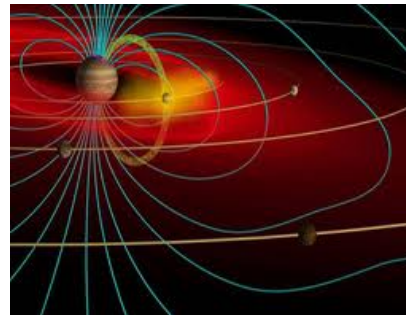
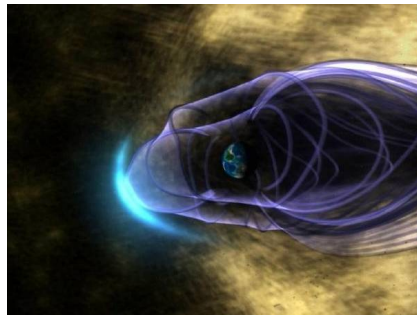
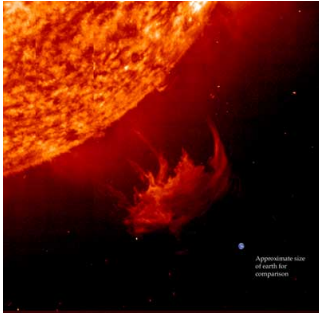




Atelier Solar Orbiter
Toulouse, 4-6 novembre 2014
CDPP team

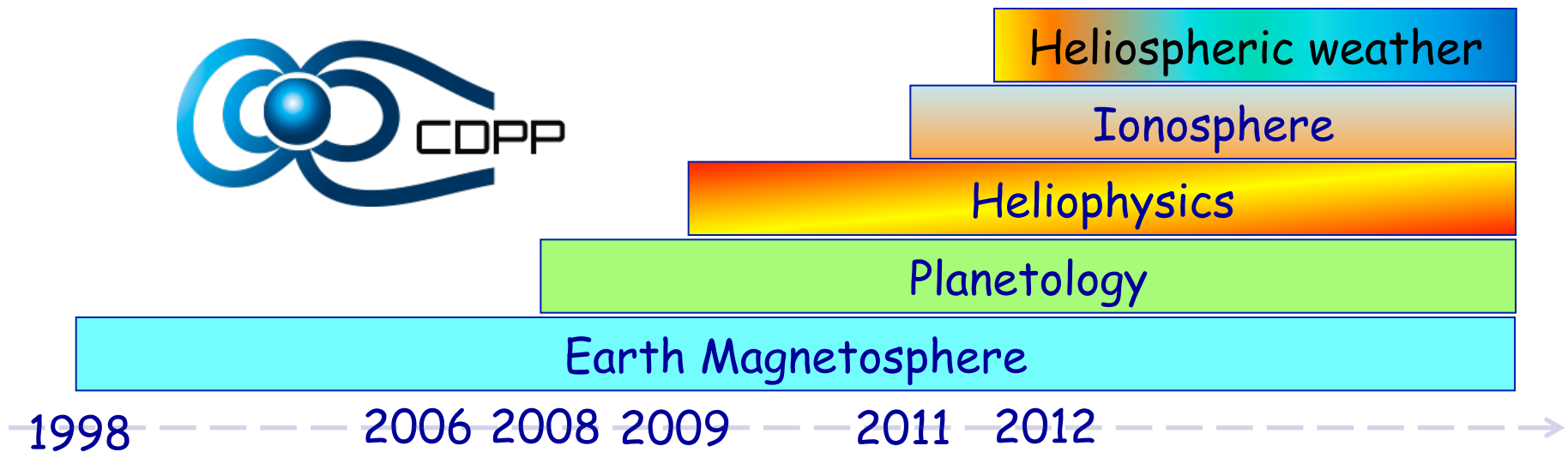
A data/tool base for natural plasma physics

- Natural plasmas :



- Approaches / origin of data
 - In-situ (S/C) and ground (radar) measurements
 - Analytical Models
 - Simulations (MHD / kinetic codes)
- Missions
 - Identify / collect / archive data on the long term
 - Provide scientific services and tools to exploit data

CDPP evolution



Tools



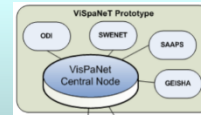
+ *space weather tool*

CDPP organisation

- Initially 2 funding partners : CNRS & CNES
- Now includes Observatoire de Paris & Université Paul Sabatier (Toulouse)
- A « director committee » takes strategic decisions
- A « user committee » suggests scientific directions
- Partnering (French) laboratories (LESIA, LPC2E, ...) provide their data
- Regular feedback (at conferences, workshops, tool test campaigns, ...) enables proper community insertion
- User interest are diversified
 - In physics / studied regions
 - In methodology : radar, imagery, radio, in-situ
 - in IT : computation, system, Virtual Observatory standards
- Personal : about 10 FTE

Projects

- Vispanet (ESA)
- EuroPlanet/IDIS (FP7)
- HELIO (FP7)



