



# CDPP activités du CDPP: Promouvoir recherche et éducation en physique spatiale

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– PNST 2016 –

# CDPP

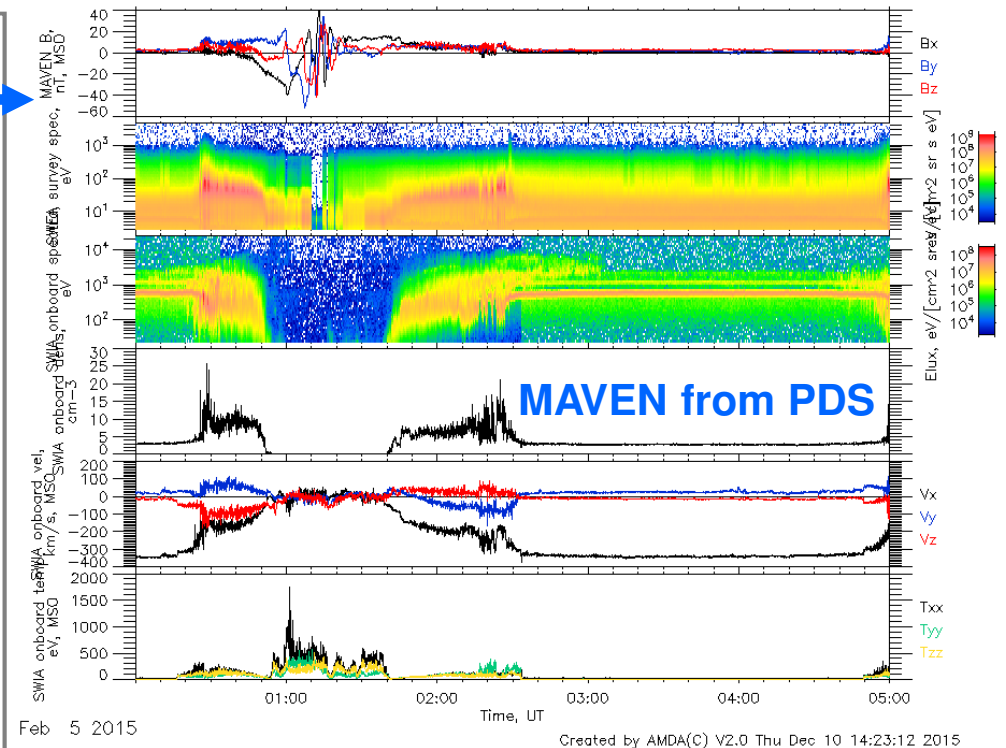
## French Plasma Physics Data Centre

- Established in 1998 from a CNES/CNRS collaboration for natural plasma [data distribution and archiving](#) : from the ionosphere to the heliosphere
- About 7 FTE, engineers and scientists, main base in Toulouse
- Since 2006, CDPP is strongly involved in the development of data [analysis and visualization tools](#)
  - AMDA, 3DView, the Propagation Tool, TREPS
- Collaboration with PDS (SPASE) resulted in the access to PDS data within CDPP tools (Galileo, Messenger, Maven, ...)
- CDPP expertise in data handling and tool development resulted in taking part to several [EU and ESA projects](#) aiming at enlarging data distribution via standards (Virtual Observatory concept)
- [Mission support activities](#) increased since 2014 when AMDA was chosen to be the multi-instrument quicklook visualization tool for the Rosetta Plasma Consortium team
- Similar role (+ data distribution to ESA) is planned for ESA Solar Orbiter and JUICE. Support to ESA/Athena is also starting
- These activities help [promoting science](#) (papers) and [education](#) (hands-on)

# Datasets available in the online tool CDPP/AMDA

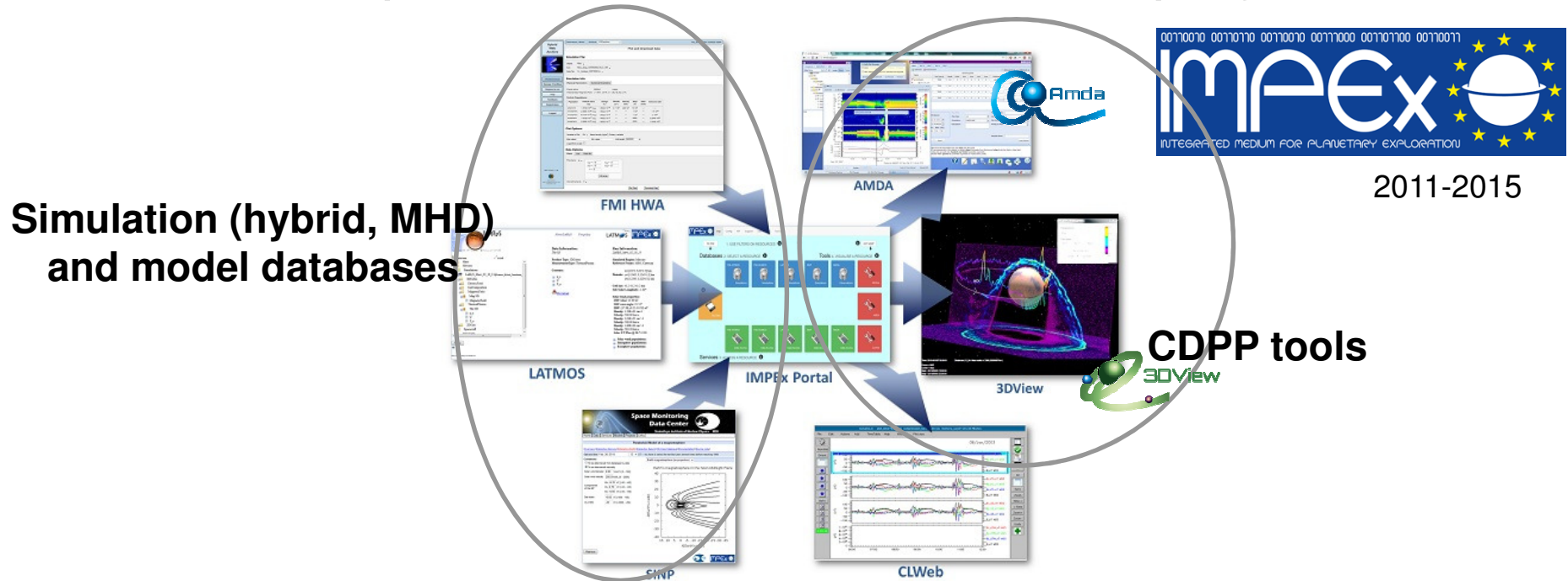


<http://amda.cdpp.eu/>



- Plot
- Data mining and combination
- Cataloguing (event lists)
- Upload / download
- Statistics (long term analysis)

