IMPEx

→ **Integrated Medium for Planetary Exploration**

FP7 call : Exploitation of science and exploration data

- Submitted in december 2009
- Pending for some time
- Official letter 01/07/2010
- Start = end of 2010 ?
- 4 years

IMPEX

Objectifs

→ Mettre en place un environnement numérique de travail permettant l'inter-connexion, dans le domaine des sciences planétaires, de

- -données observationnelles,
- -résultats de simulations numériques (codes hybrides et MHD),
- -modèles analytiques.

→Au service de la communauté « science planétaire » :

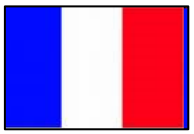
- -Recherche : analyse de données ←→ simulations
- -Planification des missions et instruments futurs

Project structure

M. Kodachenko, Project Coordinator, IWF, Graz, Austria
Management (project coordinator)

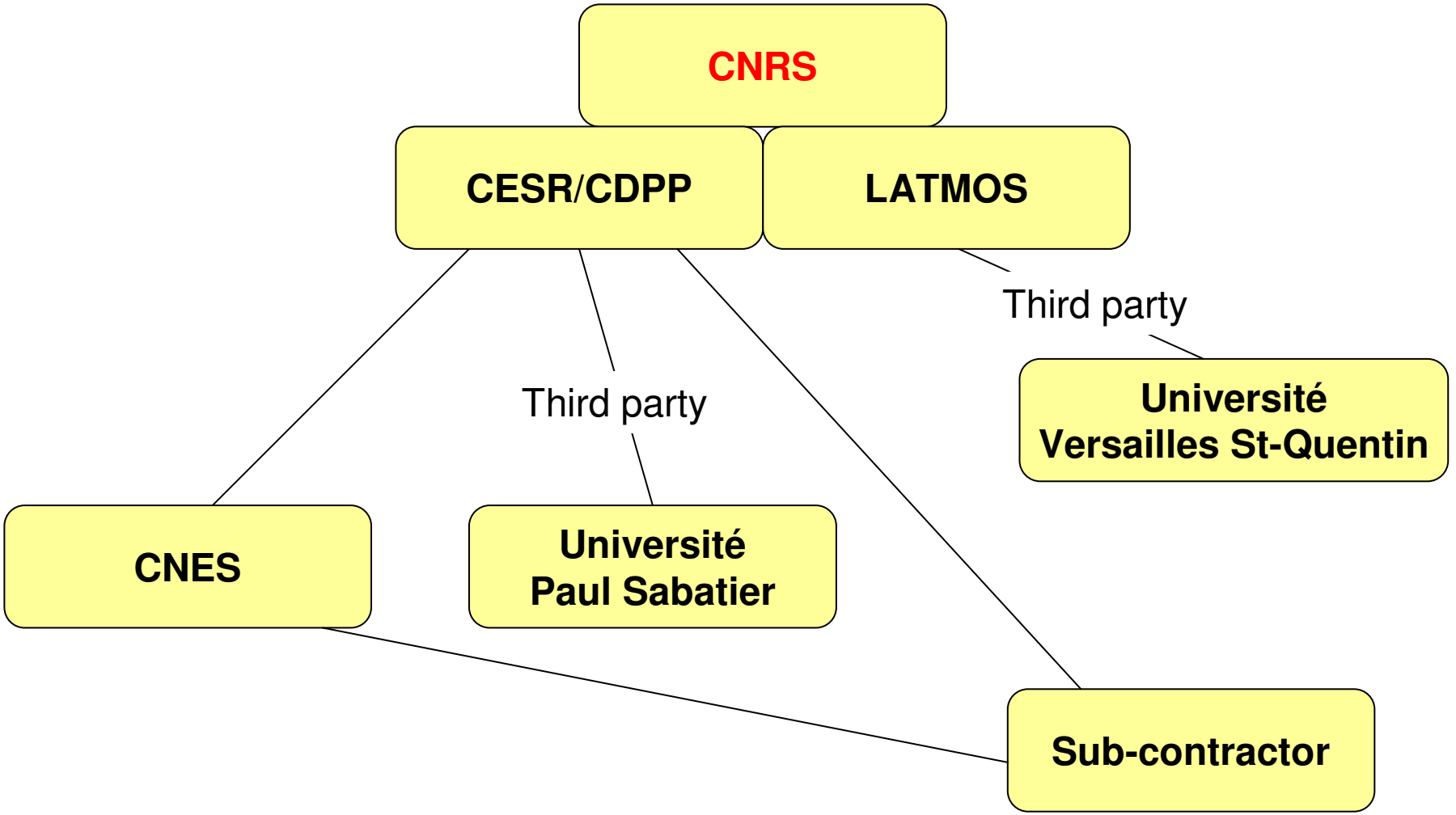
FMI, Finland
Simulation database and runs (WP leader)

SINP
Paraboloid Magnetospheric Models (WP leader)