- IMPEX (FP7) → 05/2015

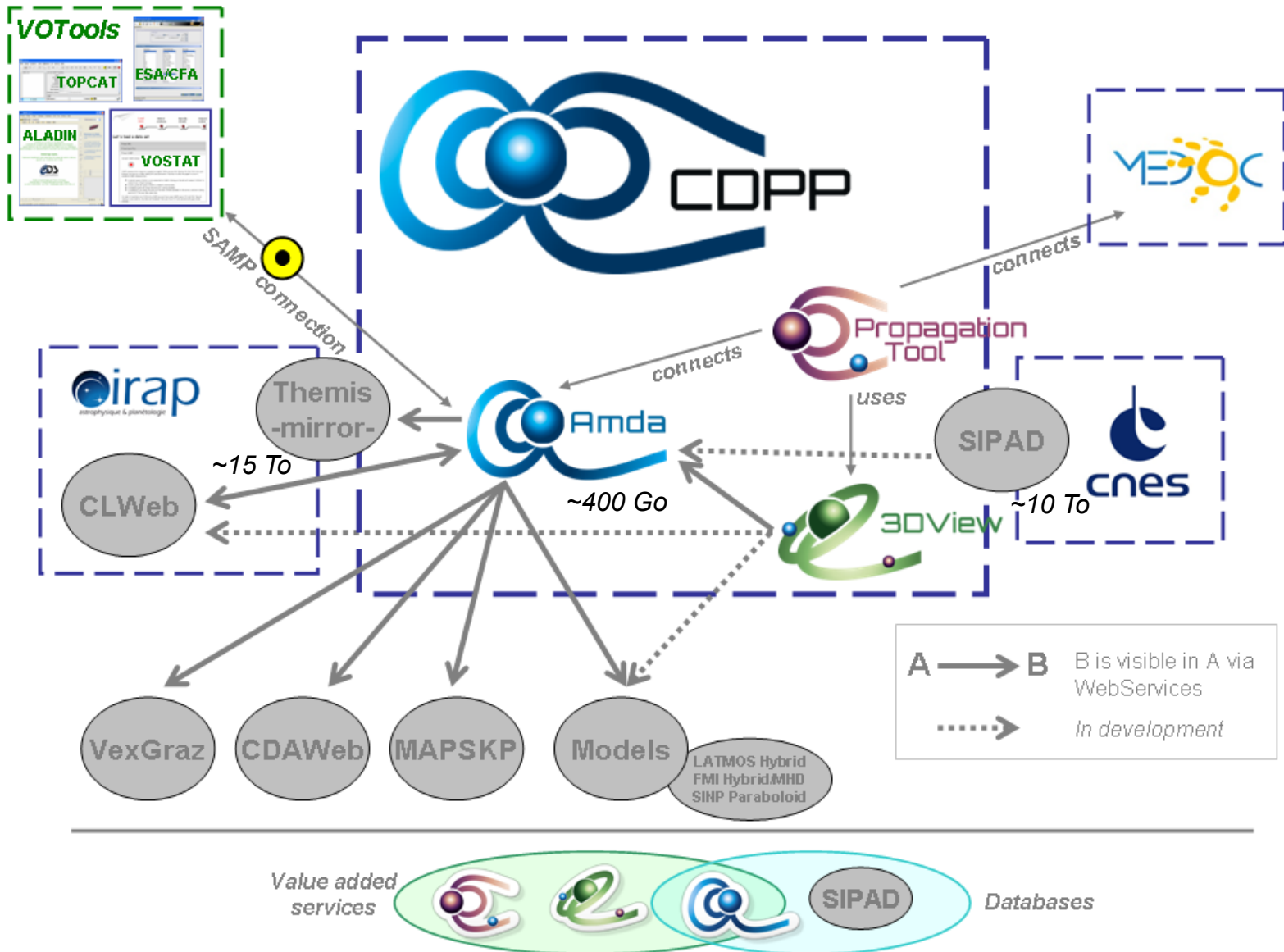


- Helcats (FP7) → 04/2017



- *SAA (contractor for the Heliospheric Weather ESC) : start 2015*

CDPP services in broader context



Data access at CDPP / summary

- The CDPP provides data (@CNES, @IRAP, @external DB) in the fields of
 - The Earth ionosphere and magnetosphere
 - Planetology
 - Heliophysics
 - Numerical models (analytical, MHD, kinetic)
- System architecture @CNES ensures perennial archiving
- The CDPP provides some *real time* data (ACE)

