



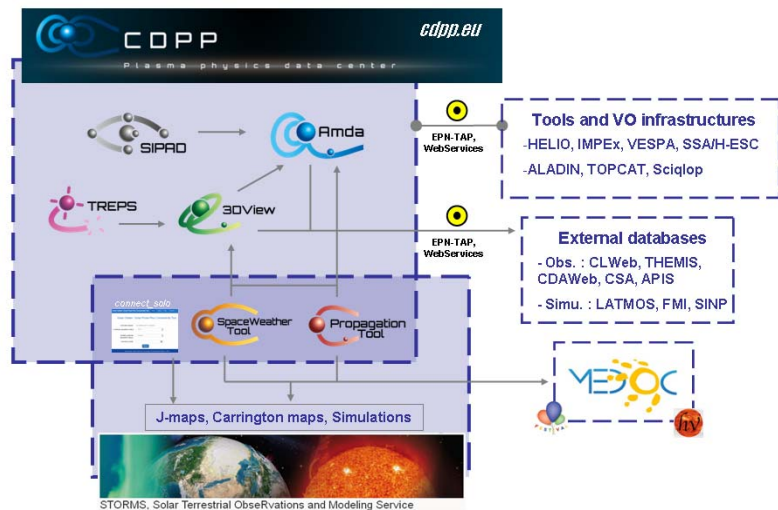
www.cdpp.eu

Centre de Données de la Physique des Plasmas: distribution de données, interopérabilité, modèles

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(1) IRAP/CNRS/UPS, Toulouse, France (vincent.genot@irap.omp.eu), (2) CNES, France, (3) Noveltis, France, (4) LESIA, Observatoire de Paris, France

The CDP

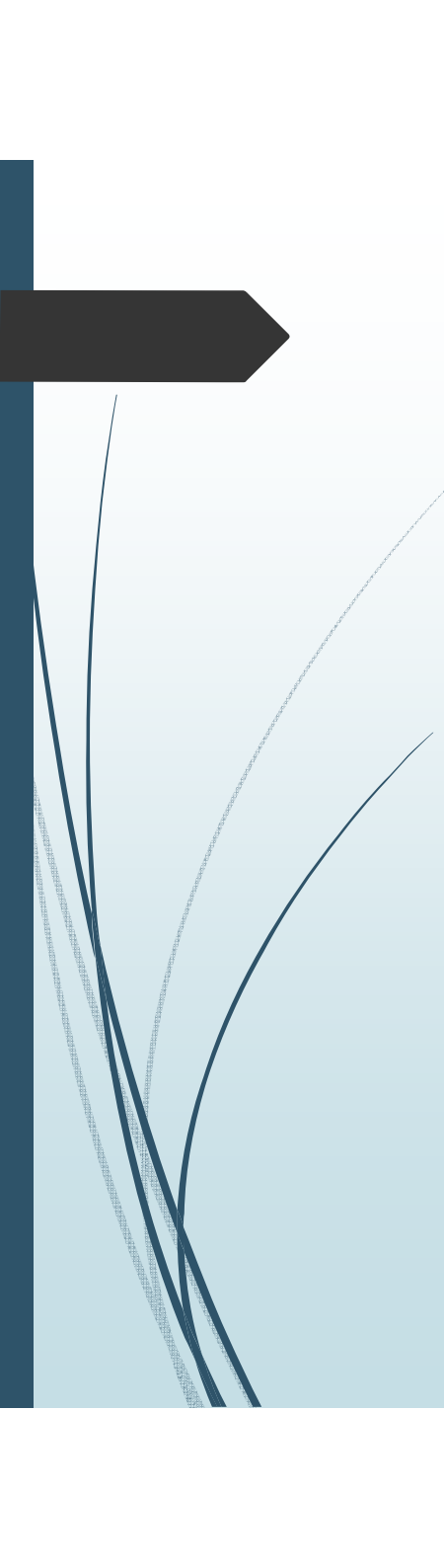


- Is established in 1998 in Toulouse by CNRS and CNES to archive plasma physics data for space mission with French participation
- Is a gathering of both scientists and engineers who participate voluntarily or as part of their duty
- Widens its scope since 2006 when AMDA is open and simplifies data access, visualization and analysis
 - In particular those from NASA/PDS
- Participated and participates in several Virtual Observatory projects whose aim is also to simplify data access, visualization and analysis
- Is part of the data distribution pipeline for Solar Orbiter (SWA) and JUICE (RPWI)
- Distributed data from the Rosetta Plasma Consortium (RPC) during the proprietary period



Plan de l'exposé

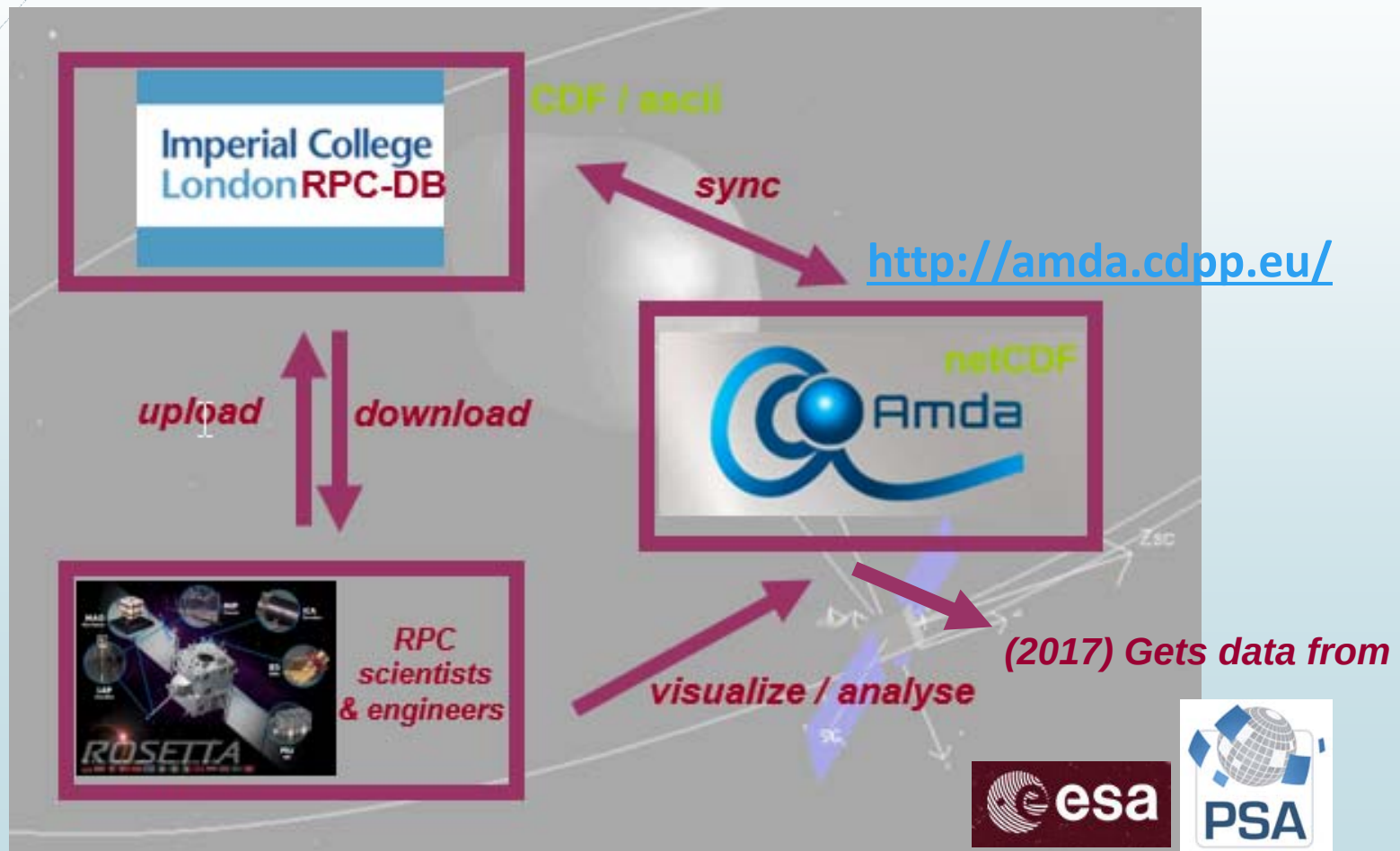
- Distribution des données plasma de Rosetta
 - Rôle de la base, rôle des outils
- Connexions du CDPP vers d'autres bases
 - Exemples: LESIA, LATMOS, LPP, IAS, ONERA ...
- Mise à disposition de modèles
 - « Run on request », mode « temps réel »
- Formation



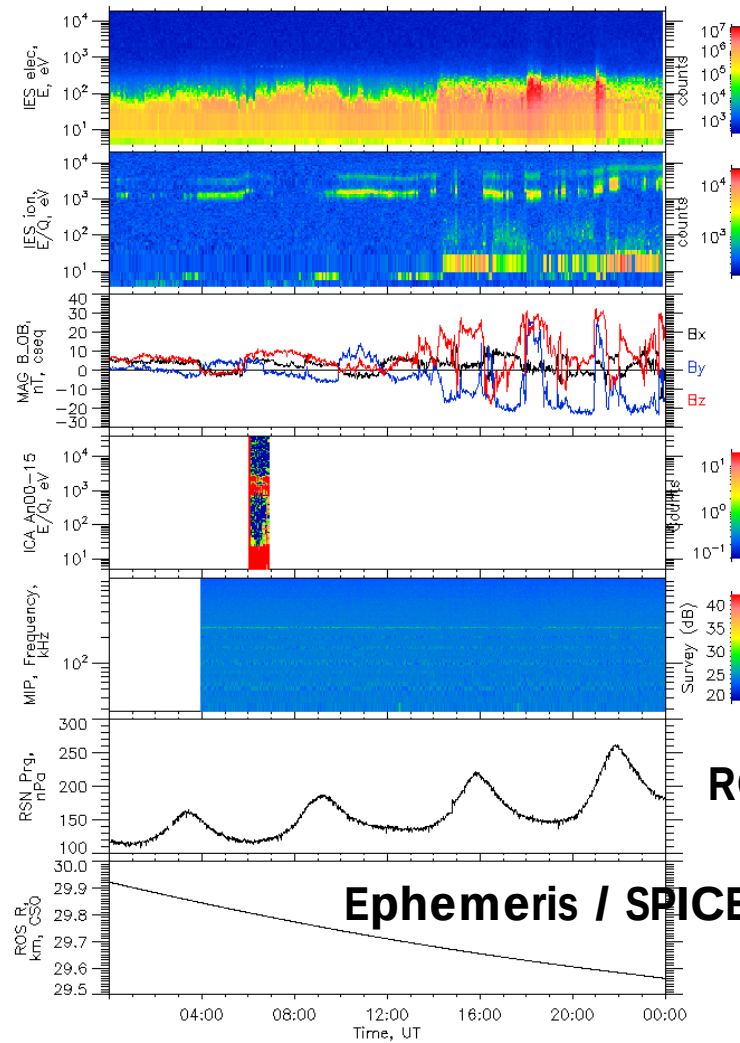
CDPP role in RPC data distribution and valorization

- Initial RPC pipeline: all teams sent their data to Imperial College London where they were transformed in CDF. No visualization is provided at the time
- *Spring 2014*: RPC leads ask CDPP to provide a quick-look system such that the team at large (including post-docs, PhD, ...) can browse data, select events, ...
- *Fall 2014*: CDPP proposes a customized version of AMDA where data from all instruments can be visualized. This environment is only accessed by the RPC team. RPC leads must give their approval before a new RPC user is registered.
 - <http://amda.cdpp.eu/>
- *October 2016*: end of operation
- *2017*: public data from PSA

