

# IMPEX

## Analysis of Planetary Data with AMDA and 3DView communicating with SAMP

Michel Gangloff<sup>1</sup>, Maxim Khodachenko<sup>2</sup>, Esa Kallio<sup>3</sup>, Vincent Génot<sup>1</sup>, Tarek Al-Ubaidi<sup>2</sup>, Florian Topf<sup>2</sup>, Walter Schmidt<sup>3</sup>, Igor I Alexeev<sup>4</sup>, Ronan Modolo<sup>5</sup>, Nicolas André<sup>1</sup>, Elena S Belenkaya<sup>4</sup>, Elena Budnik<sup>1</sup>, Myriam Bouchemit<sup>1</sup>, Benjamin Renard<sup>1</sup>, Emmanuel Penou<sup>1</sup>, Natalya Bourrel<sup>1</sup>, Sébastien Hess<sup>5</sup>, Bruno Besson<sup>6</sup>, Nicolas Dufourg<sup>6</sup>

- (1) IRAP CNRS & UPS Toulouse, France
- (2) Space Research Institute, Austrian Academy of Sciences, Graz, Austria
- (3) Finnish Meteorological Institute, Helsinki, Finland
- (4) Skobeltsyn Institute of Nuclear Physics, Lomonosiv Moscow State University, Moscow, Russian Federation
- (5) LATMOS, CNRS & UVSQ Guyancourt, France
- (6) CNES Toulouse, France

EC Grant agreement no  
262863



<b>Project number</b>	<b>262863</b>
<b>Project title</b>	<b>IMPEX – Integrated Medium for Planetary Exploration</b>
<b>Call (part) identifier</b>	<b>FP7-SPACE-2010-162863</b>
<b>Theme</b>	<b>SPA.2010.2.1-03</b> <b>Exploitation of space science and exploration data</b>
<b>Funding Scheme</b>	<b>Collaborative project</b>
<b>Budget</b>	<b>2 Millions euro</b>
<b>Submitted</b>	<b>December 6, 2009</b>
<b>Official Start</b>	<b>June 1, 2011</b>
<b>Duration</b>	<b>4 years</b>

## Consortium participants

1. **Institut für Weltraumforschung**, Österreichische Akademie der Wissenschaften, Austria (**IWF-OeAW**)
2. **Finnish Meteorological Institute**, Finland (**FMI**)
3. **Centre National de la Recherche Scientifique**, France (**CNRS**):
  - I. Laboratoire Atmosphères, Milieux et Observations Spatiales (**LATMOS**)
  - II. Centre de Données de la Physique des Plasma at Institut de Recherche en Astrophysique et Planétologie (**IRAP-CDPP**)
4. **Skobeltsyn Institute of Nuclear Physics**, Moscow State Univ., Russia (**SINP**)



## Consortium 'Third Parties' linked to beneficiary CNRS

- Université de Versailles Saint-Quentin-en-Yvelines
  - Université Paul Sabatier Toulouse 3





**Main goal** → Creation of an interactive computational framework where data from planetary missions are interconnected with numerical models to

- ① Simulate planetary phenomena and interpret space missions measurements
- ② Test models versus experimental data
- ③ Fill gaps in the measurements by appropriate modelling runs
- ④ Perform preparation of mission operations and solve technological tasks, including preparation of new missions

### **Target audience**

- Researchers in the planetary sciences community
- Data analysts
- Mission and instrument designers

**Current scientific focus of IMPEX are plasma and magnetic environments of**

- Mercury (*BepiColombo*)
- Venus (*VenusExpress*)
- Earth (*Cluster, Themis*)
- Mars (*MarsExpress*)
- Jupiter and Ganymède (*Galileo, JGO*)
- Saturn and Titan (*Cassini*)
- Comet67P (*Rosetta*)

## IMPEX will enable

- Selection, downloading, visualization and analysis of data from the modelling runs
- Superimposing modelling data with spacecrafts measurements
- Request of specific modelling runs
- Scientific tools and functionalities for the support of preparation and operation of space missions (virtual spacecraft, visualizing expected observations from simulation databases)