Current datasets in AMDA

Sun	ULYSSES : Ephem, MAG, SWOOP Stereo : Ephem, SWEA, MAG, PLASTIC ACE : Ephem, MAG, SWEPAM WIND : Ephem, MAG, SWE
Mercury	MESSENGER : Ephem, MAG, FIPS, EPS Mariner 10 : MAG
Venus	Venus Express : Ephem, IMA, ELS, MAG PVO : Ephem, MAG
Earth Moon	THEMIS : Ephem, ESA, MAG Cluster : Ephem, MAG, CIS, PEACE, RAPID, EFW, WHISPER, STAFF Double Star 1 : Ephem, MAG, HIA IMP-8 : Ephem, MAG, MIT GEOTAIL : Ephem, MGF, LEP POLAR : Ephem, MFE INTERBALL-Tail : Ephem, MAG, CORALL ISEE : Ephem, MAG, FVA Indices : AE, DST, ASY-SYM, PC North, AM, AA
Mars	ARTEMIS : Ephem, ESA, MAG Kaguya (under discussion): MAG, PACE
Jupiter	Mars Express : Ephem, IMA, ELS, MARSIS Mars Global Surveyor : Ephem, MAG, ER, PROXY
Saturn	Galileo : Ephem, MAG, EPD, PLS Michigan Solar Wind Model Voyager 1 & 2 : Ephem, MAG, PLS, PWS Pioneer 10 & 11 : MAG ULYSSES : Ephem, MAG, SWOOPS
Uranus	Cassini : Ephem, RPWS (SKR, Langmuir Probe), MAG, CAPS Michigan Solar Wind Model Voyager 1 & 2 : Ephem, MAG Pioneer 11 : MAG
Neptune	Voyager 2 : MAG Voyager 2 : MAG

Solar wind datasets

Planetary datasets

Dataset origins

- French labs (in relation with CNES)
- CDAWeb
- NASA/PDS
- ‘dataset archeology’

3DView



- 3D orbitography tool for spacecraft and celestial objects visualization (pic/movies)
- CNES property, developed by GFI
- Current developements (in the frame of the FP7 IMPEX project) include
 - direct access to external data bases for observations/simulations/models