Data distribution of RPC data during the proprietary phase

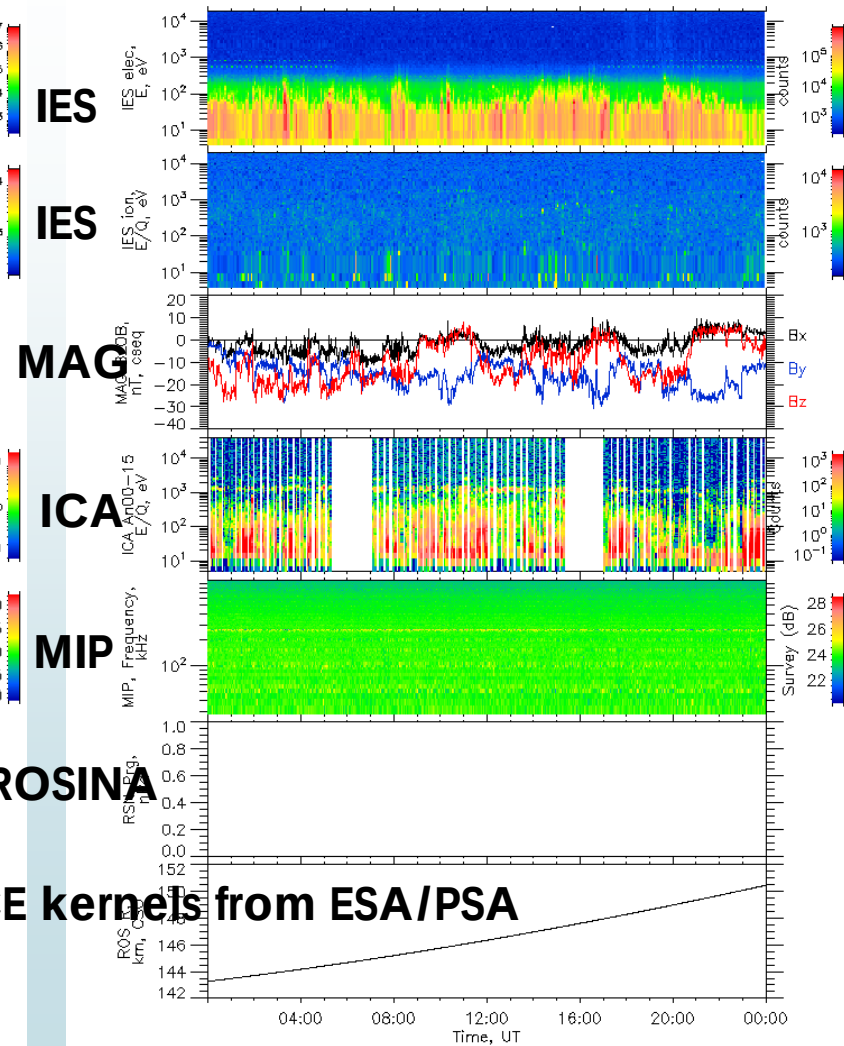


RPC data in AMDA



Nov 7 2014

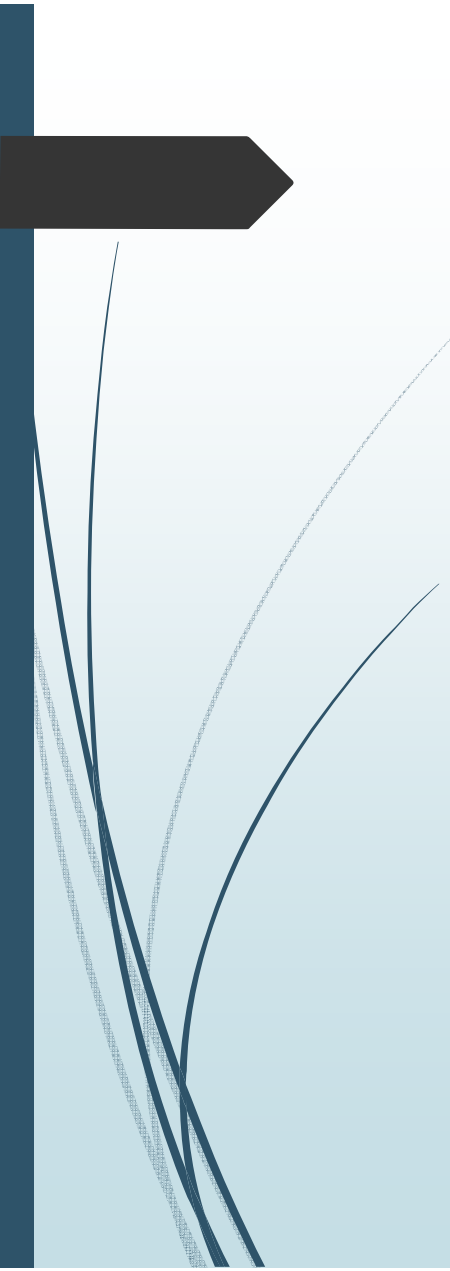
Created by AMDA(C) V2.0 Mon May 25 21:32:18 2015



Apr 12 2015

Created by AMDA(C) V2.0 Tue May 26 21:17:38 2015

Ephemeris / SPICE kernels from ESA/PSA

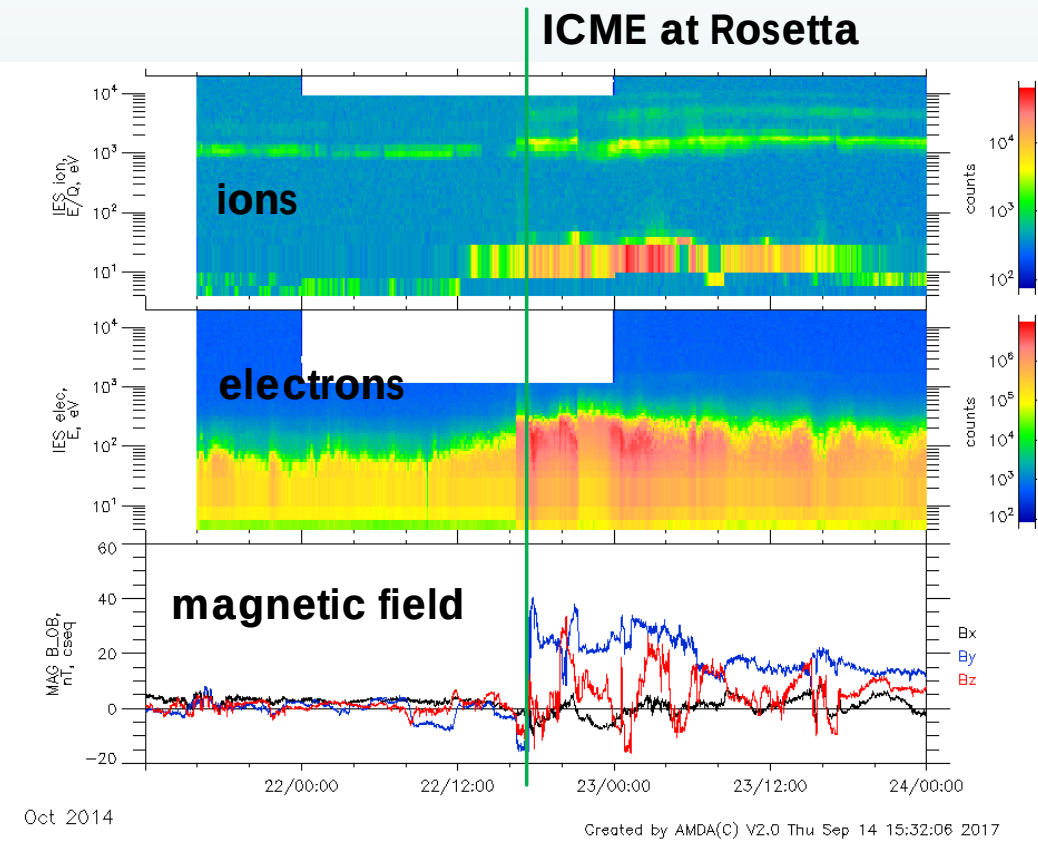
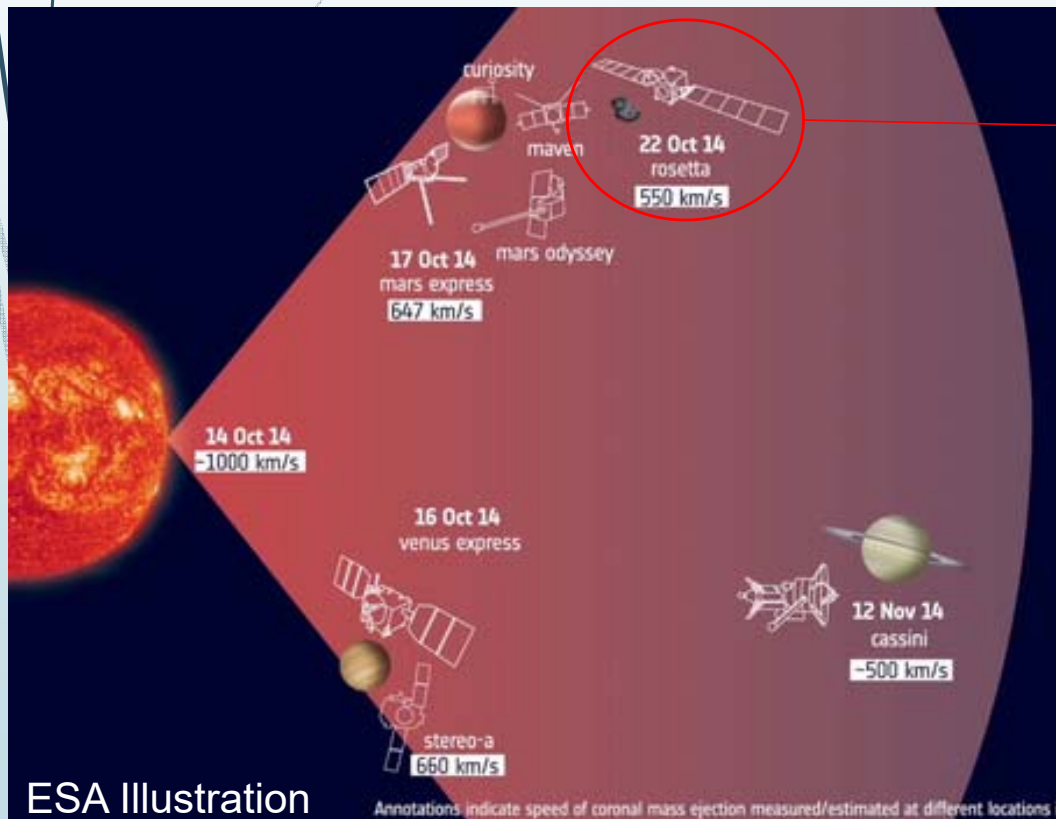


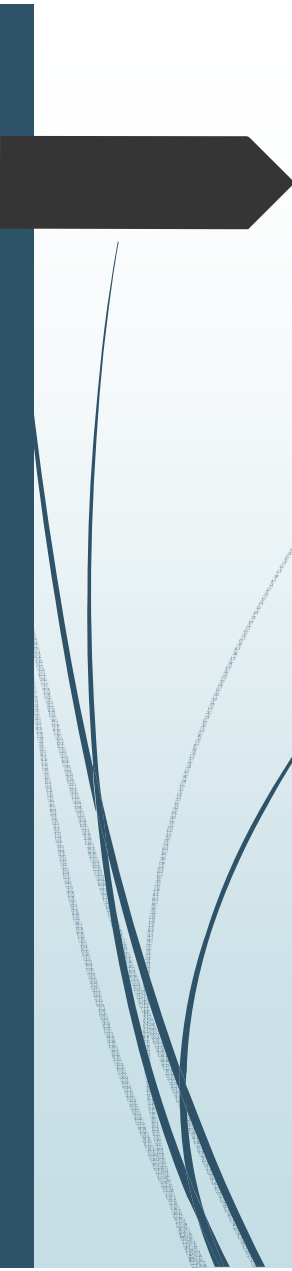
CDPP role in RPC data distribution and valorization