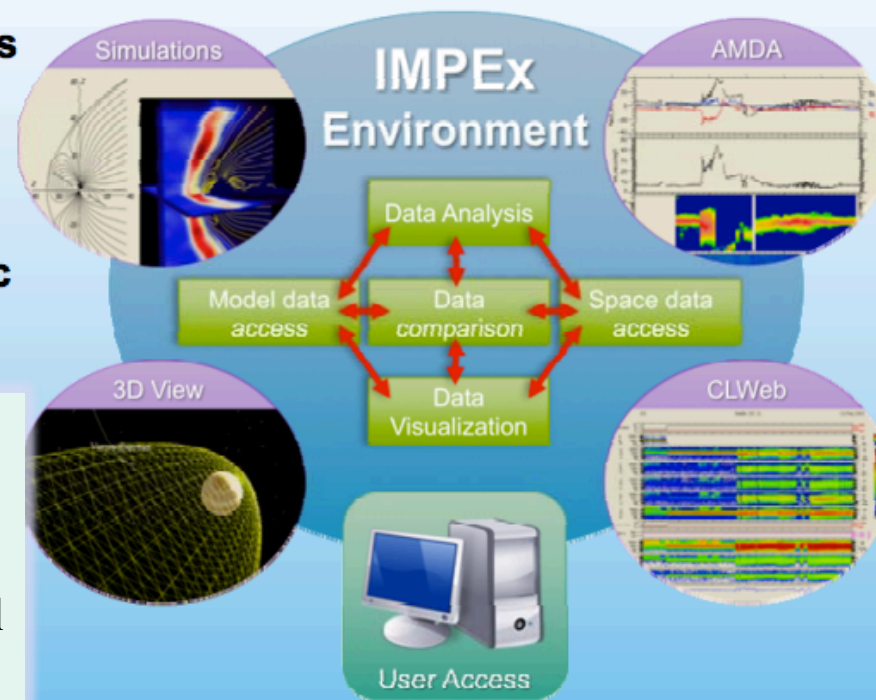
## Background resources

### Modelling sector:

- ◆ 3D hybrid & MHD platforms (FMI, Finland);
- ◆ 3D hybrid code (CNRS/LATMOS);
- ◆ Paraboloid Magnetospheric Model (SINP, Russia).

### Observational Data sector:

- AMDA data analysis tool
- 3DView visualisation
- CLWeb data analysis tool



## **AMDA** <http://cdpp-amda.cesr.fr>

AMDA (Automated Multi-Dataset Analysis) is a web-based facility for on-line analysis of space physics time series coming from either its own database or remote ones. It allows to perform on line data plots, parameter computation or extraction and innovative functions such as event search on the content of the data in either visual or automated way, and the management of event tables

## **3DView** <http://3dview.cesr.fr>

3DView is an open Java application (no registration required) which displays spacecraft and natural bodies orbits in 3D scenes. It was initially developed under CNES funding and will be updated in the frame of IMPEX