3dview.cdpp.eu

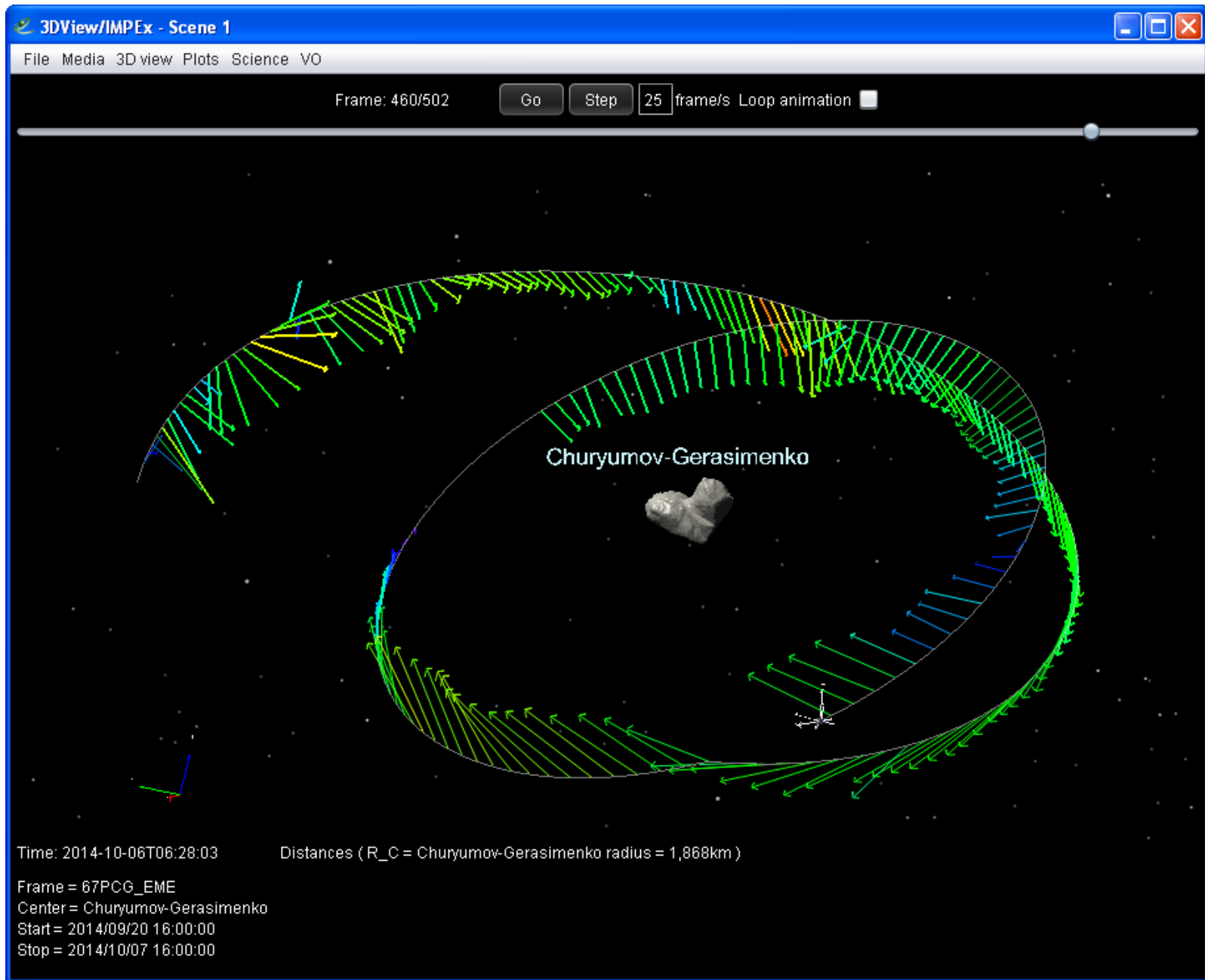
3DView : Instrument FOV

The screenshot displays the 3DView/IMPEX software interface. The main window shows a 3D model of the solar system with the Sun at the center. Two instrument fields of view (FOV) are shown as brown cones originating from the Sun: Stereo-A and Stereo-B. The Sun is labeled 'Sun', and other planets are labeled 'Mars', 'Mercury', 'Venus', and 'Earth'. A coordinate system with X, Y, and Z axes is visible in the bottom left. The software interface includes a menu bar (File, Media, 3D view, Plots, Science, VO), a frame counter (Frame: 164/502), and playback controls (Go, Step, 25 frame/s, Loop animation). Two inset windows show the instrument FOV:

- STA - Target fixed Sun - Fov: 5,00**: Shows a close-up view of the Sun. Direction: RA=-15,12783 DEC=-6,35040.
- STB - Target fixed Sun - Fov: 60,00**: Shows a wider view of the solar system, including the Sun and other planets. Direction: RA=95,36708 DEC=23,60585.

Time: 2012-10-29T21:44:26
Distances (ua = astronomical unit = 149597870,691000000km)
Frame = J2000
Center = Sun
Start = 2012/10/27 15:00:00
Stop = 2012/11/03 15:00:00