- An hands-on session (via Webex) was organized early in the project to have RPC scientists accustomed to the tool
- RPC data were available in AMDA but also in 3Dview (also only to RPC members)
 - <http://3dview.cdpp.eu/>
- Complementary data were made available to the scientists in AMDA:
 - Giotto and ICE data
 - model data : Solar Wind conditions propagated at 67P (1D MHD, *Tao et al.*, 2005)

Publications

Interplanetary coronal mass ejection observed at STEREO-A, Mars, comet 67P/Churyumov-Gerasimenko, Saturn, and New Horizons en-route to Pluto. Comparison of its Forbush decreases at 1.4, 3.1 and 9.9 AU,
Witasse et al., JGR 2017





CDPP role in data distribution and valorization

- The RPC team activity on AMDA accounted for 25% of traffic in 2015-2016
- Publications acknowledging AMDA were issued (*very important !*)
 - 8 in 2015, 12 in 2016, 8 in 2017
- The CDPP offered a wide environment of tools and complementary data
- This collaboration was a success from both RPC and CDPP points of view
- The CDPP aims at providing similar facilities for the next European Solar and Planetary missions (SO, JUICE)

Connectivité des outils du CDPP

FR

- MEDOC (IAS) : base solaire spatiale 
- APIS (LESIA) : base d'imagerie aurorale   
- SIIG (UNISTRA) : service des indices (*en dev.*) 
- CLWeb (IRAP) : base de données (IMPEX)  
- SciQlop (LPP) : catalogues/classification (*en dev.*) 
- ONERA : modèle de ceintures 

EU

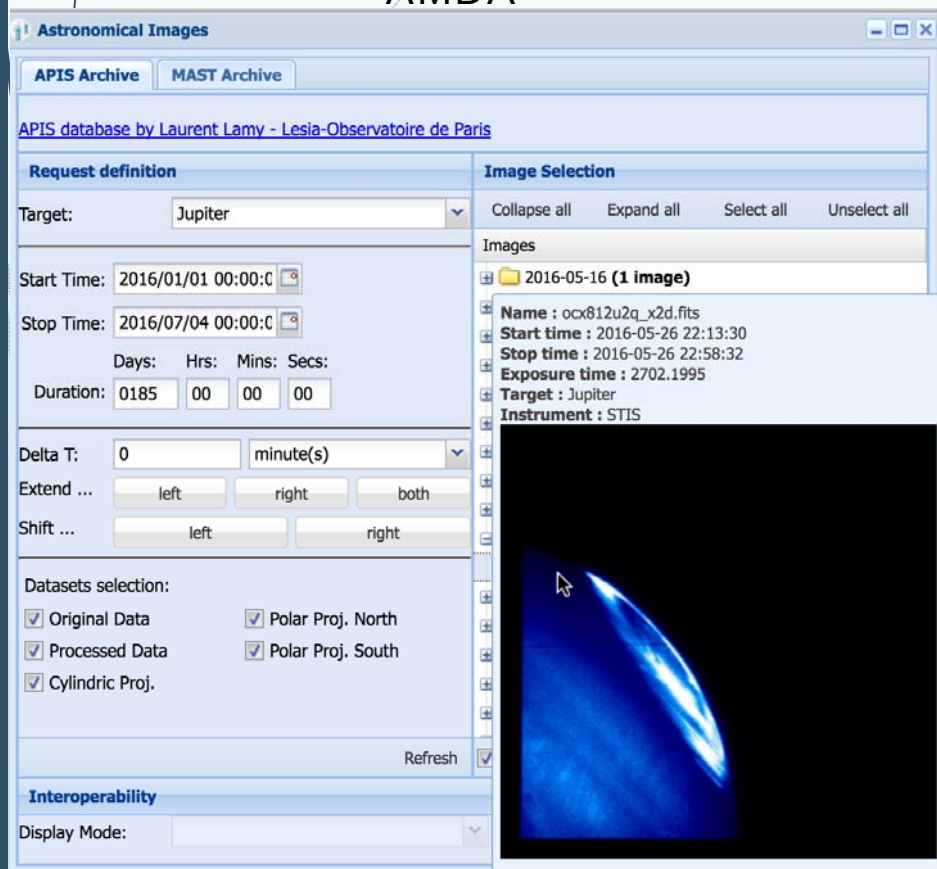
- Bases IMPEX : modèles et simulations en planétologie  
- CSA (ESA/ESAC) : archive des données Cluster (*en test*) 
- VESPA (LESIA) : registre des ressources EuroPlanet   

Int.

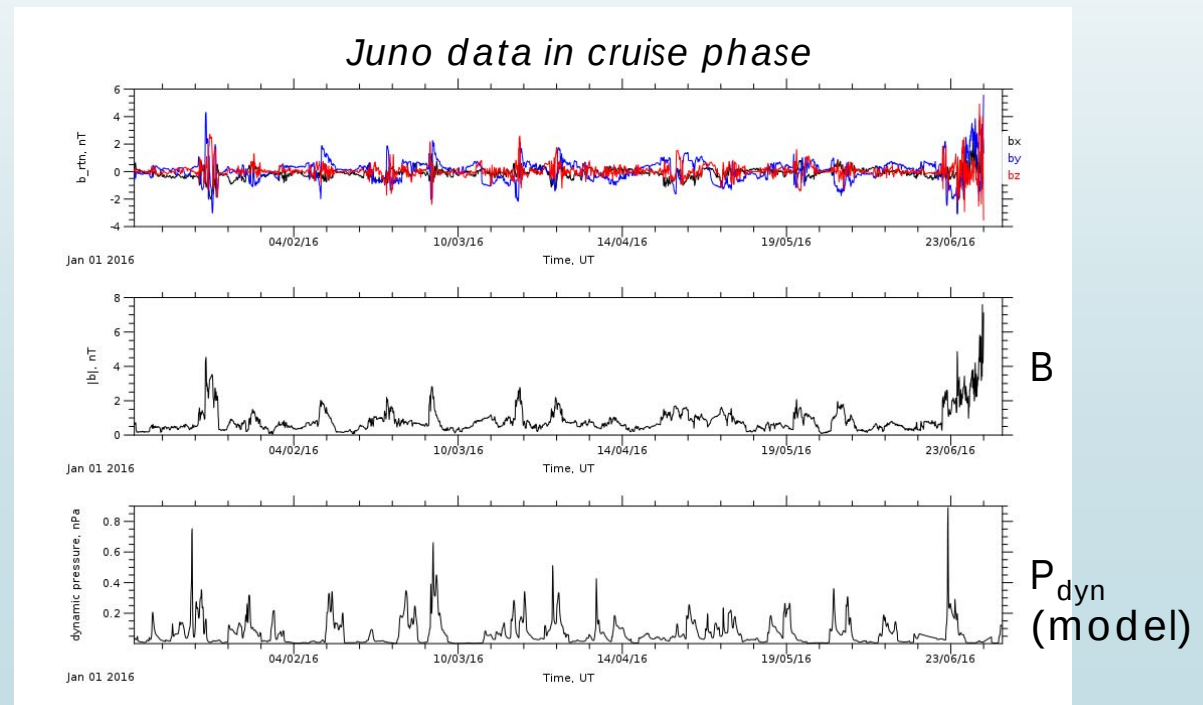
- CDAWeb (NASA/GSFC) : archive de données magnétosphériques  
- MAPSKP (U. Michigan/Cassini) : données Cassini 
- MAST : base d'imagerie aurorale du HST  
- CCMC : base de simulation (*démonstrateur*)  
- UCLA : simulations à Saturne (*démonstrateur*) 

Connexion à APIS (LESIA)

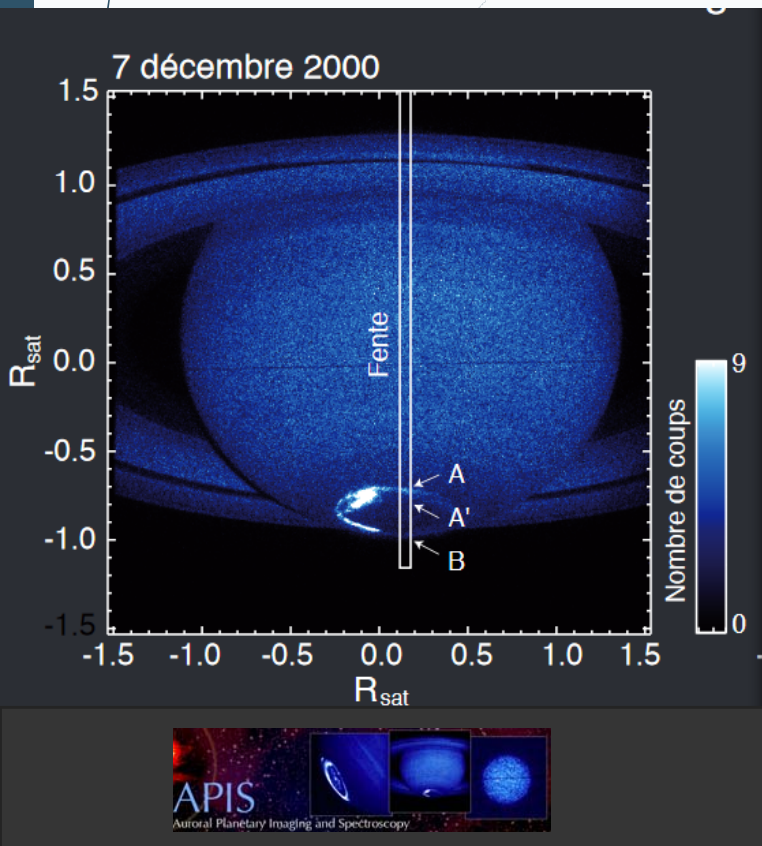
AMDA



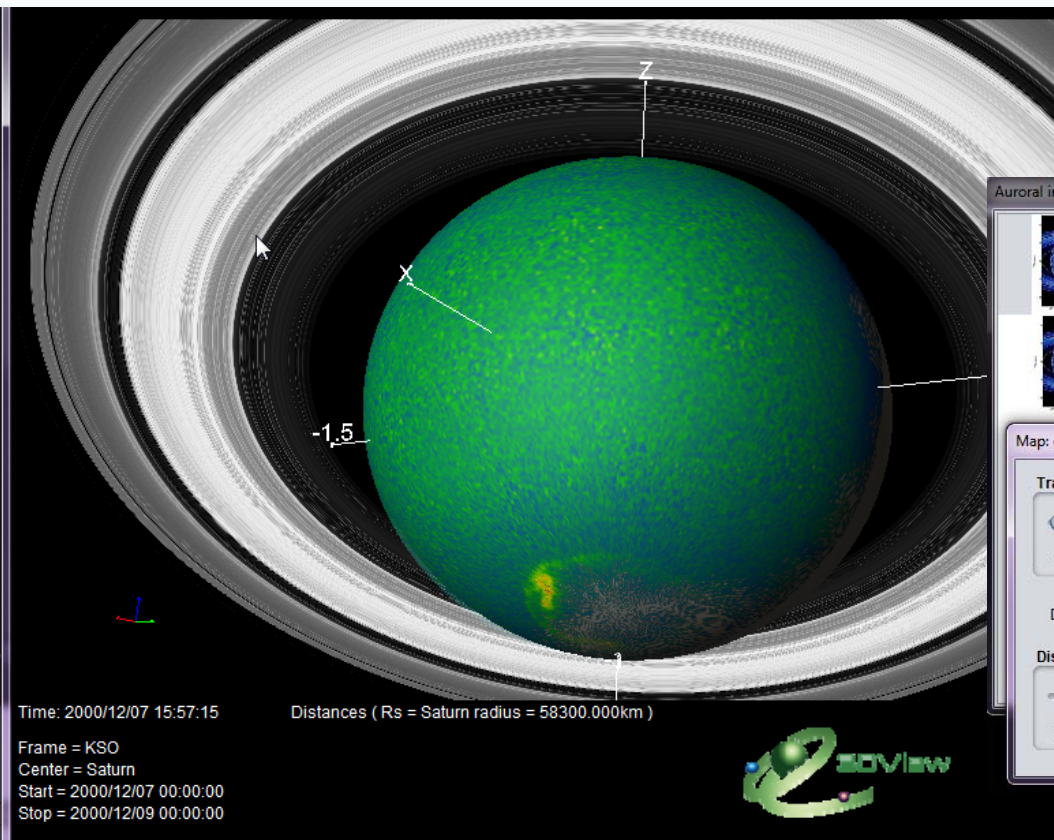
- La base APIS est accédée à la fois par AMDA et 3DView
 - Grâce au protocole EPN-TAP (VESPA)
 - AMDA (2010), 3DView et Propagation Tool (2017)
- Cf poster de L. Lamy et al.



