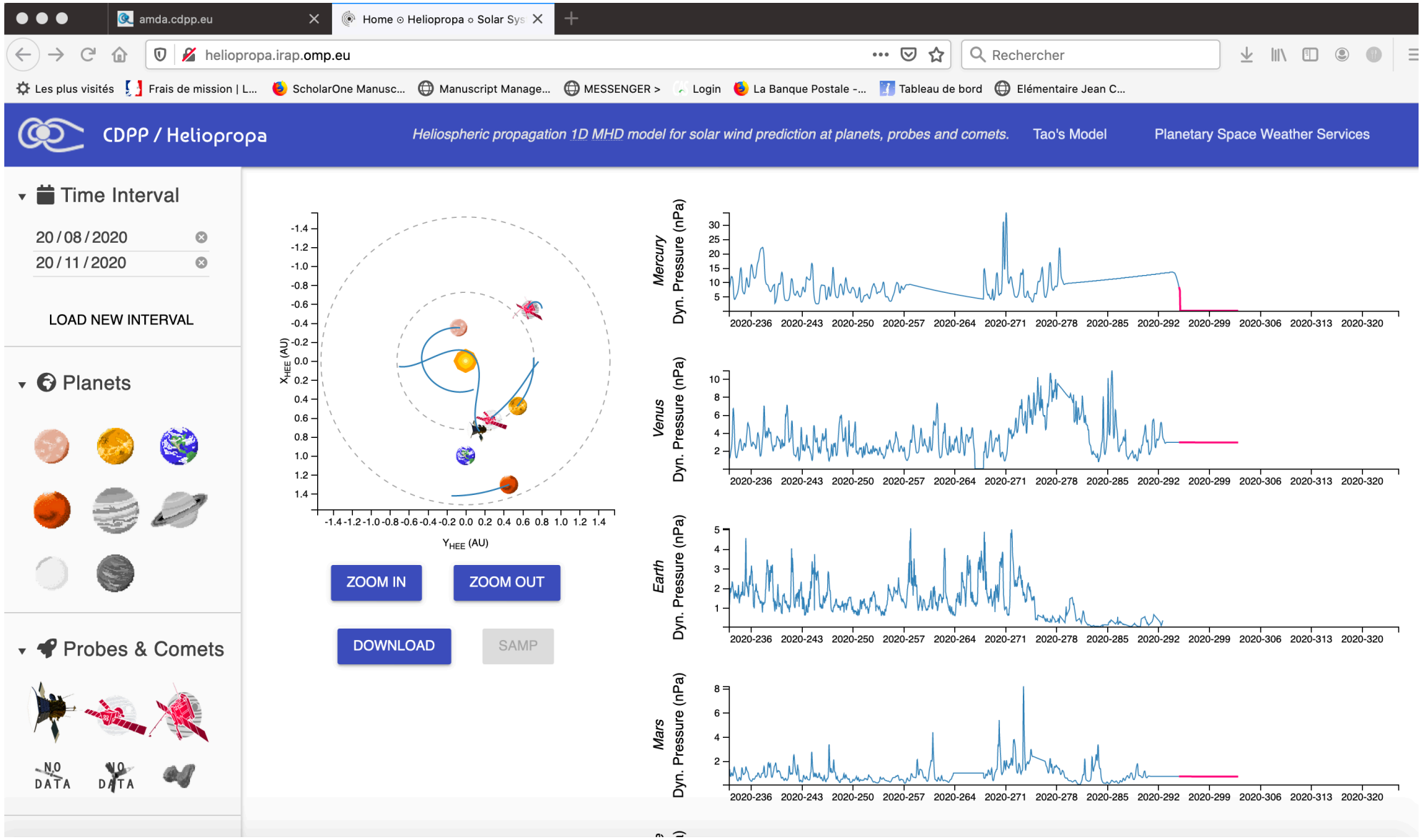
Transplanet: http://transplanet.irap.omp.eu