Data : B-field along Rosetta orbit



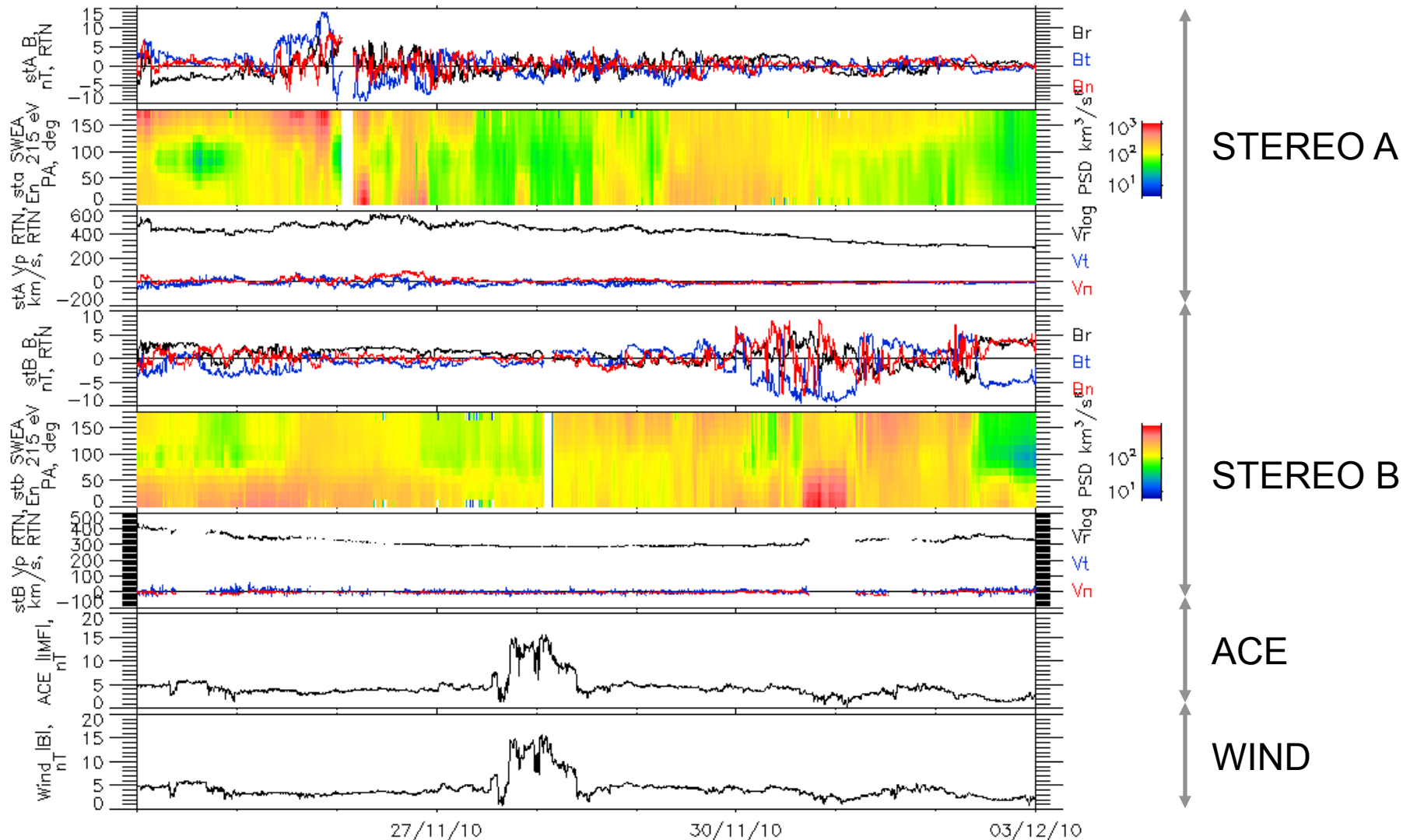
AMDA : database and analysis tool

- Developed since 2006 at IRAP
- Started as a plotting tool for the database formed around simple, standardized physical parameters (times series)
- Enlarged scientific functionalities
 - Data mining
 - New parameter editing
 - Catalogues
- Connections to external databases + regular data ingestion
- 300-400 connections each month
- A few papers per year
- Involvement in several projects
- Used for educational purposes



amda.cdpp.eu

Ex: Solar wind data in AMDA



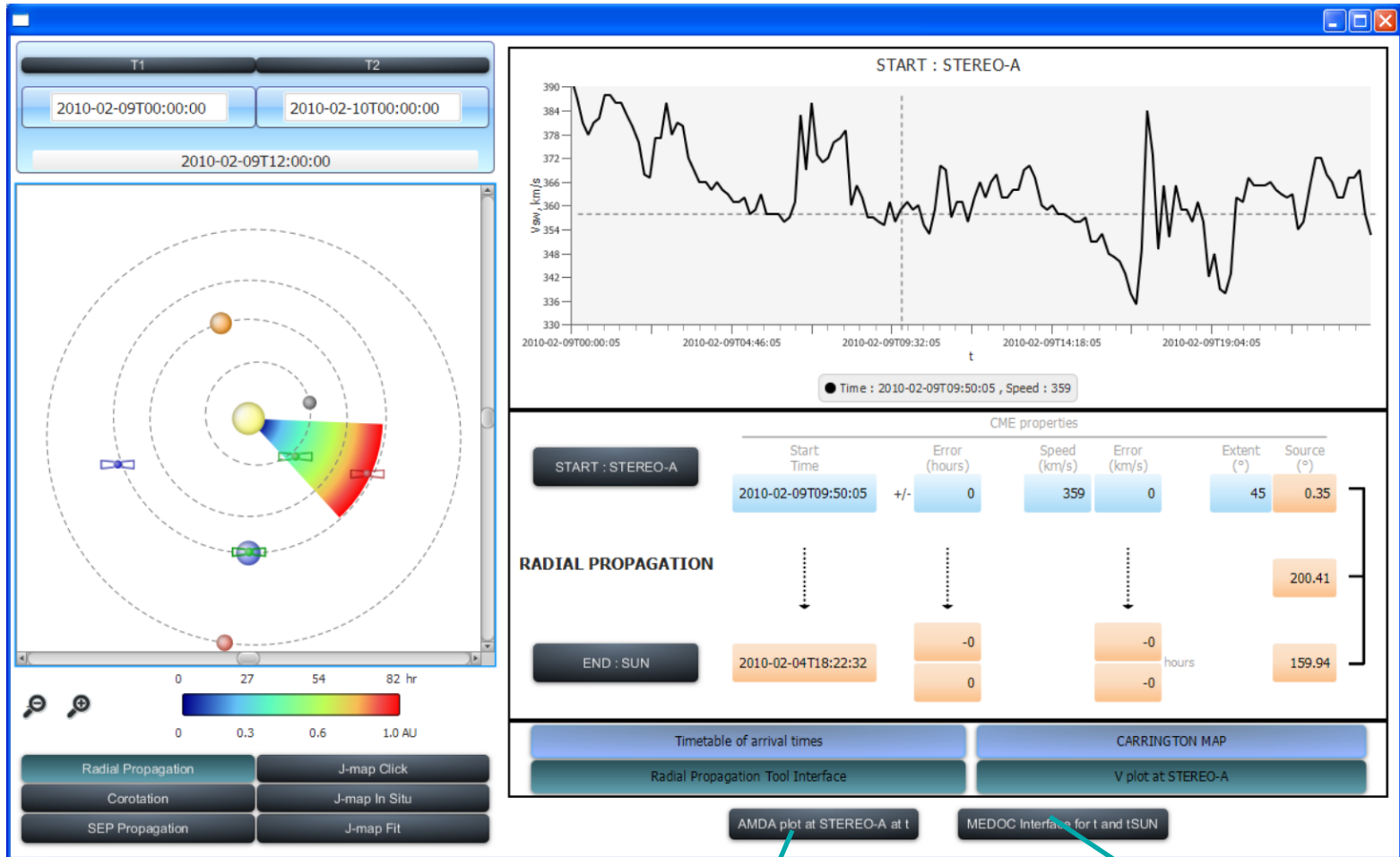
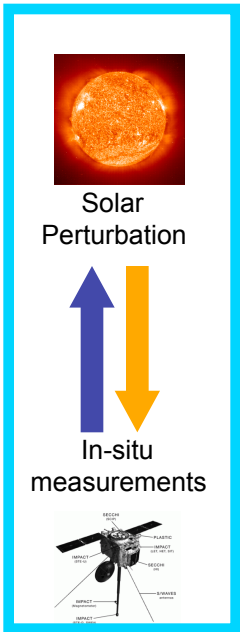
Propagation Tool