Connexion à APIS (LESIA)

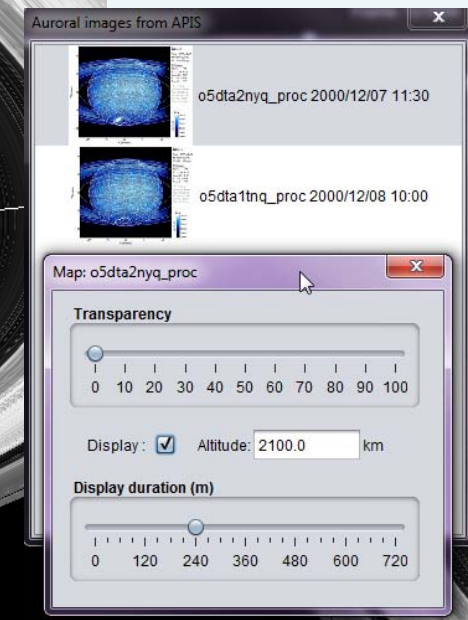


APIS

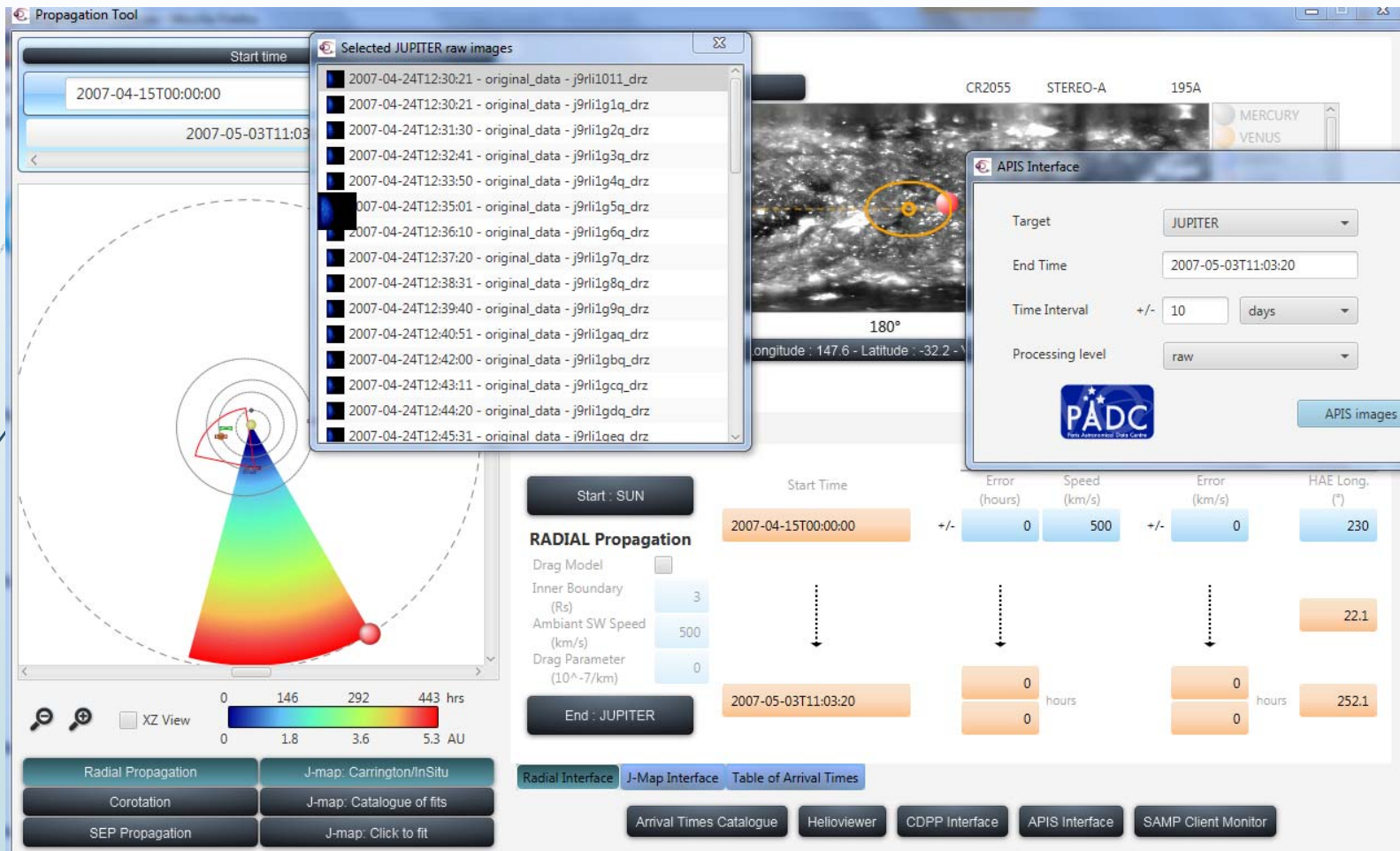


3DView

Affichage des images
« processed »,



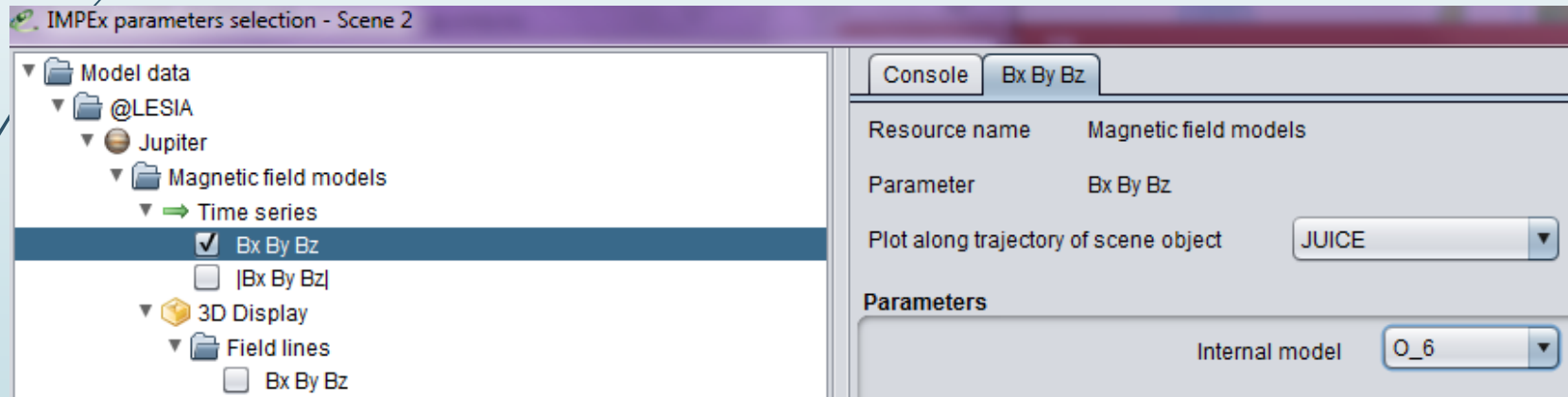
Connexion à APIS (LESIA)



Propagation Tool

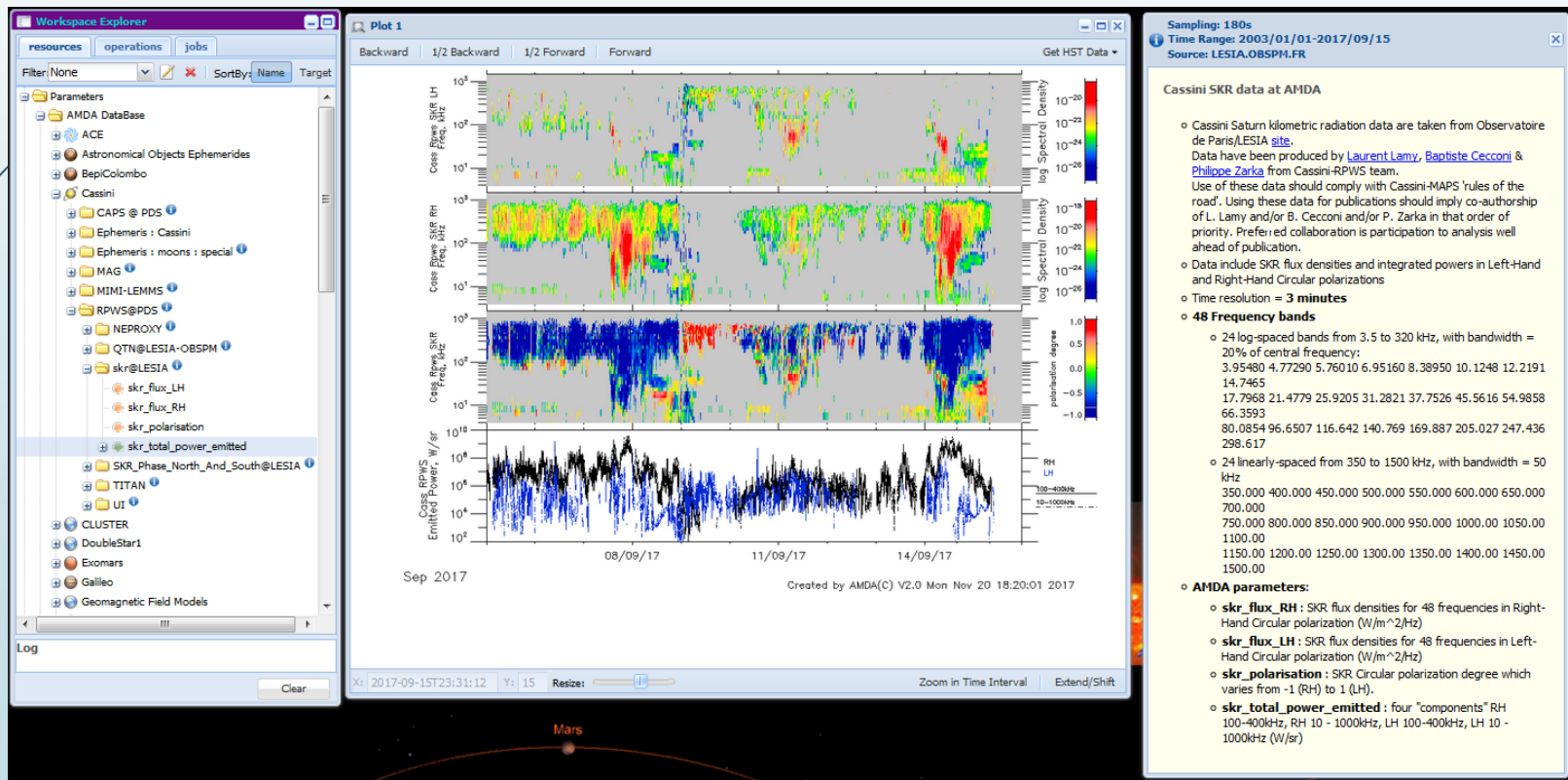
Connexion autre service (LESIA)

- Web service de calcul de champ magnétique
 - O6, VIT4, VIP4, VIPAL
 - Status ?