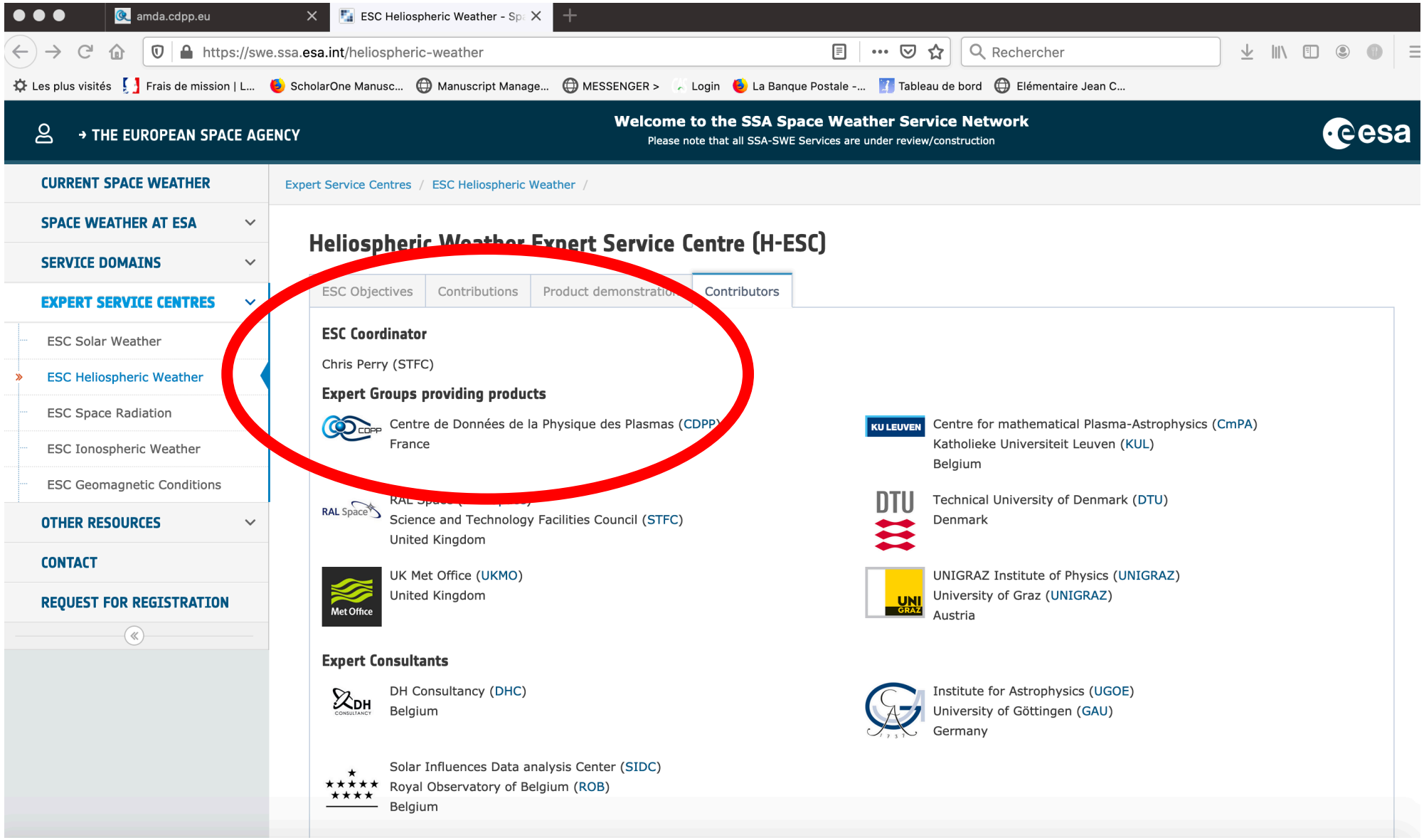


Initiated		User	Id	Description		Kti	Kpi		Mag	A
1 month ago		Julian Eisenbeis	julian.eisenbeis _20200908072655 _5f57323fd426a1		1h	60s	✓	1	IGRF	M
1 month ago		Julian Eisenbeis	julian.eisenbeis _20200908072552 _5f573200e43471		12h	60s	✓	1	IGRF	M
3 months ago		Jean-michel Glorian	jean-michel.glorian _20200625152612 _5ef4c2142d9f21		1h	60s	✓	1	IGRF	M
5 months ago		Elowitzm	elowitzm _20200520180144 _5ec570886af461	Initial Test Run	1h	60s	✓	1	IGRF	M
7 months ago		Sandrast	sandrast _20200310093646 _5e675faec20f01		1h	60s	✓	1	IGRF	M
7 months ago		Nicolas Andre	nicolas.andre _20200228142400 _5e592280ed20c1	mars is fun	1h	60s	✓	1	No B field	M
8 months ago		Sarakocevska4	sarakocevska4 _20200128150831 _5e304e6f7af311	A concise description of this run	1h	60s	✓	1	No B field	M
1 year ago		Aurelie Marchaudon	aurelie.marchaudon _20190906072941 _5d720ae50f1a81	MH_eclipse2017	72h	60s	✓	1	IGRF	M
1 year ago		Mindurain	mindurain _20190905091008 _5d70d0f023c5a1	922da78 version test	6h	60s	✓	1	No B field	M
1 year ago		Mindurain	mindurain _20190905090929 _5d70d0c99858c1	922da78 version test	6h	60s	✓	1	No B field	H M
1 year ago		Mindurain	mindurain _20190905090143 _5d70cef784ce71	922da78 version test	6h	60s	✓	1	IGRF	M

Heliopropa: http://heliopropa.irap.omp.eu



ESA/Space Situational Awareness



A community infrastructure

CDPP tools

- Are used by a wide community of scientists
  - Eg, about 400 AMDA sessions / month
  - Including students (courses, projects, thematic schools)
- Are regularly reviewed by a user committee
- Help/facilitate scientific publication
  - About 10-15 papers / year

CDPP tools in IHDEA

Tool	Protocols	Data models	Web services	Formats	Licences
AMDA	SAMP *HAPI (prototype)* EPN-TAP	SPASE EPN-core	SOAP/REST – for data distribution	CDF, netCDF, VOTable	Shared property (*not ideal*) *on gitlab*
3DView	SAMP EPN-TAP	no	SOAP – for coordinate transformation	CDF, netCDF, VOTable	GPLv3 *on gitlab*
Propagation Tool	SAMP	no	no	FITS, VOTable	GPLv3 *on gitlab*