- The need to properly quantify the propagation time of a solar perturbation to an observer emerged a few years ago (french project OVSysSol)
- The HELIO project gave the frame for the specification of such a tool and for a first implementation
- CNES enabled the development of a full tool, using STEREO imagery
 - Post analysis of heliospheric event propagation based on 3 complementary approaches (radial, corotation, SEP)
- A second tool has been recently developed : the Space Weather tool, aiming at predicting
 - The magnetic field orientation of CME in the heliosphere
 - The background solar wind
 - The intensity of Solar Energetic Particles events

propagationtool.cdpp.eu

Propagation Tool



In-situ data on AMDA

Solar data at MEDOC

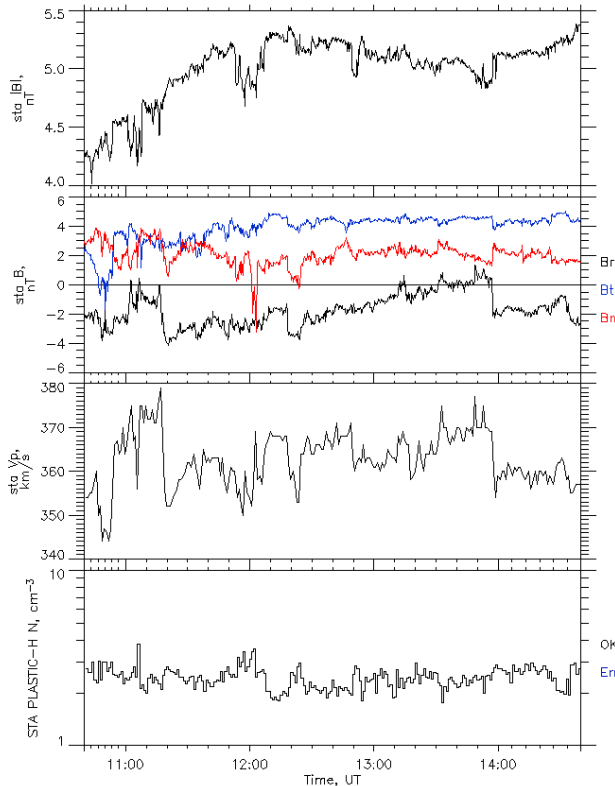
$T_{S/C}$

T_{sun}

AMDA plot

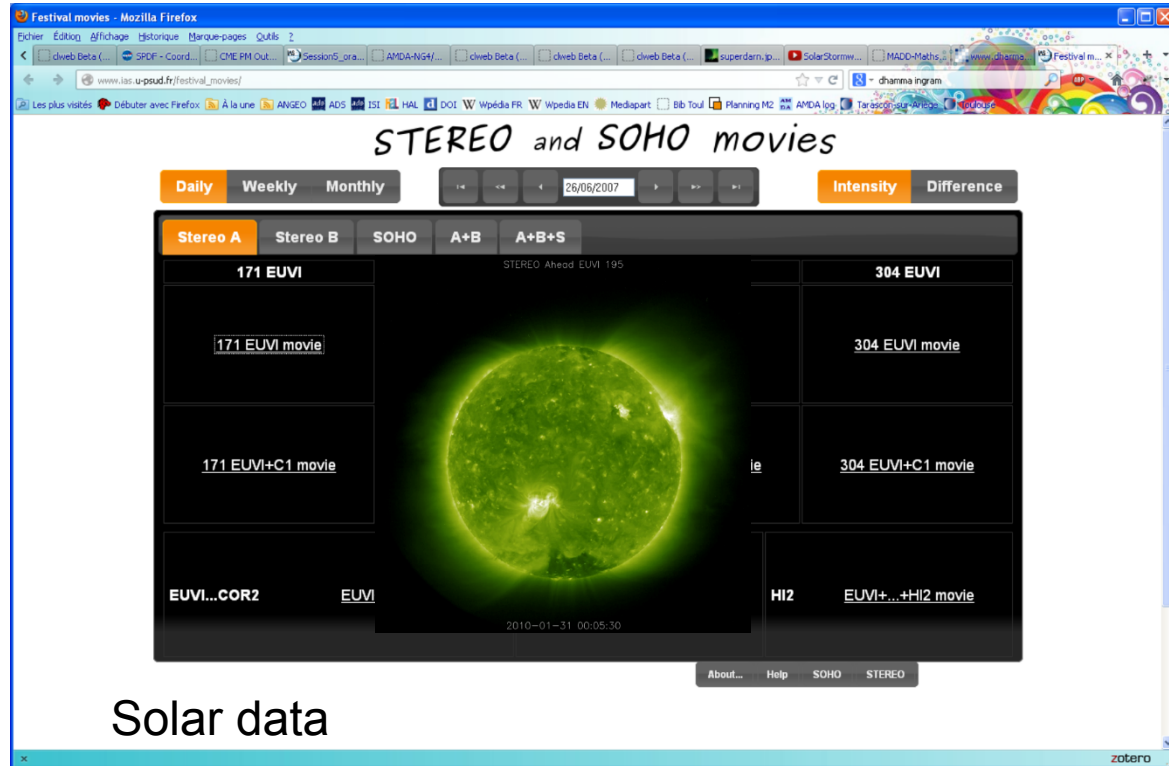
MEDOC database

In-situ data



Feb 9 2010

Created by AMDA(C) V2.0 Mon Feb 18 14:34:02 2013