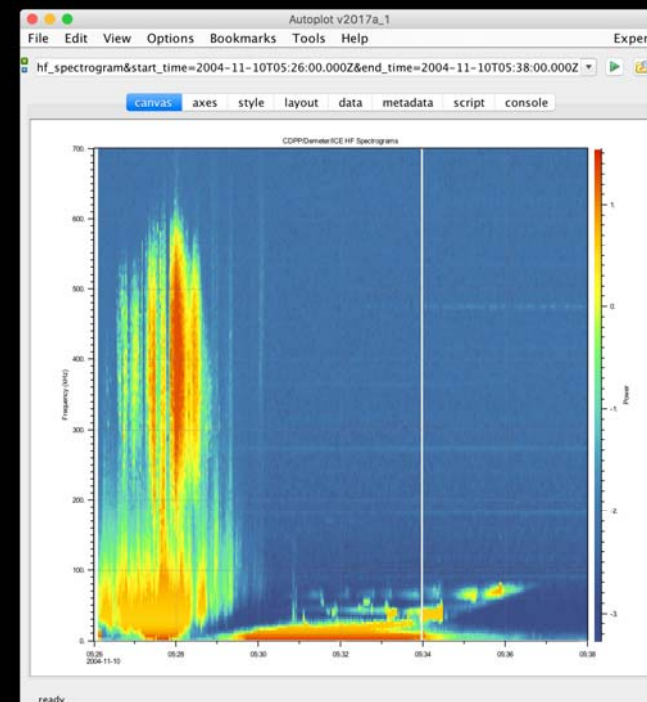
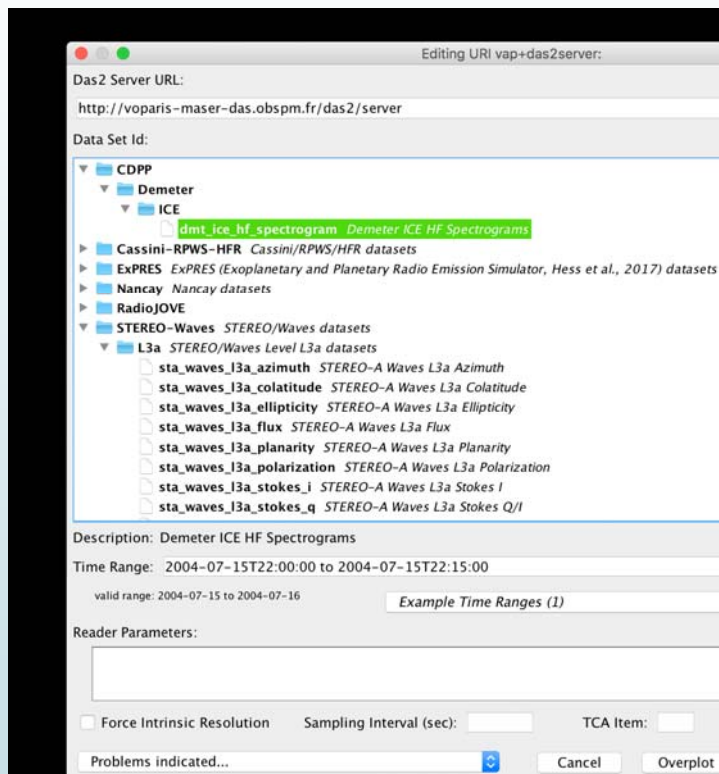
Connexion autre service (LESIA)

- Données RPWS/SKR de Cassini (2003-2017)
- Envoi régulier des données par L. Lamy pour mise à disposition dans AMDA

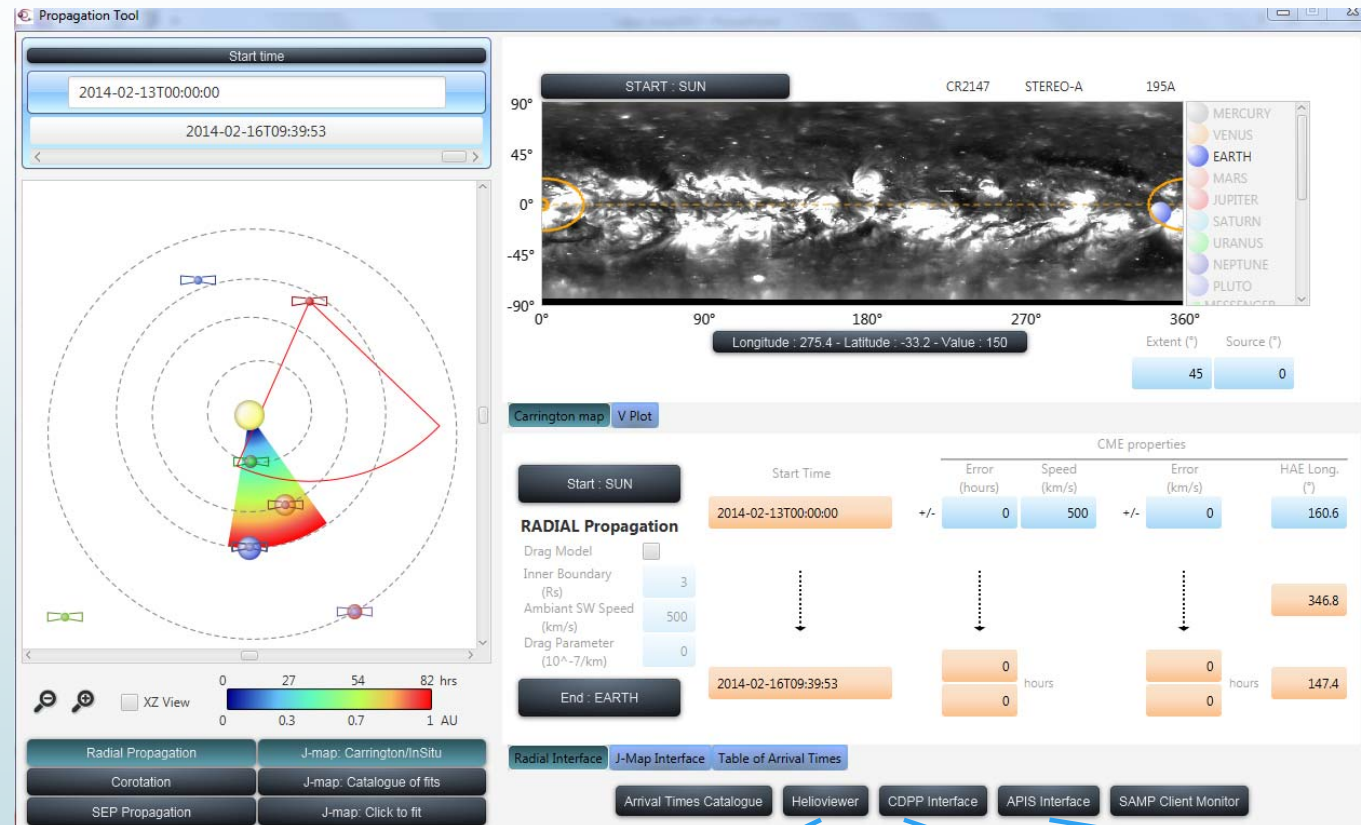
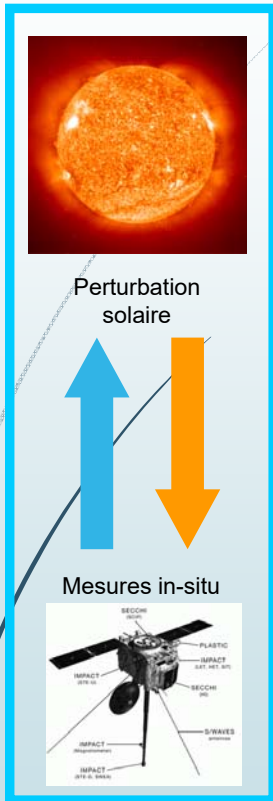


Connexion autre service (LESIA)

- Valorisation des données radio de l'archive CDP
- Serveur «das2» à Toulouse (à l'étude)
- Fonctionnel au LESIA pour les données Voyager
- Collaboration LPC2E/LESIA : module pour lire et distribuer les données Demeter/ICE Spectrogramme HF (B. Cecconi)



Connexion à MEDOC



Outil de propagation



Données solaires
à MEDOC

Données in-situ
sur AMDA

Données imagerie
aurorale : APIS

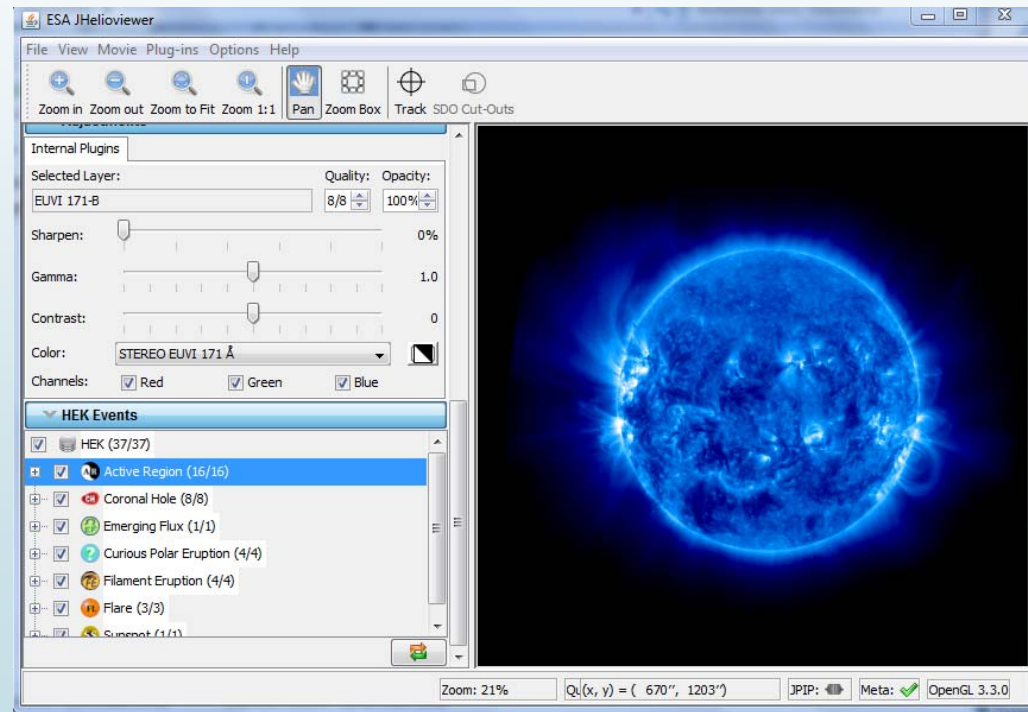
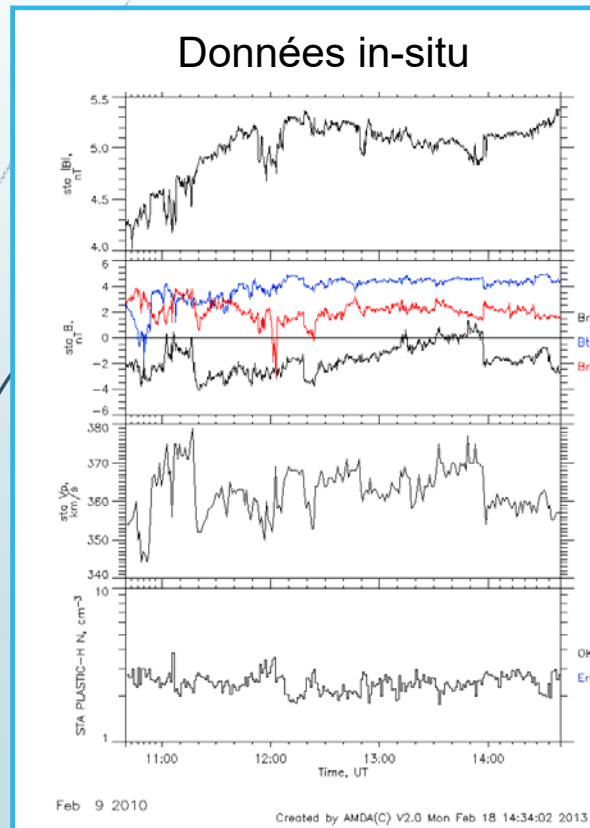