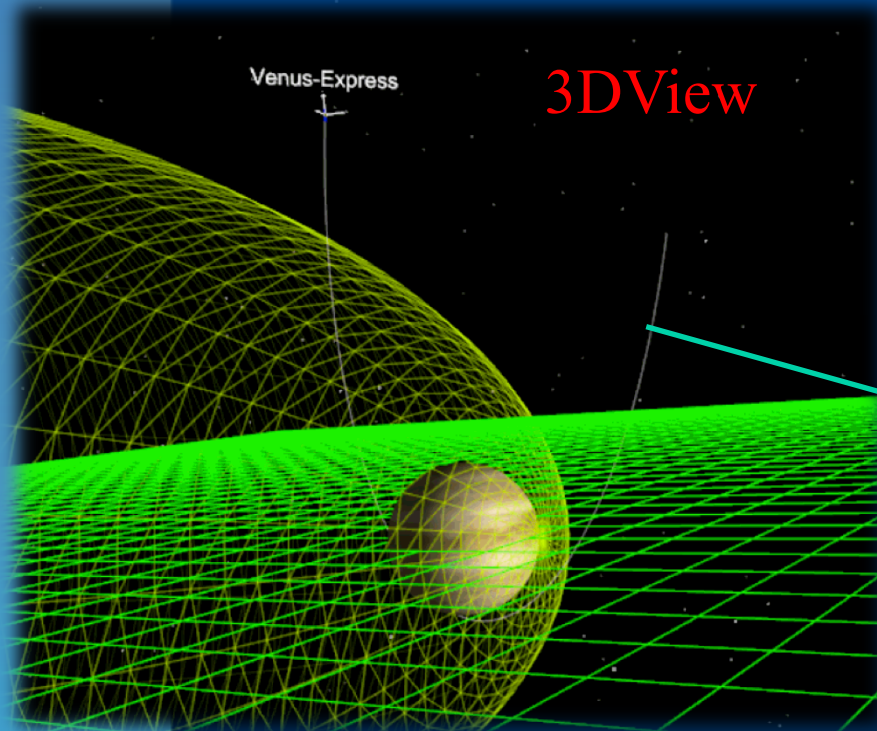
Copyright (3DView) CNES



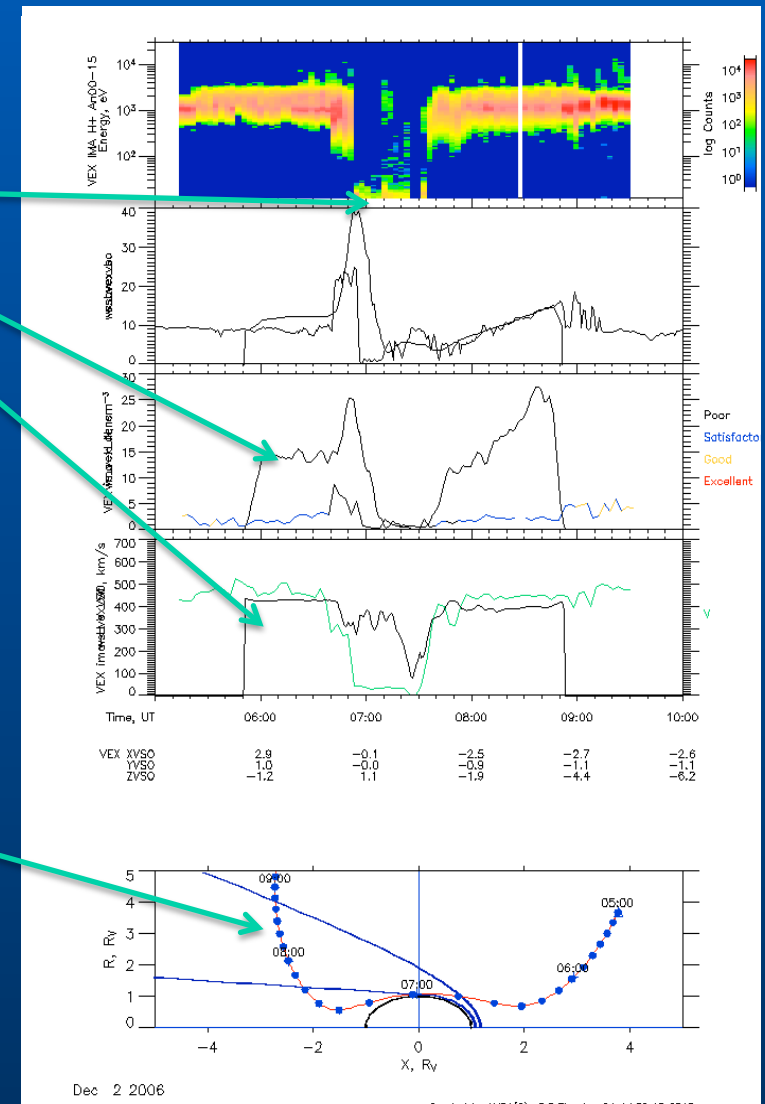
Tous droits réservés



Measurements / Simulations  
 Comparison  
 Observed vs **simulated** data



## AMDA



Dec 2 2006  
 Created by AMDA(C) 2.0 Thu Jun 24 14:29:46 2010  
 Illustration 1: Example of data/simulation comparison displayed in AMDA

**Workspace Explorer**

resources operations jobs

Filter: None

- THEMIS-C
- THEMIS-D
- THEMIS-E
- CLUSTER1
  - ephemeris
  - FGM
  - CIS-HIA
    - hia\_pp
    - hia\_mom
      - density
      - v\_gse
      - temperature
      - temp\_par
      - temp\_perp
      - pressure
      - pres\_xx\_gse
      - pres\_yy\_gse
      - pres\_zz\_gse
    - hia\_pad
  - CIS-CODIF
  - PEACE
  - RAPID
  - EDW

Log

Clear

**Plot**

Plot 1 Plot 2 Plot 3 Plot 4 Plot 5

Add Panel Remove Panel

Name	Panel Properties								Parameter Arguments	Y2
	Plot Type	Height	Width	Xmin	Xmax	Ymin	Ymax	Additional		
Panel 1	TIME	0.4	1	0	0	0	0	select...		
hia_v_c1									select...	<input type="checkbox"/>
Panel 2	TIME	0.4	1	0	0	0	0	select...		
hia_prest_c1(0)									select...	<input type="checkbox"/>

Time Selection

Time Table  Interval

Start Time: 2012/10/22 01:17:16

Stop Time: 2012/10/23 01:17:16

Duration: Days: 0001 Hrs: 00 Mins: 00 Secs: 00

Plot Title:

Char Size:

Orientation: LANDSCAPE

Description:

Plot File Name:

Line Thickness:

File Format: PNG

Request Name:

Plot Get Data Reset

Information

This is info zone...