The screenshot shows the 'STEREO and SOHO movies' web interface. It features a navigation menu with 'Daily', 'Weekly', and 'Monthly' tabs, and a date selector set to '26/06/2007'. Below the menu are buttons for 'Intensity' and 'Difference'. The main content area is divided into a grid of movie thumbnails:

- 171 EUVI
- 304 EUVI
- 171 EUVI+C1 movie
- 304 EUVI+C1 movie
- EUVI...COR2
- EUVI
- HI2
- EUVI+...+HI2 movie

A large central image shows the Sun in green, with the text 'STEREO Ahead EUVI 195' and '2010-01-31 00:05:30' overlaid. At the bottom of the interface are 'About...', 'Help', 'SOHO', and 'STEREO' buttons.

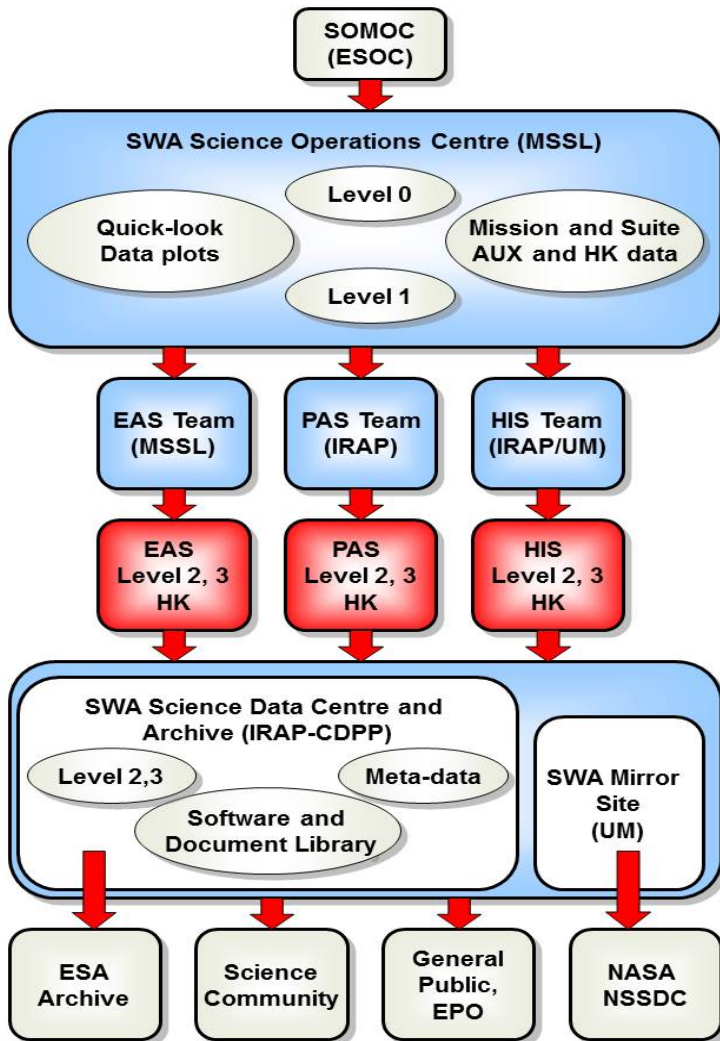
Solar data



Involvement in international consortia

- IPDA (*planetology*)
- IVOA (*astronomy*)
- SPASE (NASA/HDMC, *heliophysics*)
- (ESA) PSA (UG member)
- (ESA) CAA (review panel member)
- MADAWG (Model & Data Analysis Working Group)

Data distribution for Solar Orbiter : SWA



Task

The SDCA will be responsible for the and archiving and dissemination of all SWA data products, and will provide the interface for SWA data products to the ESA archive, NSSDC and the science community. Similarly the RPW data could also be archived and disseminated by the CDPP.