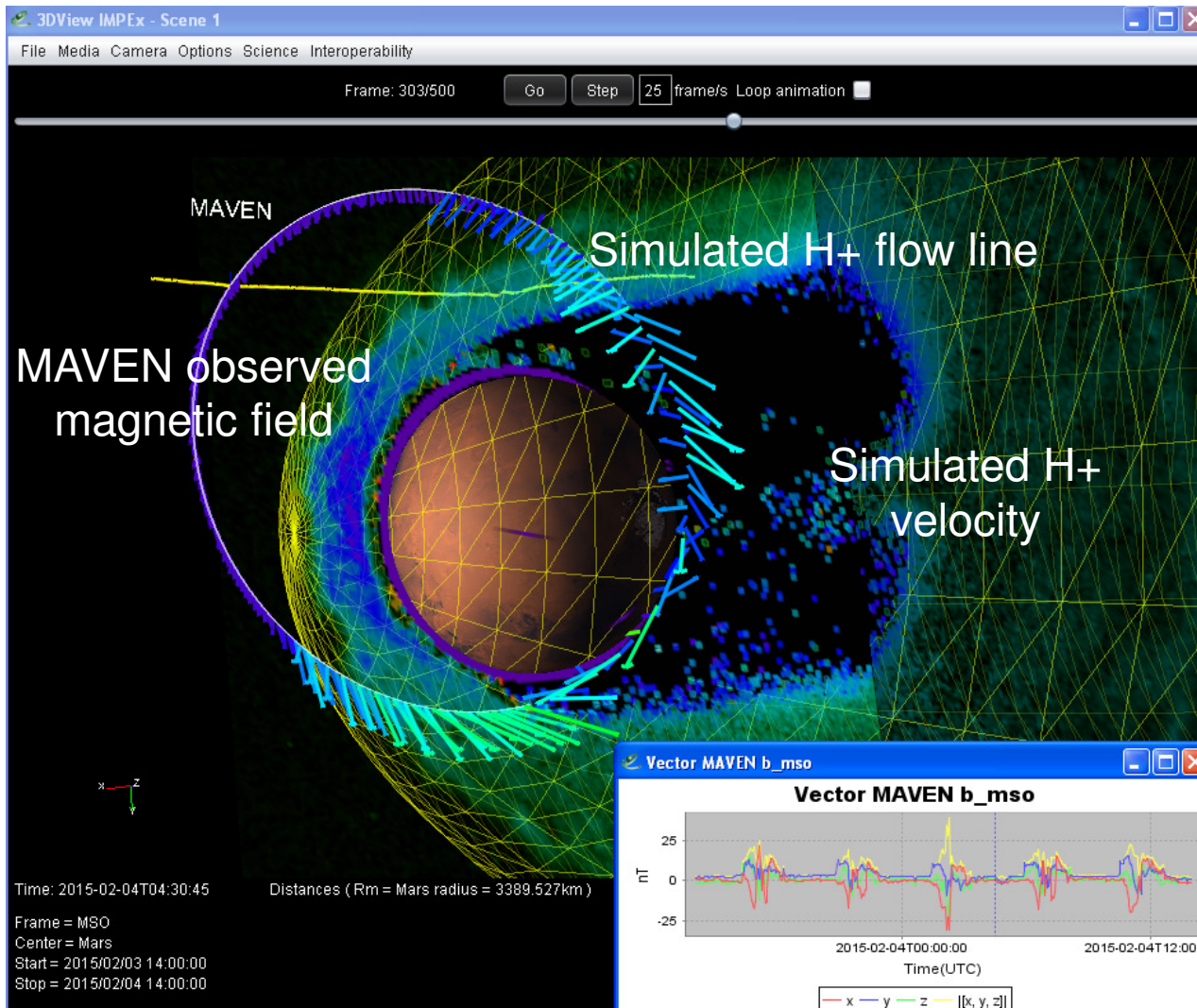
# Developing a data + model framework the experience of the FP7 IMPEX project



- **Idea = Access observations and models from the same tools / portal**
- **Concept = Keep expertise local**
- **Approach = Develop**
  - a light exchange protocol (use of web services)
  - common methods for data treatment (interpolation, planar cuts, ...)
  - a common data model (extend the SPASE model used for observations)
  - **ANR**