Connect to SAMP HUB

- 1/ Select data in AMDA
- 2/ Plot data in AMDA
- 3/ Send data to 3DView through the SAMP HUB







**Access to AMDA data: via Web Services (currently)  
will use SAMP for IMPEX**

AMDA Webservice Access data

Object: Cluster-1

Known data

```

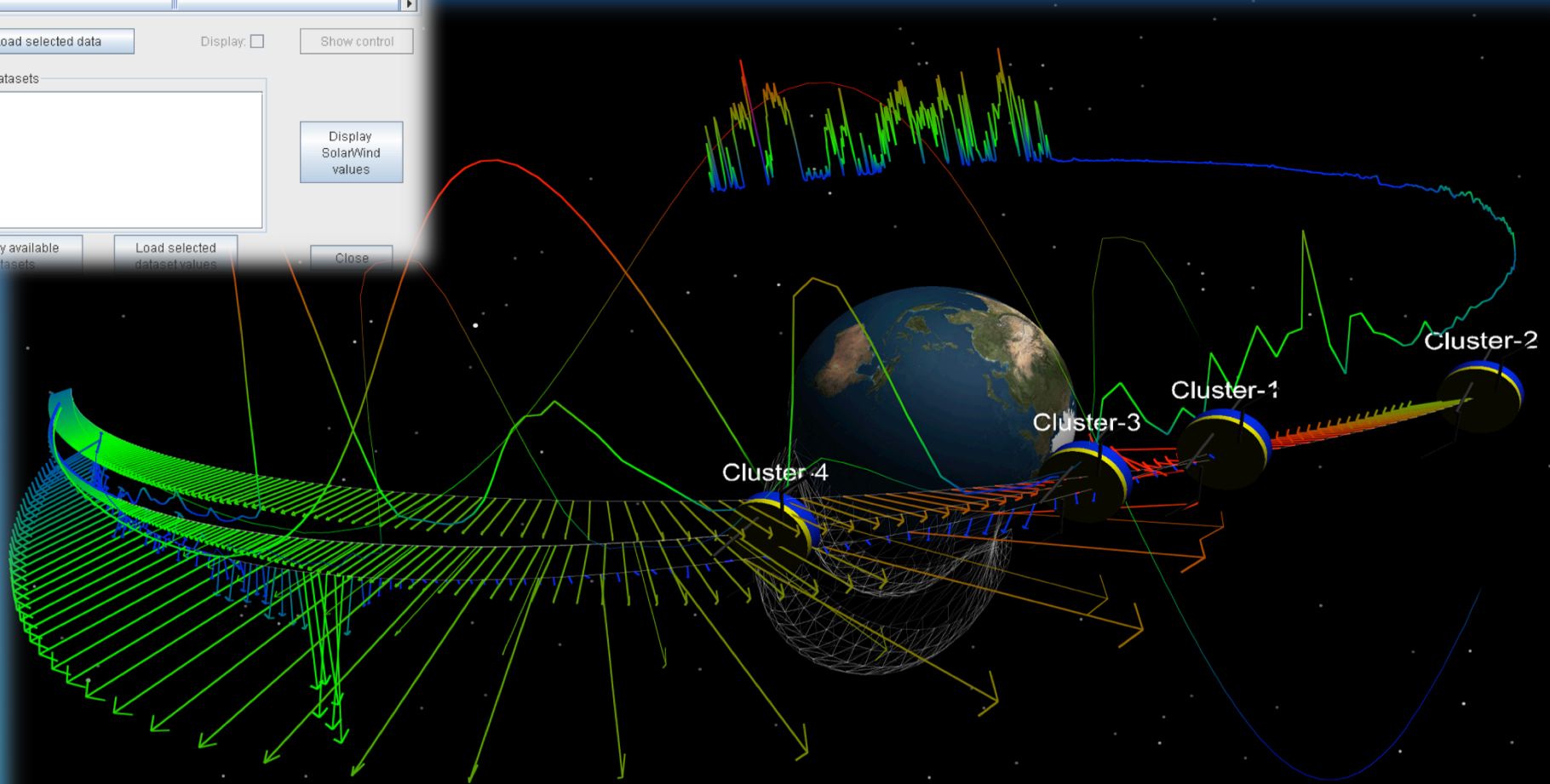
VECTOR - clust1_fgm_prp 2000/11/01 17:02:17.017-2010/06/30 23:59:58.058
VECTOR - clust1_cis_prp 2001/01/16 14:50:14.014-2010/08/31 23:59:54.054
SCALAR - clust1_fgm_prp Bz 2000/11/01 17:02:17.017-2010/06/30 23:59:58.058
SCALAR - clust1_cis_prp density 2001/01/16 14:50:14.014-2010/08/31 23:59:54.054
    
```