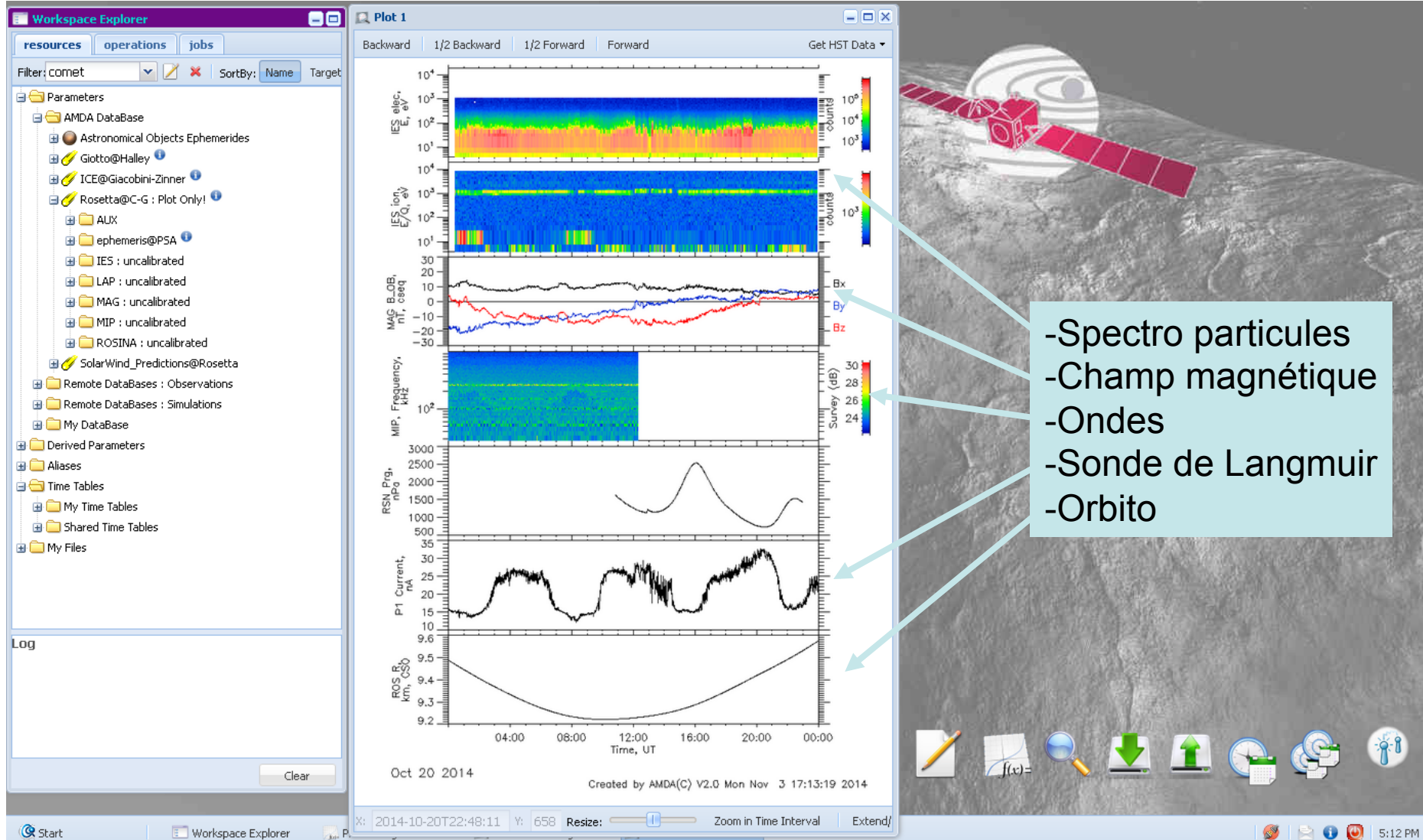
Goal

The CDPP will take advantage of the wealth of its data holding and of its analysis services to provide a comprehensive data analysis framework to the broad Solar Orbiter community, notably in conjunction with MEDOC thanks to the propagation tool.

Positionnement du CDPP

- Mise à disposition des données «in-situ» de Solar Orbiter à travers AMDA (ex: système mis en place pour Rosetta)
 - ‘Contractuel’ pour SWA
 - RPW ok (cf planche de Milan)
 - EPD, MAG : à investiguer
 - Accès aux données complémentaires : autres missions, modèles
- Extension à Solar Probe Plus / IHP

L'espace de travail AMDA pour les équipes Rosetta



Au delà du Propagation Tool : développer les synergies CDPP/ MEDOC

- Proposer des « quick-looks » formés d'une combinaison d'observations in-situ/imagerie à partir d'un calcul de propagation (automatique ou paramétrable)
- Intégrer les périodes d'observations « imagerie » (instruments on/off, special events) dans les visualisations de données in-situ (typiquement des Time Tables dans AMDA)
- Proposer des données solaires formatées servant d'inputs « ready-to-use » au SpaceWeather Tool