# Combining times series analysis and 3D visualization in context

<http://3dview.cdpp.eu/>



**3DView embeds direct connexion to external databases**

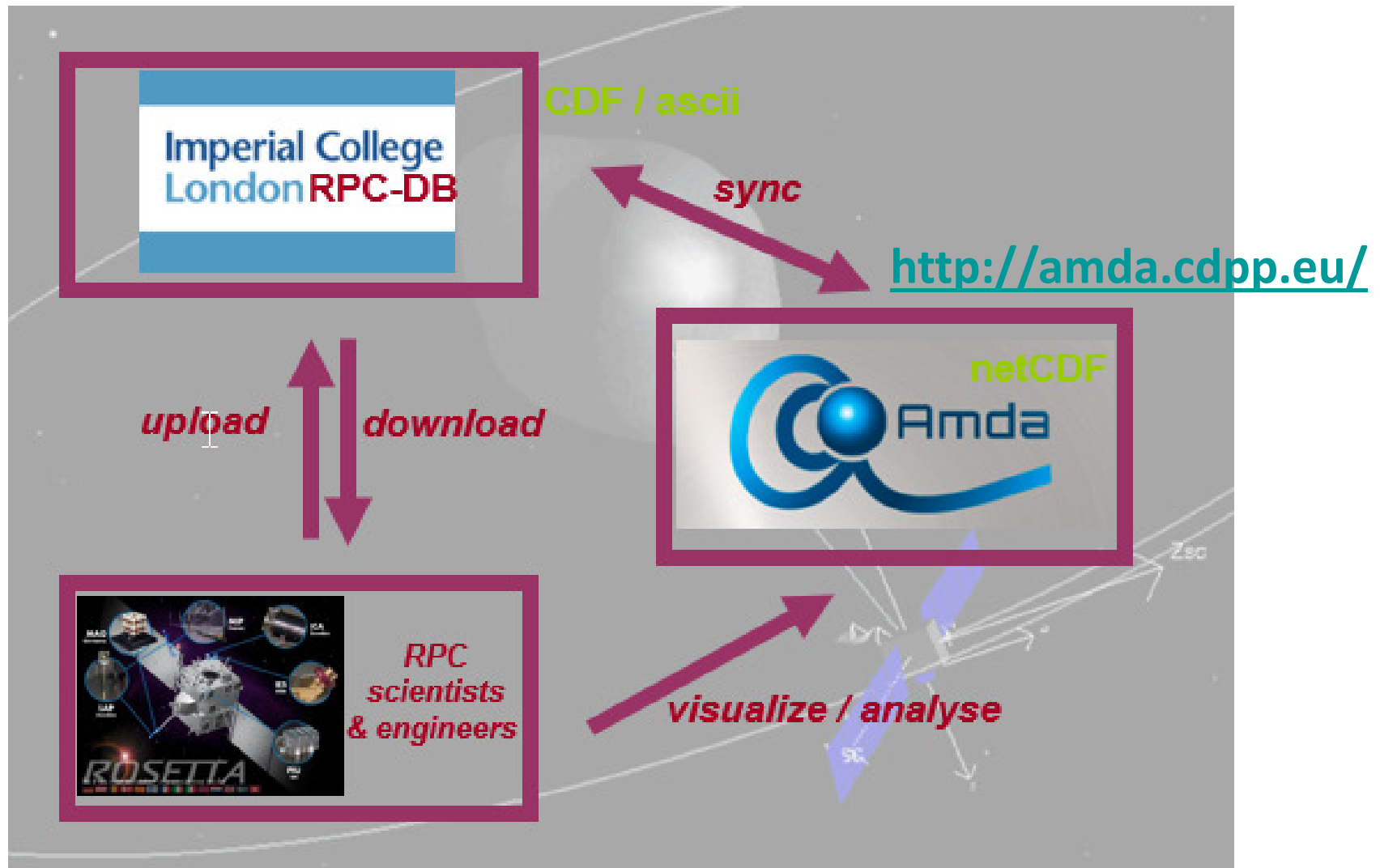
- Mars simulation from LATMOS database

- MAVEN data from AMDA (PDS)

# Mission support

- CDPP is formally involved
  - in the data distribution and archiving (in connexion with ESA) of
    - Solar Orbiter / SWA (ions & electrons)
    - JUICE / RPWI (fields & waves)
  - In environment modeling (plasma at L2) for
    - Athena / X-IFU
- The involvement of CDPP in Rosetta Plasma Consortium data visualization from 2014 has been a test-bed for future missions

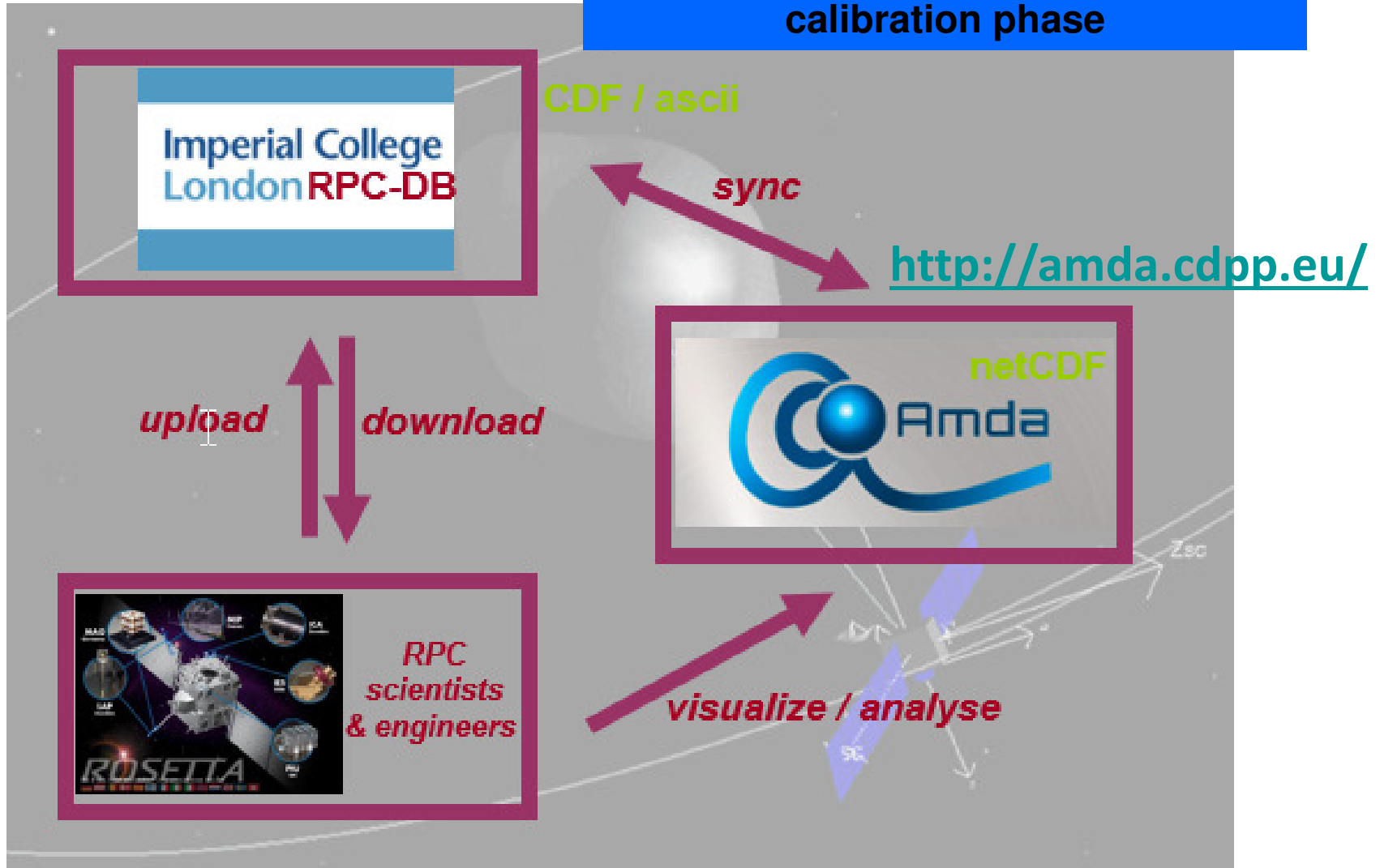
# Data distribution : Rosetta/RPC data during the proprietary phase



# Data distribution : Rosetta/RPC

data during the

Present discussion with ESA/PSA, CNES and PI for the pre-archiving / calibration phase