$T_{S/C}$

T_{sun}

AMDA plot

MEDOC database / JHelioviewer



Données solaires

Exploitation du Propagation Tool

- L'outil a été utilisé pour plusieurs études
 - Catalogues de CIR : produits pour HELCATS et accessibles dans l'outil
 - Effets des CME sur les SEP
- Présentations régulières au groupe MADAWG (préparation à l'exploitation de Solar Orbiter)
- Publications 2017, surtout dans le cadre de HELCATS
 - Observational Evidence for the Associated Formation of Blobs and Raining Inflows in the Solar Corona, Sanchez-Diaz et al., The Astrophysical Journal Letters, 835, 1, article id. L7, 7, 2017a
 - The temporal and spatial scales of density structures released in the slow solar wind, Sanchez-Diaz, E., et al., submitted to Astrophysical Journal, 2017b
 - The magnetic connectivity of coronal shocks from behind-the-limb flares to the visible solar surface during gamma-ray events, Plotnikov, I., et al., Astronomy and Astrophysics, In Press, DOI [10.1051/0004-6361/201730804](https://doi.org/10.1051/0004-6361/201730804) 2017
 - Rouillard et al., A propagation tool to connect remote-sensing observations with in-situ measurements of heliospheric structures, Planetary and Space Science, doi:10.1016/j.pss.2017.07.001, 2017

Participation du CDPP au SSA / Heliospheric-Expert Service Center



ESA SSA SWE NEO SST

About SWE

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

Service Domains

- Spacecraft Design
- Spacecraft Operation
- Human Space Flight
- Launch Operation
- Transionospheric Radio Link
- Space Surveillance and Tracking
- Power Systems Operation
- Airlines
- Resource Exploitation System Operation
- Pipeline Operation
- Auroral Tourism Sector
- General Data Service

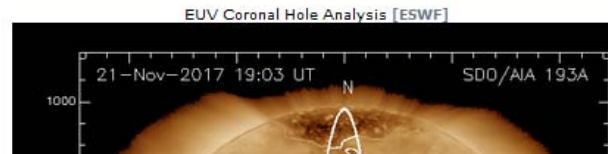
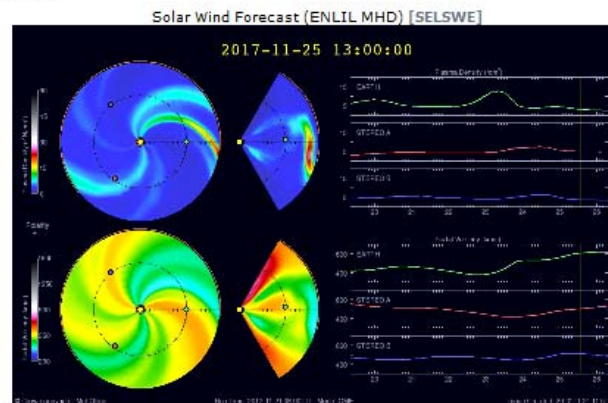
Expert Service Centres

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

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

ESWF

- Empirical Forecast

DBM

- CME Event Model

AWARE

- Automated near-Earth alerts

AMDA

- Archive of planetary/solar wind/Earth magnetosphere & ionosphere missions and ground-based assets
- Supporting models: magnetic footprints, magnetic fields, solar wind propagation at planets and probes, ...
- Access to external databases for observations and simulations (hybrid, MHD)
- Embedded plotting, data mining, and cataloguing functionalities

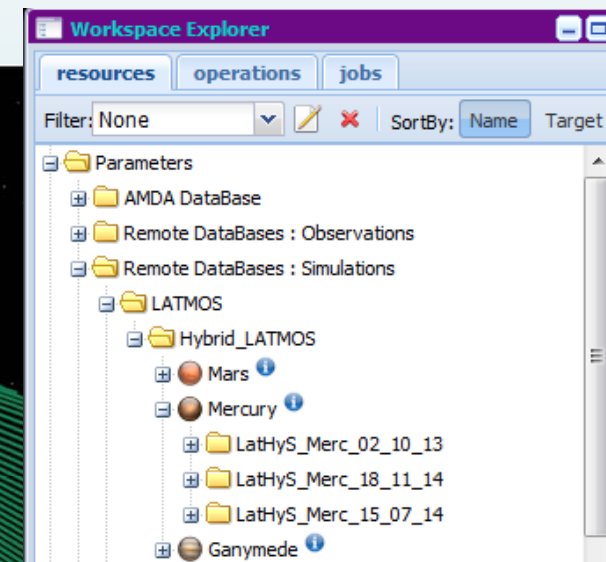
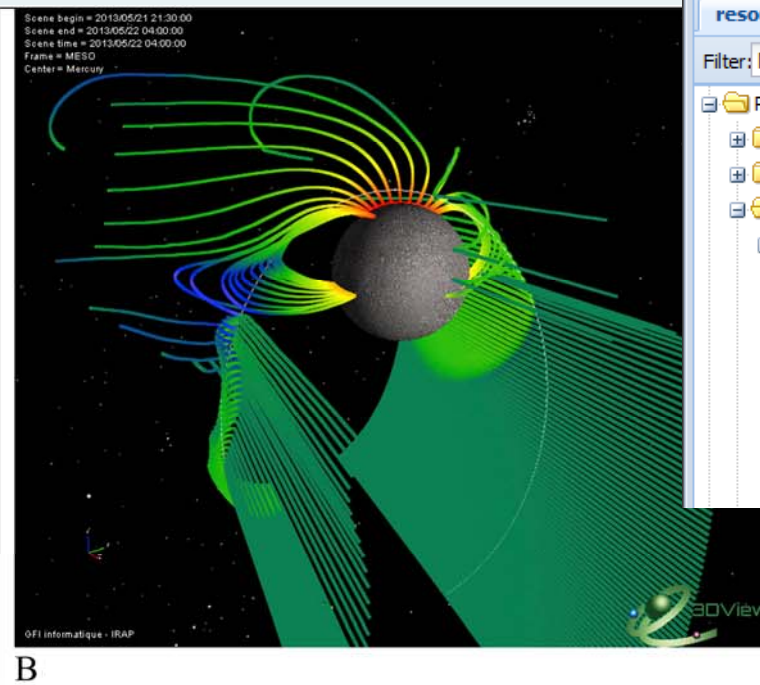
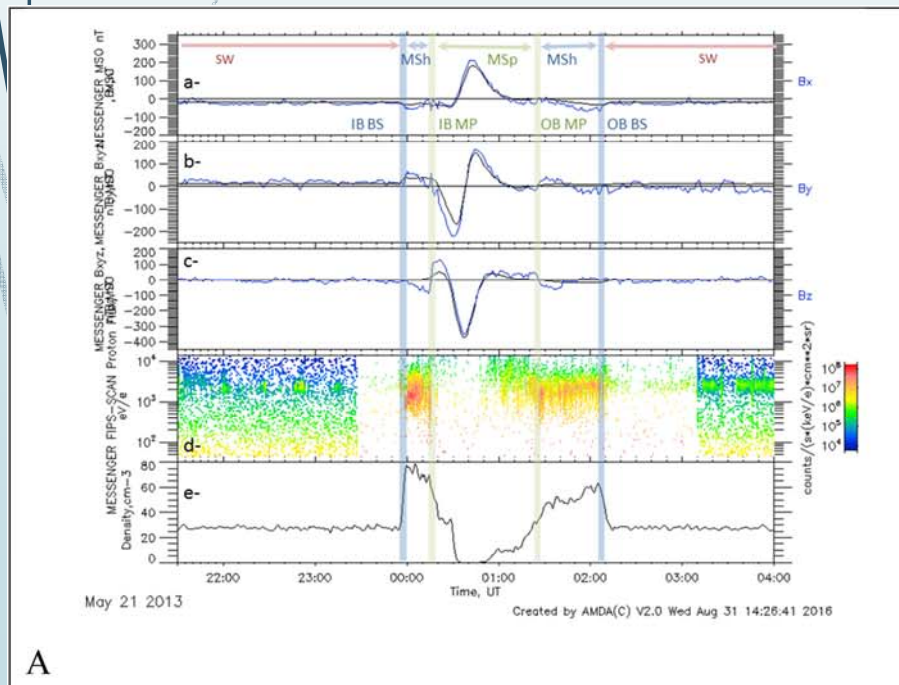
Coming soon:

PROPTOOL

- CME/CIR/SEP arrival times at all planets/probes/comets
- Tracking of heliospheric structures using white light J-maps
- Access catalogues of CME / CIR trajectories
- Connect in-situ (AMDA) and imagery (JHelioviewer/MEDOC) databases

Connexion à LatHyS (LATMOS)

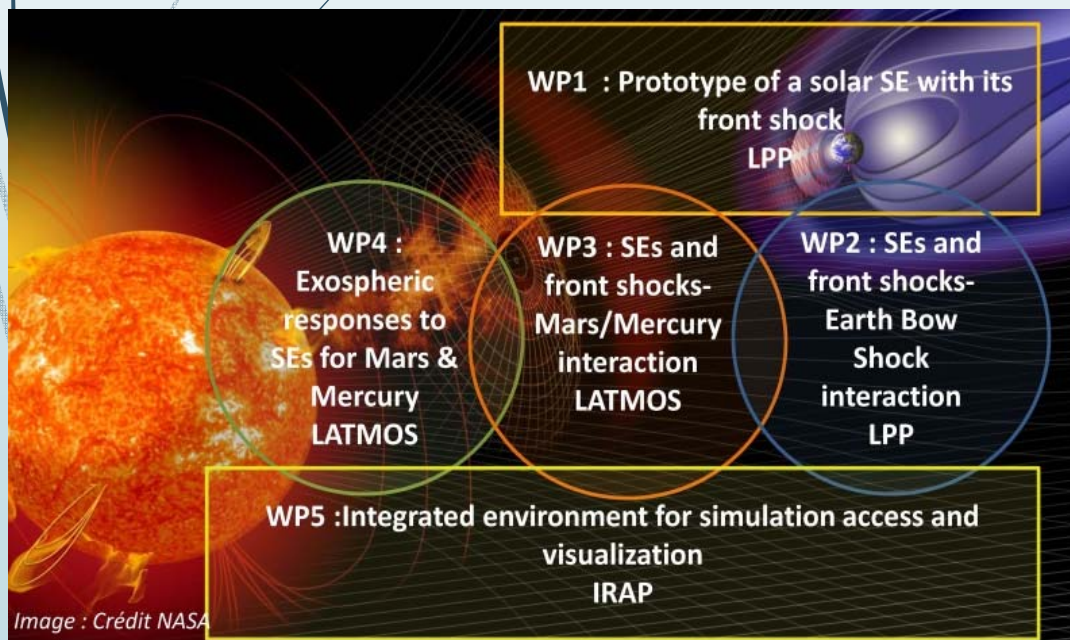
- Visibilité des simulations hybrides Mars/Mercure/Ganymède du LATMOS
- Comparaison données/observations depuis AMDA et 3DView
- Connexion (=protocole/standards) réalisée dans le cadre d'IMPEX (2011-2015)