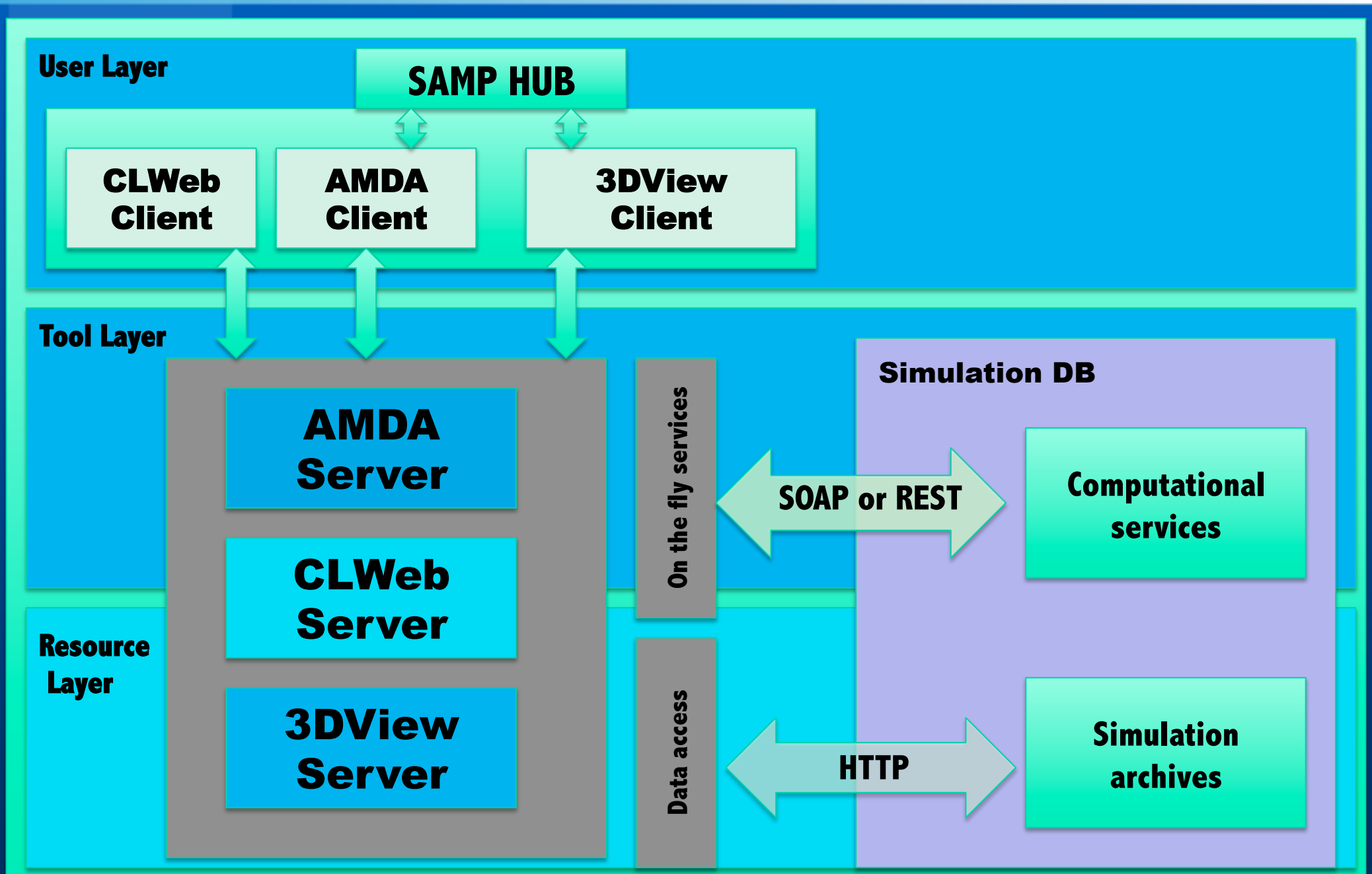
Load selected data    Display:     Show control

Available datasets

Display SolarWind values

Display available datasets    Load selected dataset values    Close





**In the context of planetary sciences IMPEX tries to use existing international standards:**

- **IVOA SAMP for the communication of data between tools**
- **IVOA VOTable format for the exchange of event tables and data**

**More information:**                      **<http://impex-fp7.oeaw.ac.at/>**