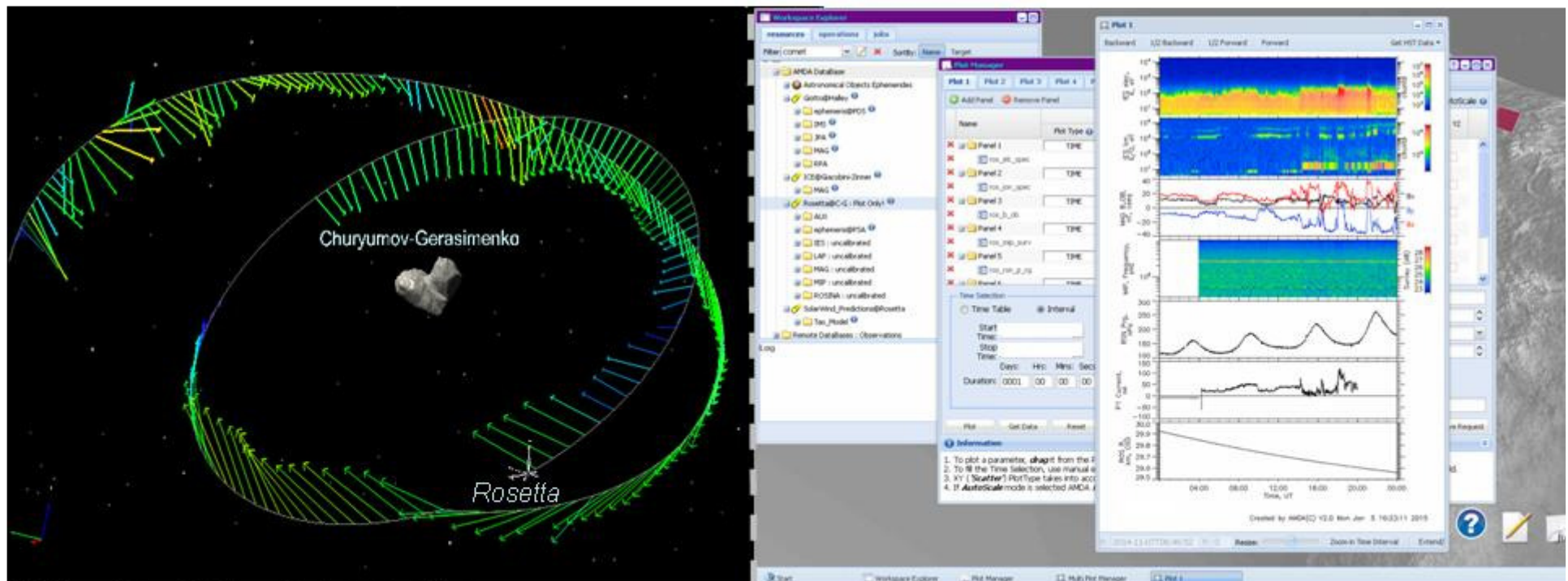
# Use of the CDPP tools in the Rosetta context

➡ ~10 publications as of today

in-situ and model data  
in 3D interactive scenes  
[3dview.cdpp.eu](http://3dview.cdpp.eu)

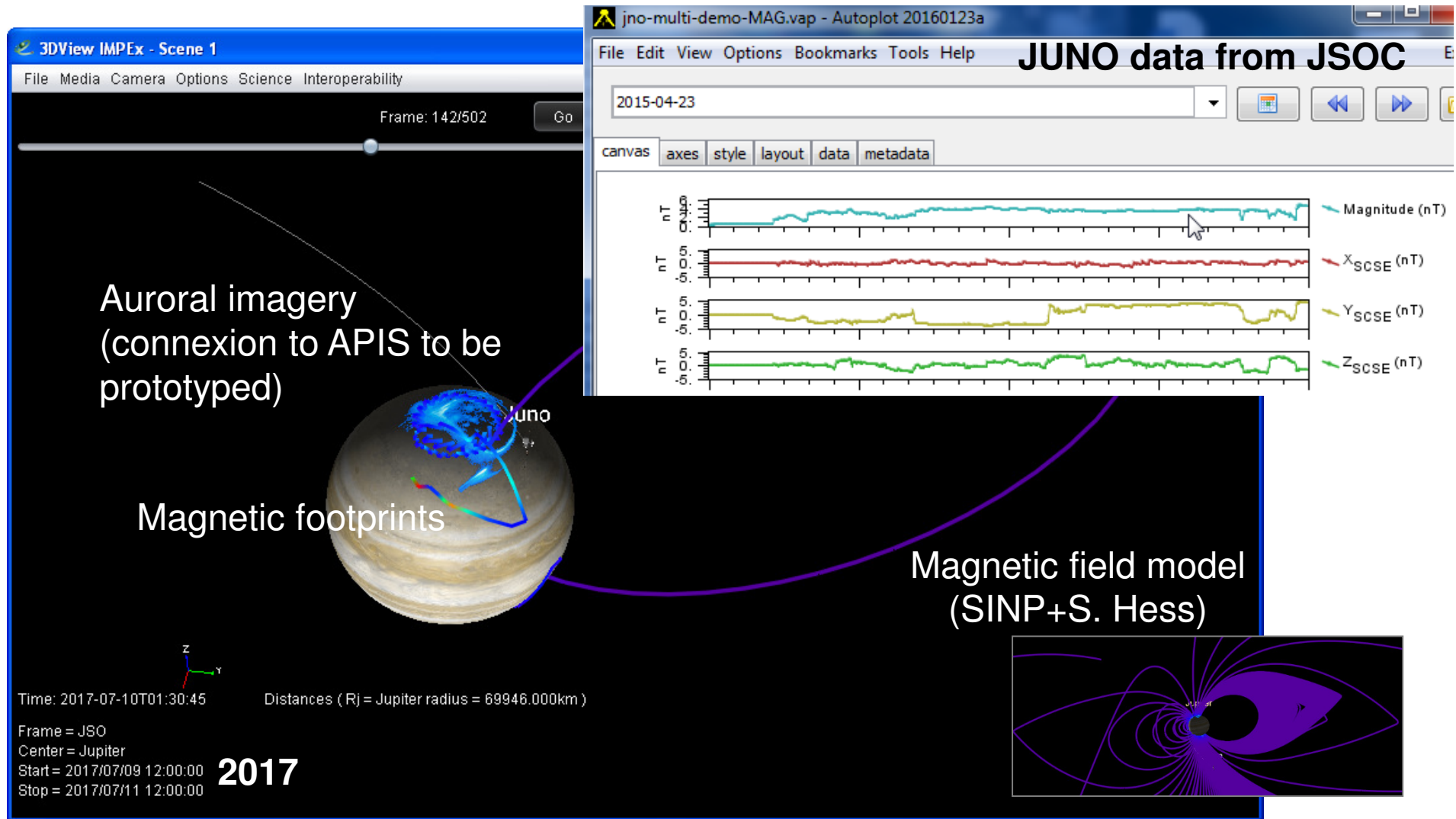


database and analysis tool  
[amda.cdpp.eu](http://amda.cdpp.eu)