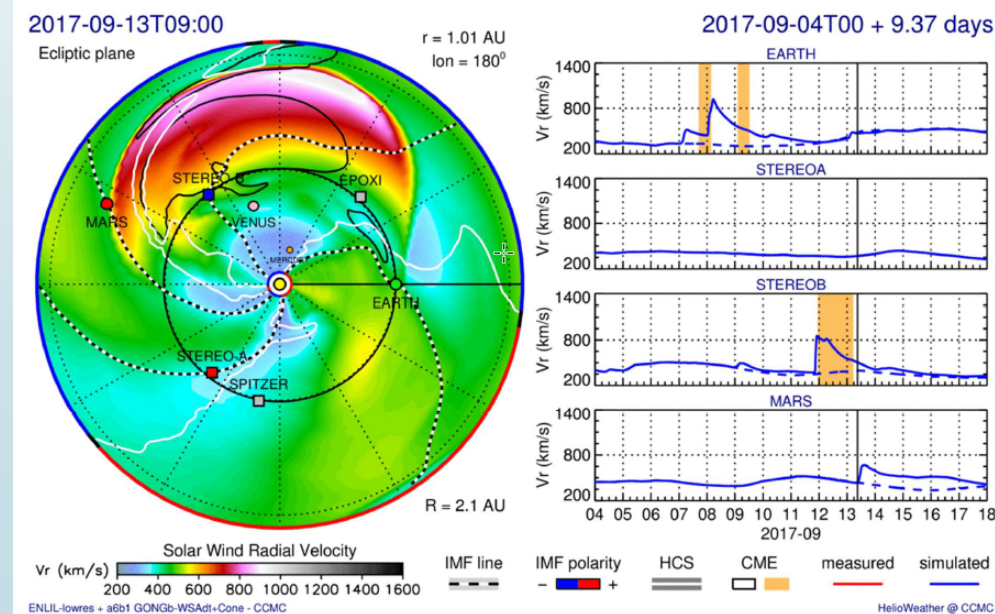
Génot et al., 2017

Connexion à LatHyS (LATMOS)

- Continuité avec le démarrage de l'ANR TEMPETE en 2018 (= Temporal Evolution of Magnetized Planetary Environments during exTreme Events)
- Simulations dépendantes du temps / évolution des outils
- Cf poster (R. Modolo et al.)

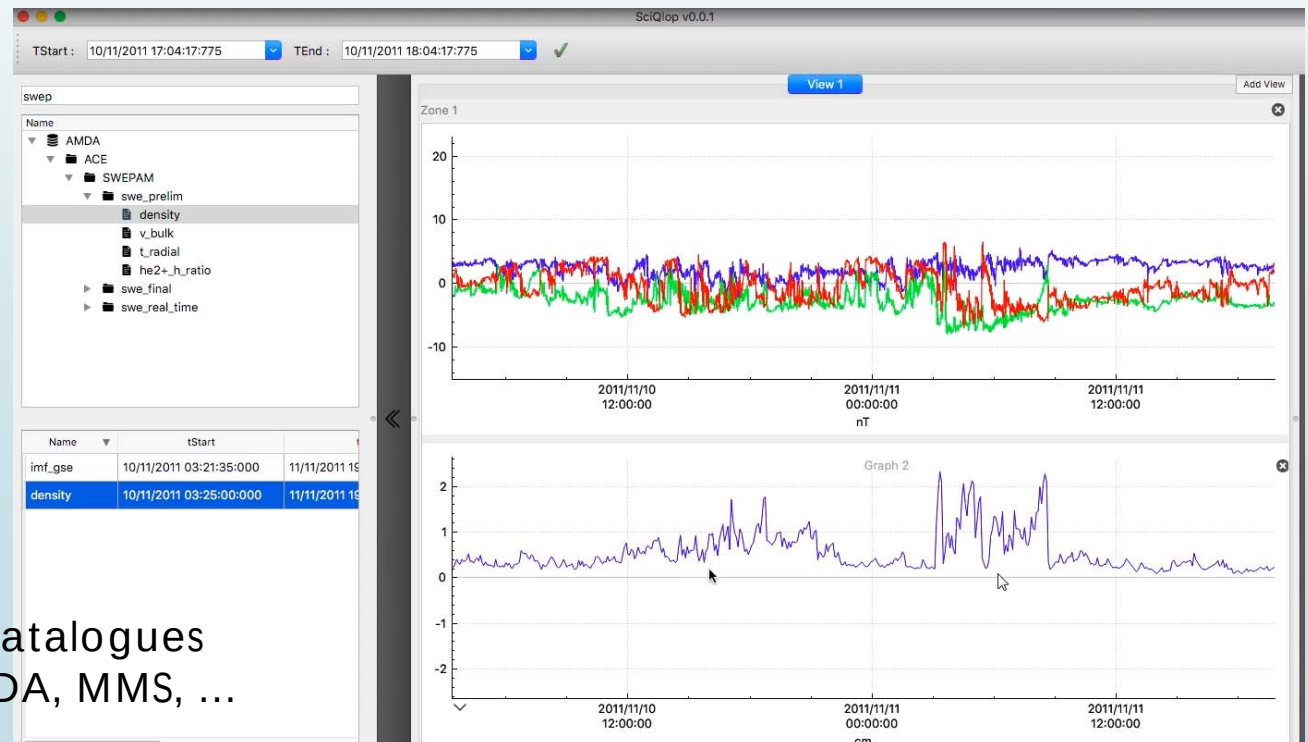
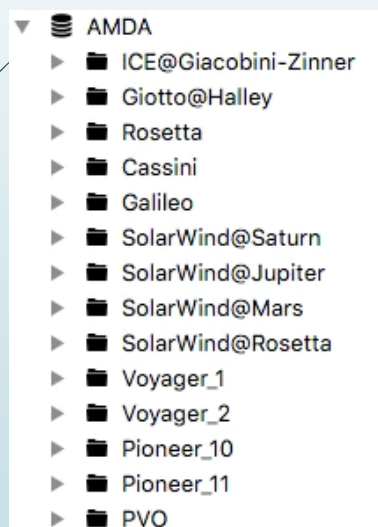


Sept. 2017 event / ENLIL



Connexion à SciQlop (LPP)

- Connexion de SciQlop à AMDA
 - Utilisation des WS d'accès aux données d'AMDA
- Cf dernière présentation orale de la journée (N. Aunai et al.)

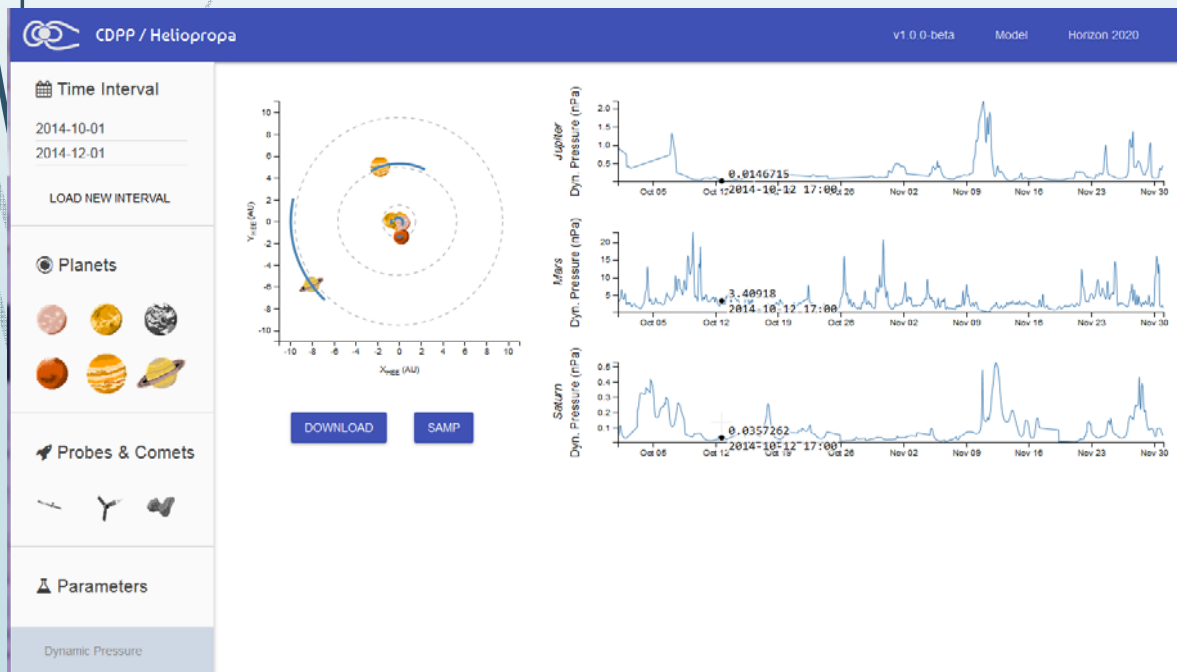


- Identification de regions, catalogues
- Connexion à CDAWeb, AMDA, MMS, ...

Mise en ligne de modèles

<http://heliopropa.irap.omp.eu/>

- Mise à disposition des résultats de vent solaire propagé à différentes planètes et sondes (code 1D MHD *Tao et al*, 2005)
- Interface web → appel à AMDA → visualisation
- Utilisation de données « real time » (ACE, DSCOVR) pour une prédiction à qq jours pour Mars et Jupiter

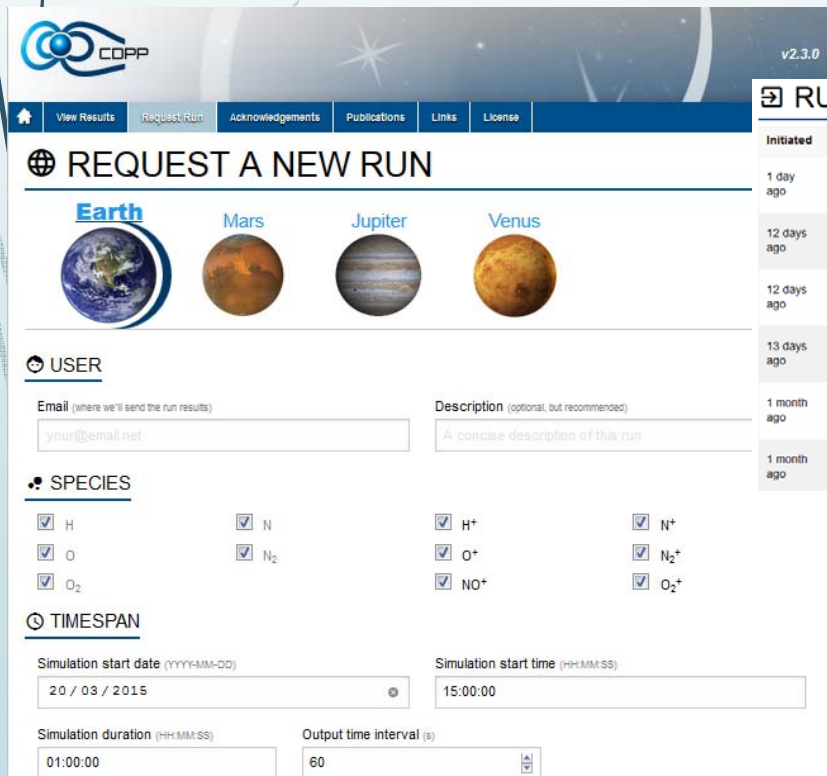


- Suivi facilité de perturbations dans l'héliosphère
- Proposé à SSA / H-ESC P3 (en négociation)
- Mise en place d'un service d'alertes (VOEvent)
- Financement Europlanet/PSWS

Mise en ligne de modèles

<http://transplanet.irap.omp.eu/>

- Mise en ligne du code ionosphérique IPIM (*Blelly & Marchaudon, 2015*)
- Extension à Mars, Jupiter, Vénus (new)
- Interface web → calculateur → base de données de résultats



CDPP v2.3.0

View Results Request Run Acknowledgements Publications Links License

REQUEST A NEW RUN

Earth Mars Jupiter Venus

USER

Email (where we'll send the run results):

Description (optional, but recommended):

SPECIES

☒ H ☒ N ☒ H⁺ ☒ N⁺

☒ O ☒ N₂ ☒ O⁺ ☒ N₂⁺

☒ O₂ ☒ NO⁺ ☒ O₂⁺

TIMESPAN

Simulation start date (YYYY-MM-DD):