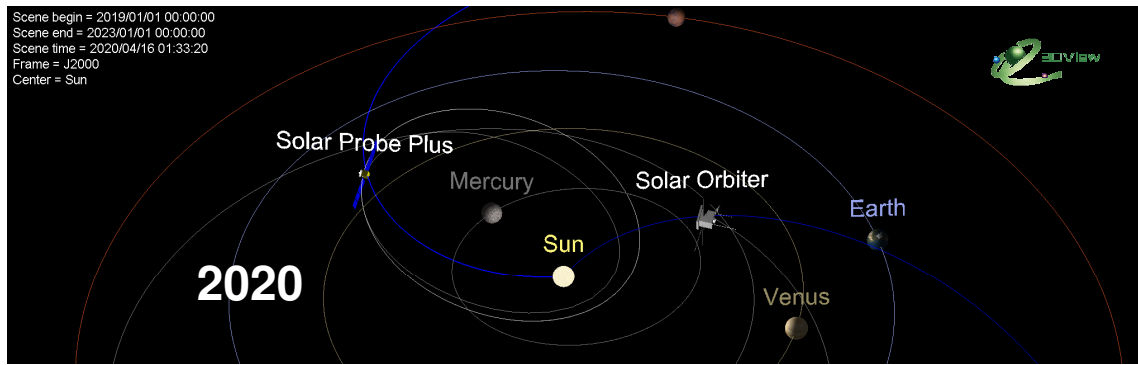


# Preparing JUNO : integrating UV images, magnetic field models and data

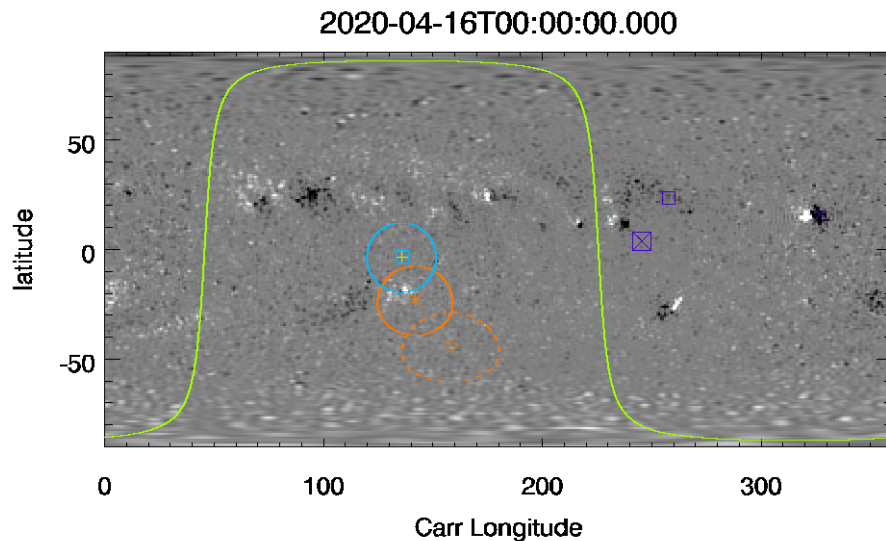
## *Access to JSOC in discussion*



# Preparing Solar Orbiter : magnetic connectivity + MADAWG



- Parker field lines
- Instrument FoV
- ConnectSolo (**STORMS**)



EUI FOV

FOV along field line

- SOS Slow wind (dash)
- SO Fast wind

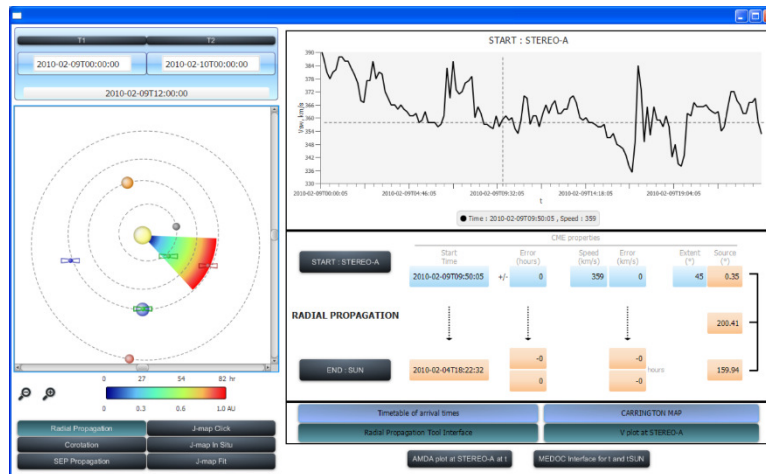
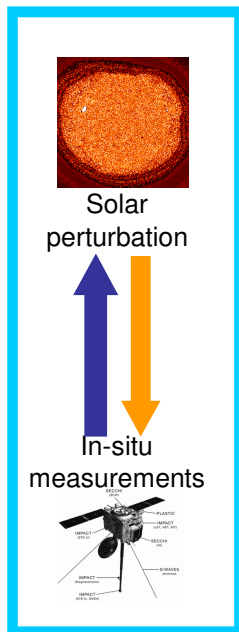
Limb

SPP

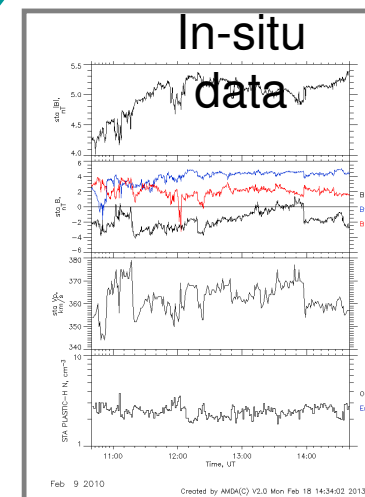
**Simulations : Rui Pinto** <http://storms-connectsolo.irap.omp.eu/>

# Connexion MEDOC-CDPP

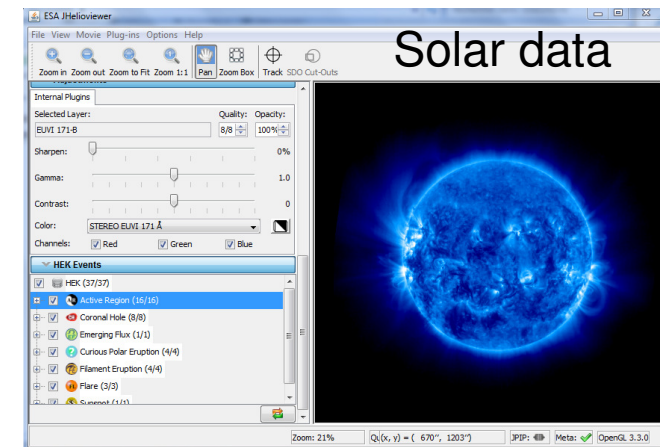
## l'exemple du Propagation Tool



AMDA plot



MEDOC database / JHelioviewer

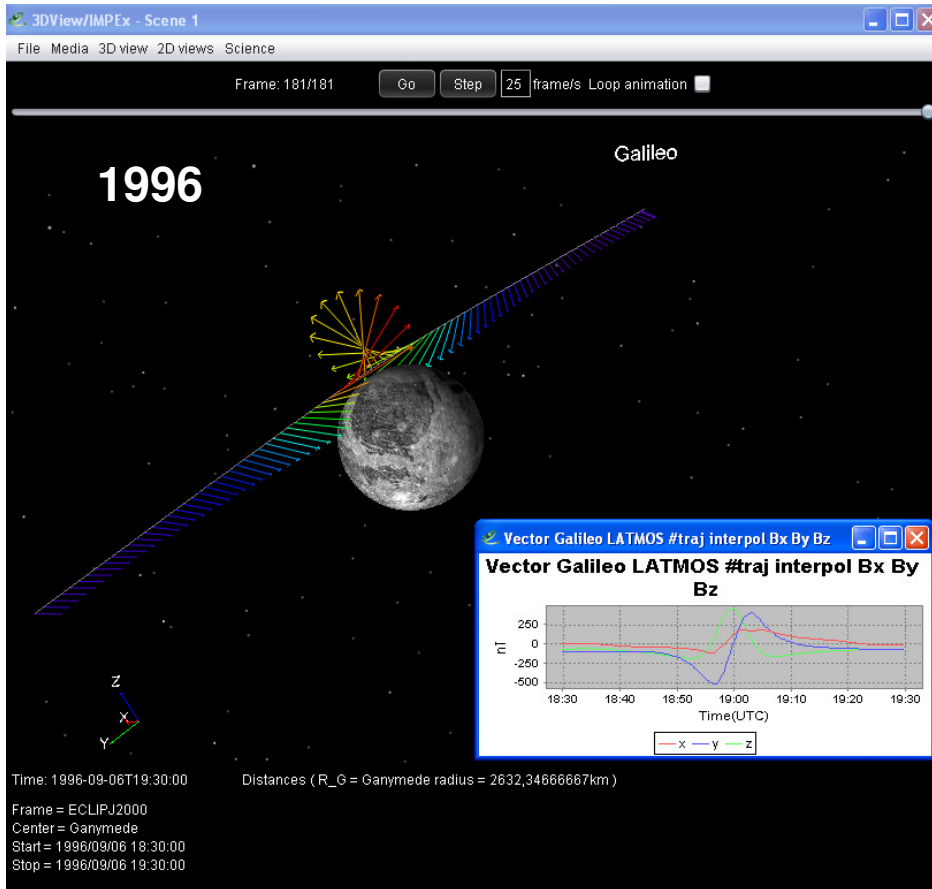


- Developed by GFI company under CNES funding
- Designed by A. Rouillard and the **STORMS** team based on a FP7 HELIO initial concept
- Used to distribute STEREO catalogues obtained during the FP7 HELCATS project <http://www.helcats-fp7.eu/>
- Gives access to J-Maps (real and simulated) and carrington maps

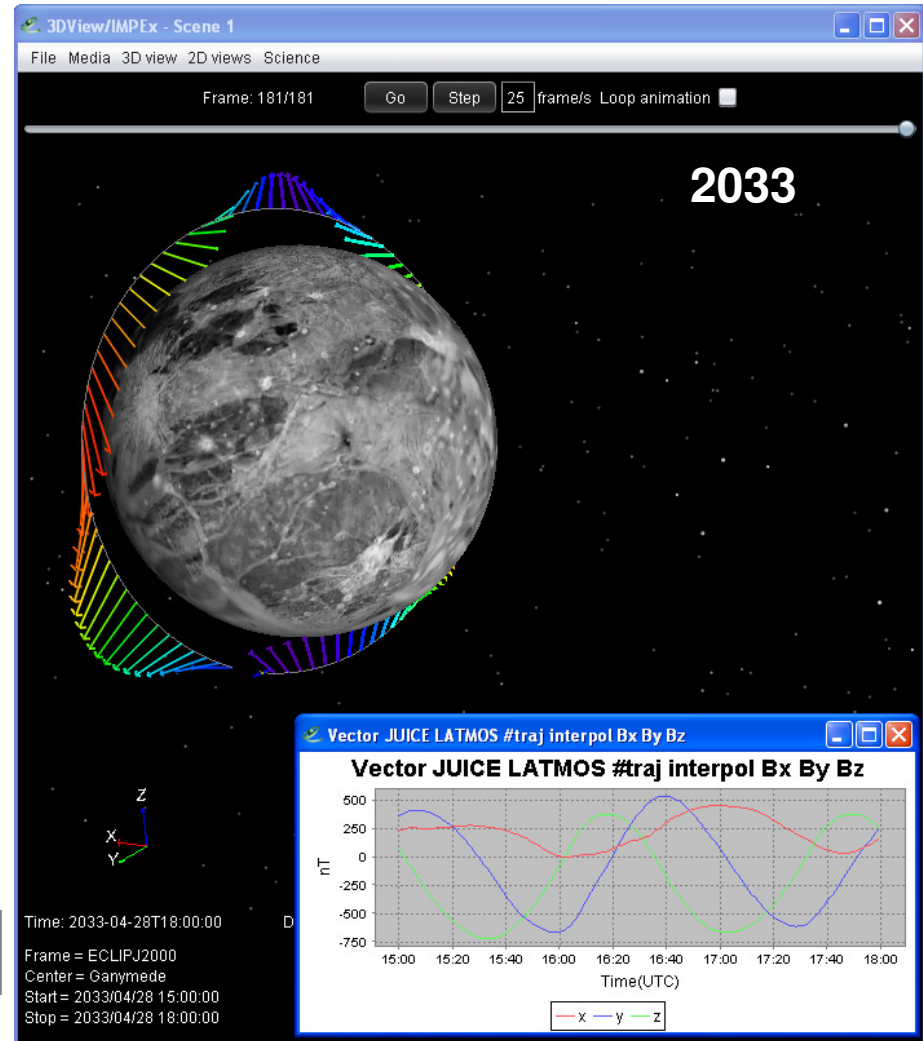
# Preparing JUICE : simulation at Ganymede

## Galileo – Ganymede flyby #2

## JUICE – Ganymede orbit phase



Magnetic field (in GPHIO)



Simulation : L. Leclercq + R. Modolo (LATMOS)

# Hands-on sessions for students

Tools for education in space sciences

- At the Master level, in summer schools, ...