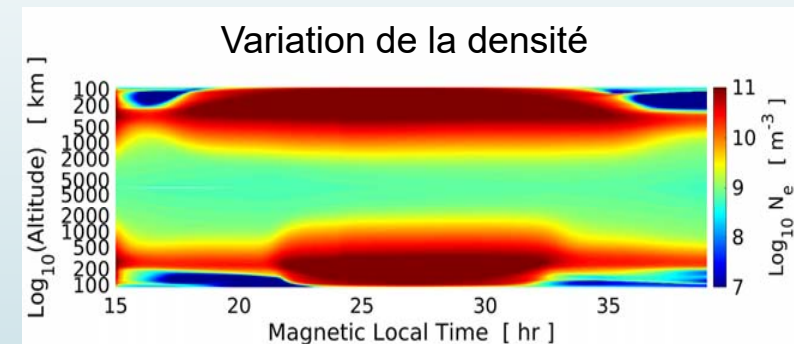
Simulation start time (HH:MM:SS):

Simulation duration (HH:MM:SS):

Output time interval (s):

RUNS (103)

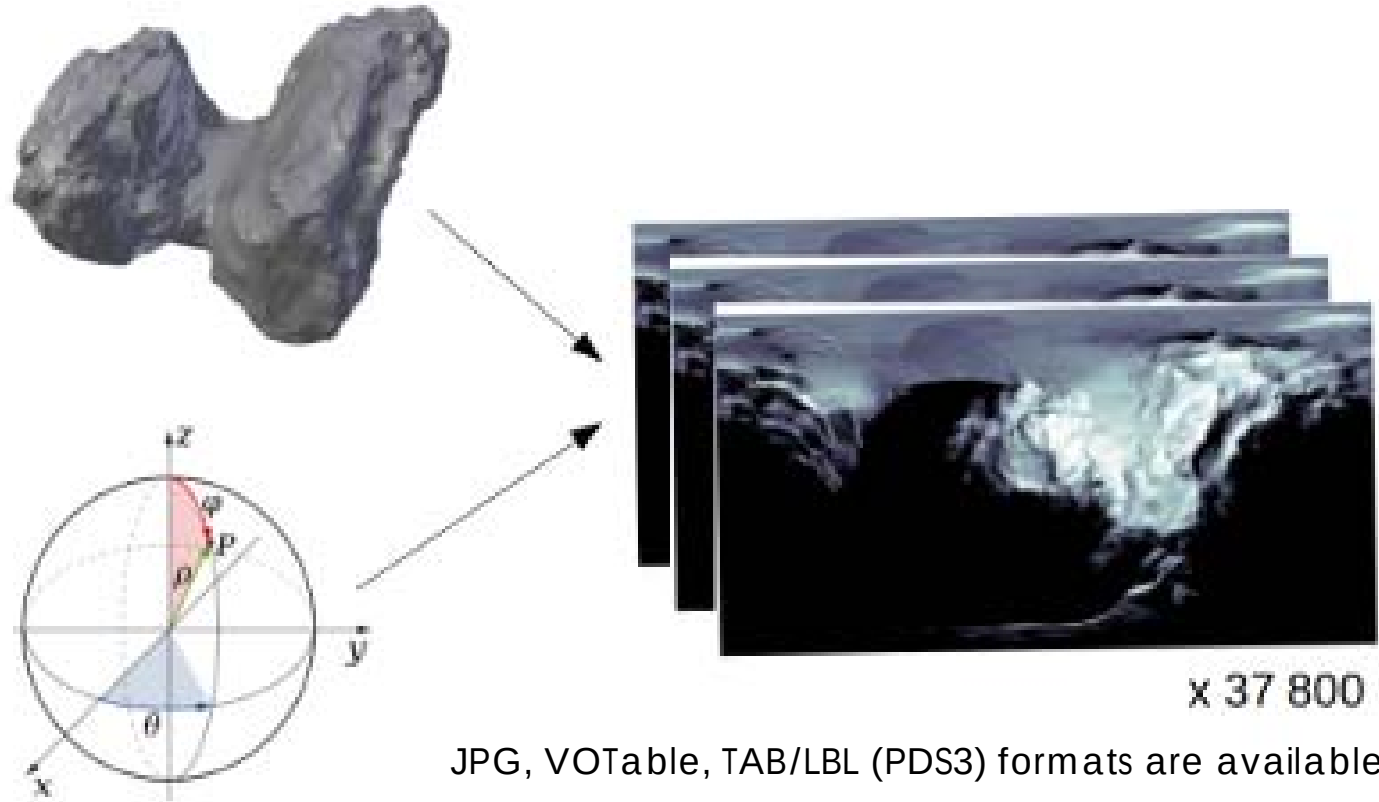
Initiated	User	Id	Description	Kti	Kpi	Mag	Atm
1 day ago	Mikel Indurain	..._201503140001_..._201503140001	First Venus Test	4h	60s	✓ 1	No B field Hedin Model ✓
12 days ago	Kilian Thezelais	..._201503130000_..._201503130000	Simul. T. 1day	24h	60s	✓ 2	IGRF MSIS ×
12 days ago	Kthezelais	..._201503130000_..._201503130000	test Terre	1h	60s	✓ 1	IGRF MSIS ✓
13 days ago	Kilian Thezelais	..._201503120000_..._201503120000	test	10m	60s	✓ 1	IGRF MSIS ✓
1 month ago	Japheth Yates	..._201503080000_..._201503080000		5m	60s	✓ 1	VIPAL (Generic) Galileo ✓
1 month ago	B. Sanchezano	..._201503080000_..._201503080000	test	1h	60s	✓ 1	No B field MCD ✓



- Plusieurs dizaines de simulations disponibles
- Test d'architecture pour d'autres codes
- Intérêt exprimé par SSA / I-ESC (en discussion)
- Financement Europlanet/PSWS

Illumination maps of comet 67P

- Collaboration with Imperial College London (code by A. Beth)
- Deliverable for ESAC
- VESPA service



JPG, VOTable, TAB/LBL (PDS3) formats are available

Availability in

- EPN TAP server for AMDA data
- EPN TAP clients developed in AMDA, 3DView and the Propagation Tool
- See S. Erard's presentation

VESPA
Virtual European Solar and Planetary Access

All VO Custom resource Direct Query Advanced Query Help

EPN Resources

AMDA - Planetary and heliophysics plasma data at CDP/AMDA	963741 results	🔍	📄	📊	📅
APIS - Auroral Planetary Imaging and Spectroscopy	33066 results	🔍	📄	📊	📅
BASECOM - The Nançay Cometary Database	15811 results	🔍	📄	📊	📅
BDIP - Base de Données d'Images Planétaires	16906 results	🔍	📄	📊	📅
BIRA-IASB TAP - Profiles from SPICAV-SOIR/VEX	1612 results	🔍	📄	📊	📅
CLIMSO - CLIMSO coronagraphs at pic du midi de Bigorre	163448 results	🔍	📄	📊	📅
CRISM - CRISM data from Earth Server 2	20722 results	🔍	📄	📊	📅
DynAstVO - Asteroid orbital database and ephemerides	16881 results	🔍	📄	📊	📅
ExoPlanet - Extrasolar Planets Encyclopaedia	3631 results	🔍	📄	📊	📅
HFC1AR - Heliophysics Feature Catalog active regions	948827 results	🔍	📄	📊	📅
HFC1T3 - Heliophysics Feature Catalog type 3 radio bursts	90845 results	🔍	📄	📊	📅
litateHF - litate HF data	3050 results	🔍	📄	📊	📅
IKS - IR spectroscopy of comet Halley	206 results	🔍	📄	📊	📅
ILLU67P - Illumination maps of 67P	189000 results	🔍	📄	📊	📅
IMPEX_EPN20 - IMPEX Simulation Data	1277 results	🔍	📄	📊	📅
IPRT - IPRT/AMATERAS data	1410 results	🔍	📄	📊	📅
M4AST - M4AST - Modeling for Asteroids	6414 results	🔍	📄	📊	📅
Mars_Craters - Martian Impact Craters	384344 results	🔍	📄	📊	📅
MCD - EPN-TAP access to the MCD database	62244 results	🔍	📄	📊	📅
MDISC - UCL Magnetodisc Model for Jupiter and Saturn	22 results	🔍	📄	📊	📅
mpc - Minor Planet Center - Asteroid Orbital Data	746779 results	🔍	📄	📊	📅
nasadustcat - INAF-IAPS RDB NASA dust catalogue TAP service	4272 results	🔍	📄	📊	📅
NDA Obs. Database - Nançay Decameter Array observation database	26196 results	🔍	📄	📊	📅
pds_speclib - PDS spectral library	2260 results	🔍	📄	📊	📅
planets - Main characteristics of solar system planets	8 results	🔍	📄	📊	📅
PSWS Transplanet - Magnetosphere Ionosphere coupling simulation runs	346 results	🔍	📄	📊	📅

Plotting tools

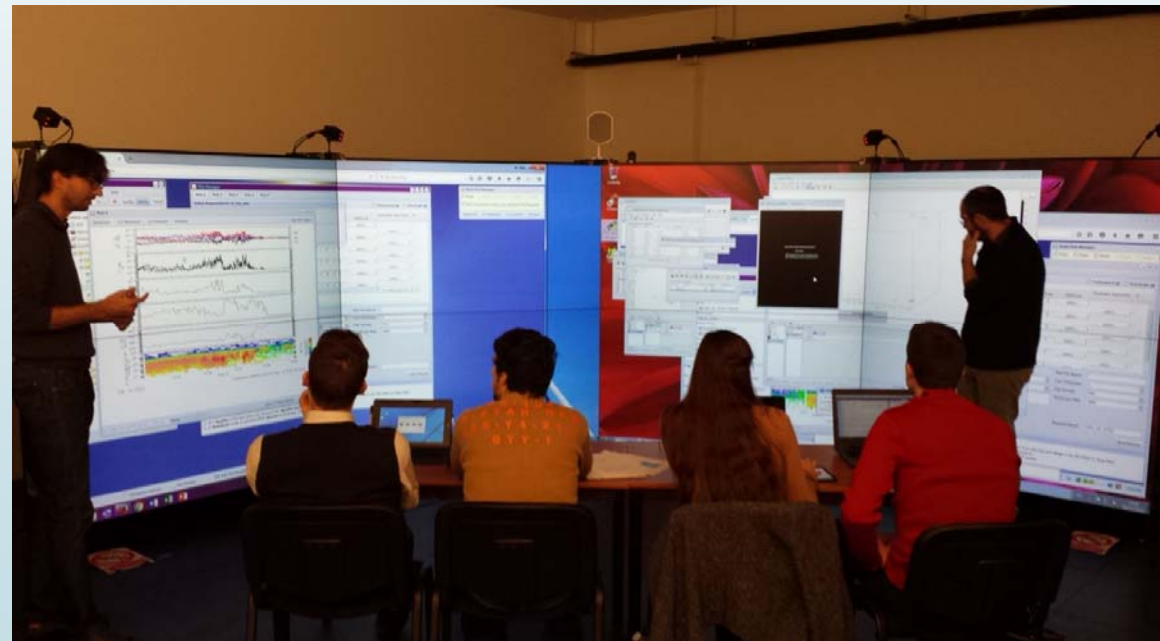
- TOPCAT
- Aladin
- SPLAT
- CASSIS
- efi-3DView

Example queries

Saturn in March 2012

Utilisation des moyens du CDPP dans les formations

- Master Astro/Plasma de Paris, Orléans, Toulouse
- TP d'analyse de données
 - Relation de Rankine-Hugoniot à la traversée de choc, visu 3D des chocs interplanétaires, ...
- Ecoles d'été (Plas@Par, en Afrique, ...)
- Workshop ESA/Chine sur MEX



Conclusion



- Bons retours scientifiques (publications)
- Implication missions, SSA, ANR, H2020, labos
- Ressources (-)
- Merci au CU, aux utilisateurs (feedback)