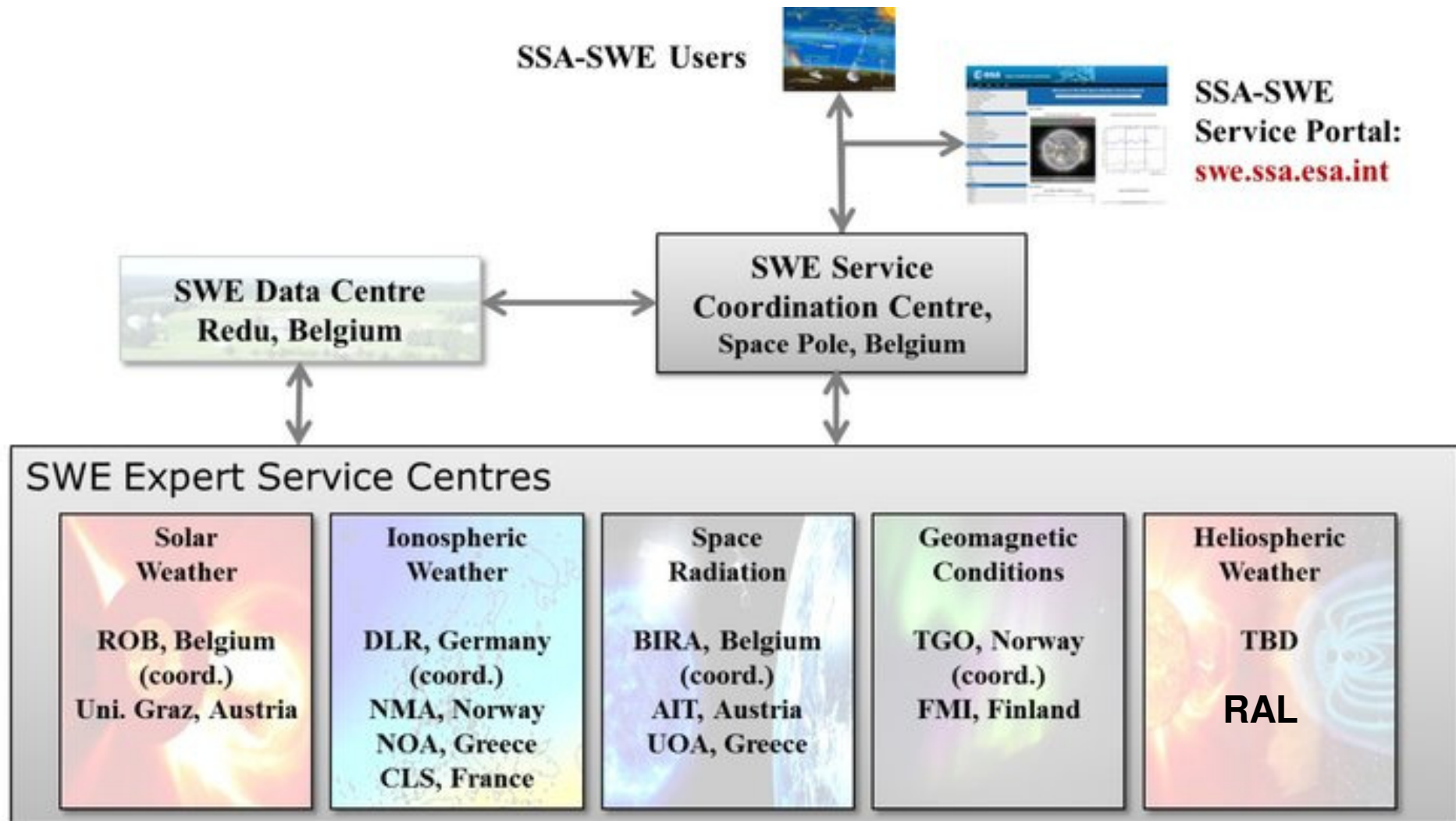
# Enabling science

## CDPP tools

- Are used by a wide community
  - About 400-500 AMDA sessions / month
- Are regularly reviewed by a user committee
- Help/facilitate publication
  - 10-15 papers / year

- Altitude dependence of nightside Martian suprathermal electron depletions as revealed by MAVEN observations, *M. Steckiewicz et al., GRL, 2015*
- Evolution of the plasma environment of comet 67P from spacecraft potential measurements by the Rosetta Langmuir probe instrument, *E. Odelstad et al., GRL 2015*
- Inertial range turbulence of fast and slow solar wind at 0.72 AU and solar minimum, *Teodorescu et al., ApJLet., 2015*
- Space weather effects on the bow shock, the magnetic barrier, and the ion composition boundary at Venus, *Vech et al., JGR, 2015*

# ESA / Space Situational Awareness





# Place du CDPP dans SSA

- Rôle de « consultant » pour la partie ‘héliosphère’ (lead : RAL)
- Implication des outils AMDA + Propagation Tool (*post-event analysis*)
- Mise en réseau (fédération), peu de développement (homogénéisation des accès)
- Enveloppe limitée / Visibilité forte
- Kick-off : 24/09/2015 (2 ans)


# Portail H-ESC / prototype

ESA - Space Situational Awareness Space Weather - Solar Weather - Internet Explorer

Z:\Heliospheric\_Weather\_ESC\05 - SWE Portal\01 - Initial Mock I

ESA - Space Situational Awar...

File Edit View Favorites Tools Help


esa space situational awareness

ESA SSA SWE NEO SST

**About SWE**

- What is Space Weather
- SSA Space Weather Activities
- User Domains
- Current Space Weather
- Contact

**Expert Service Centres**

- Solar Weather
- Heliospheric Weather
- Space Radiation
- Ionospheric Weather
- Geomagnetic Conditions

**SWE Applications**

- SWENET
- SPENVIS
- SEISOP
- SEDAT
- IONMON
- EDID

**Other Resources**

- DOCUMENTS
- SWWT
- SWEN NEWSLETTER
- UPCOMING EVENTS

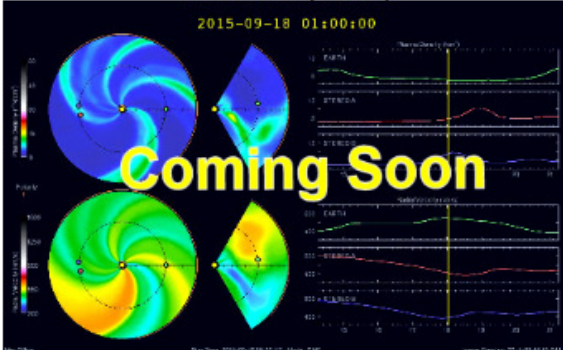
**Sign-In**

- You are not signed in.
- Sign In
- Register

## Heliospheric Weather Expert Service Centre

This page provides access to the latest data, products and analysis tools from the SSA SWE Heliospheric Weather Expert Service Centre.

**Latest data**

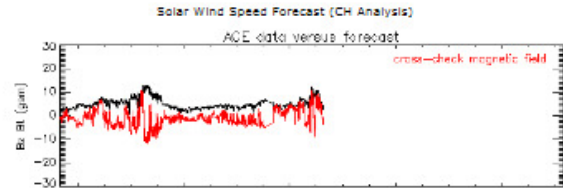


**ESC tools and products**

MOSWOC	Coming Soon: <ul style="list-style-type: none"> <li>▪ Predicted near-Earth solar wind properties (MHD)</li> <li>▪ Nearcast near-Earth solar wind</li> <li>▪ Nearcast near-Earth SEP</li> <li>▪ CME Earth arrival forecasts (MHD)</li> <li>▪ Near-Earth alerts</li> </ul> Coming Later: <ul style="list-style-type: none"> <li>▪ Solar system space weather forecasts &amp; alerts</li> </ul>
UOG	<ul style="list-style-type: none"> <li>▪ Predicted near-Earth solar wind speed</li> <li>▪ CME Earth arrival forecasts (DBM)</li> </ul>
DTU	Coming Soon: <ul style="list-style-type: none"> <li>▪ Automated near-Earth alerts</li> </ul>
IRAP	Coming Later: <ul style="list-style-type: none"> <li>▪ Solar wind propagation tool</li> <li>▪ Science archive federation (AMDA)</li> </ul>
RAL	Coming Later: <ul style="list-style-type: none"> <li>▪ H-ESC Product Archive</li> <li>▪ H-ESC Performance Metrics</li> <li>▪ Statistical heliospheric products</li> </ul>

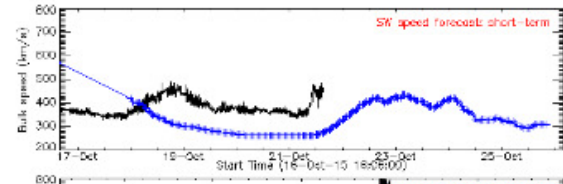
**Solar Wind Speed Forecast (CH Analysis)**

ACE data versus forecast



**Solar Wind Speed Forecast (CH Analysis)**

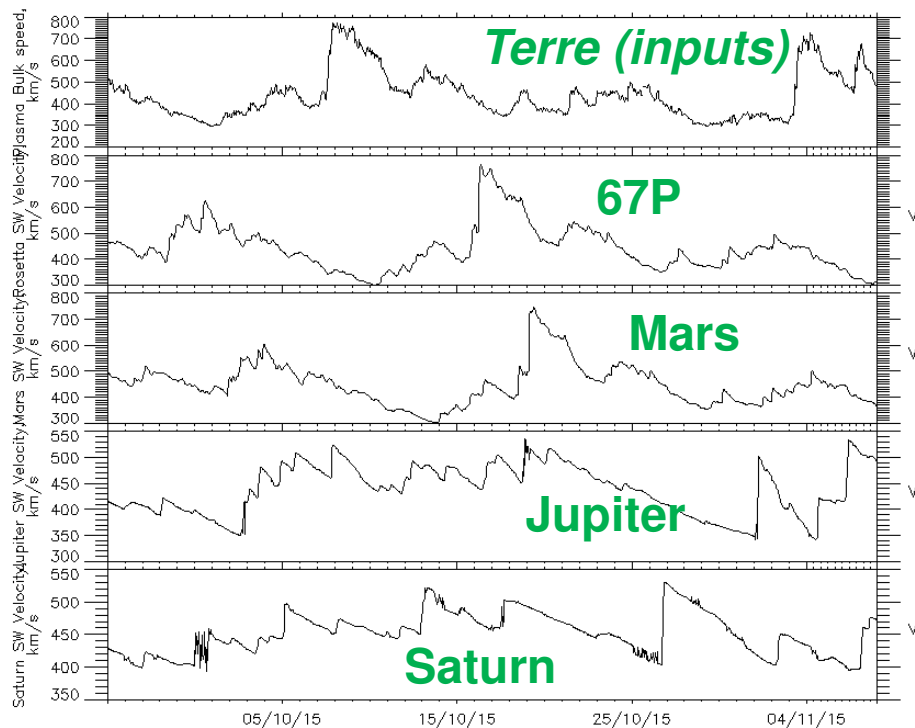
SW speed forecast: short-term



## PSWS : developping & promoting planetary space weather

- Validation of propagation methods in the heliosphere
- Predict SW conditions at solar systems bodies
- Transcar « planètes »

### 1D MHD SW prediction (Tao et al.)



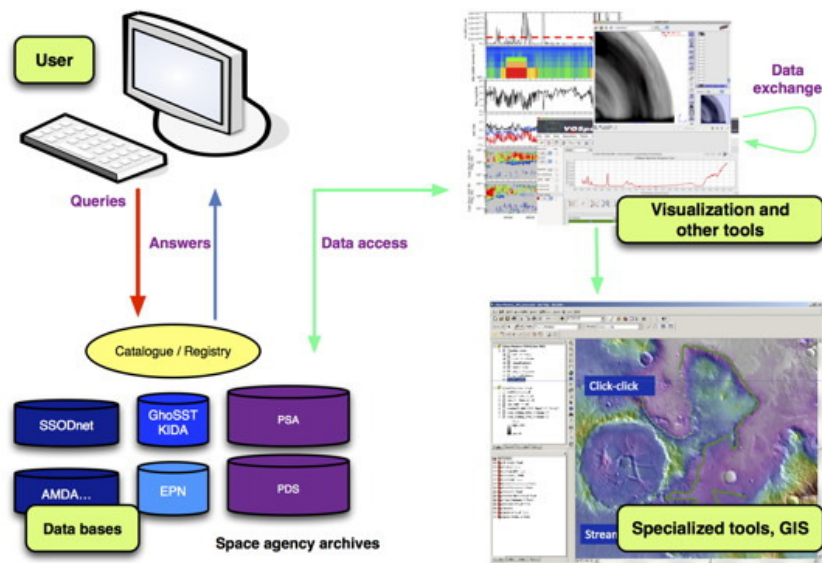
### Comets < ~Jupiter orbit



# eur PLANET

**VESPA** : connecting a wide range of multi disciplinary planetology databases and tools

- Use of the EPN-TAP protocol (derived from IVOA standard) to enable data discovery
- Develop data services including simulations/models
- Develop software client in tools
  - Implementation in 3DView, AMDA and CASSIS
  - New data services to be open in the coming months/years
- 1st implementation workshop : IRAP, 5-8 april



A partir d'un contexte d'observations (corps, milieu), trouver toutes les ressources associées (images, spectres, séries temporelles, ...)

# En résumé

- Activité régulière d'archivage (SIPAD/CNES)
- Développement d'outils
  - Science, enseignement
- Support aux missions spatiales
  - Bases, relation avec l'ESA, modélisation
- Activités ME
  - SSA, partenariats STORMS et MEDOC, PSWS
- Activité « planéto »
  - Europlanet, Rosetta, simulations