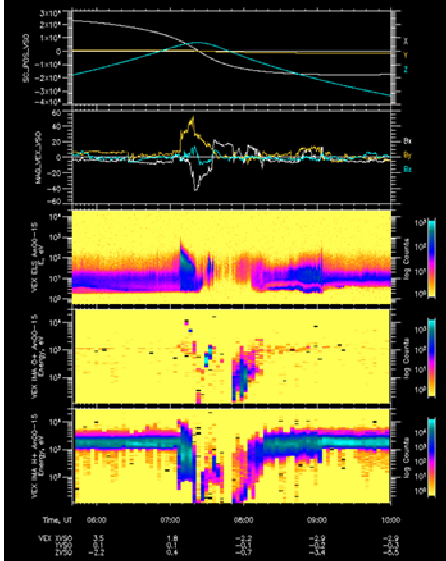


CNRS
Data and Models environment (WP leader, project scientist)

A unique french participant

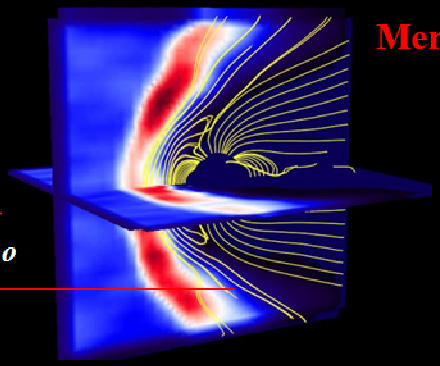


AMDA



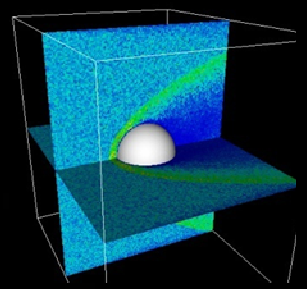
HMM

Mercury



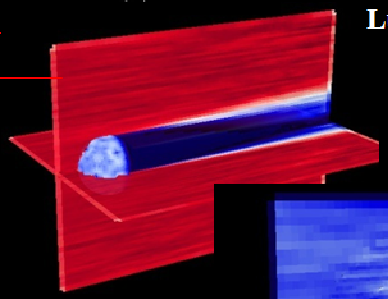
Messenger
BepiColombo

Venus



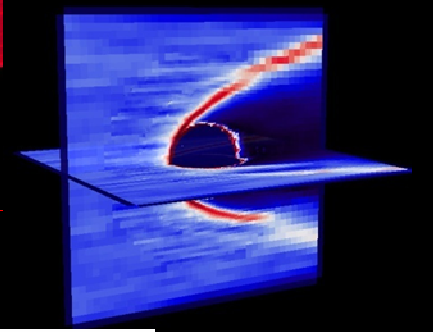
Pioneer Venus Orbiter
Venus Express

The Moon

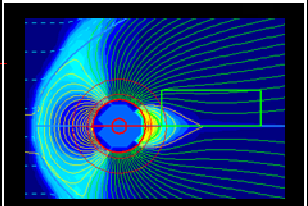


Lunar Prospector
Artemis

Mars



e.g.,
Cluster
THEMIS

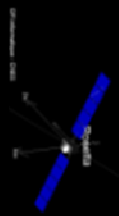


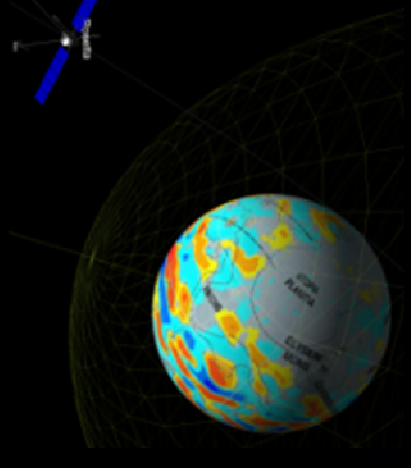
The Earth

Phobos 2
Mars Global Surveyor
Mars Express

IMPEx

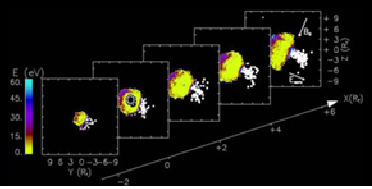
3DView





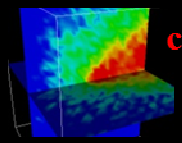
Pioneer 10 & 11
Voyager 1 & 2
Ulysses
Galileo
Cassini/Huygens
New Horizons
Juno
EJSM

Pioneer 11
Voyager 1 & 2
Cassini/Huygens



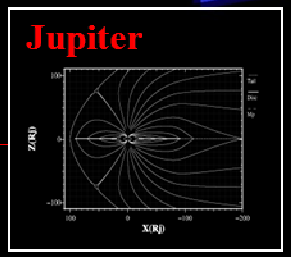
Saturn
& Titan

comet



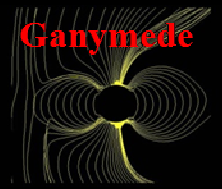
Giotto
Rosetta

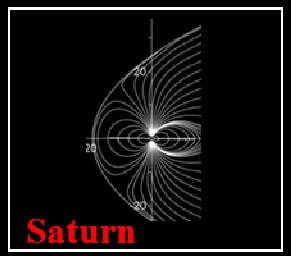
Jupiter



Jupiter
&
Ganymede

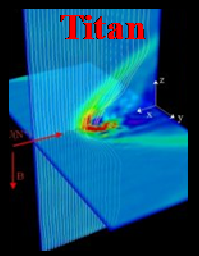
Ganymede





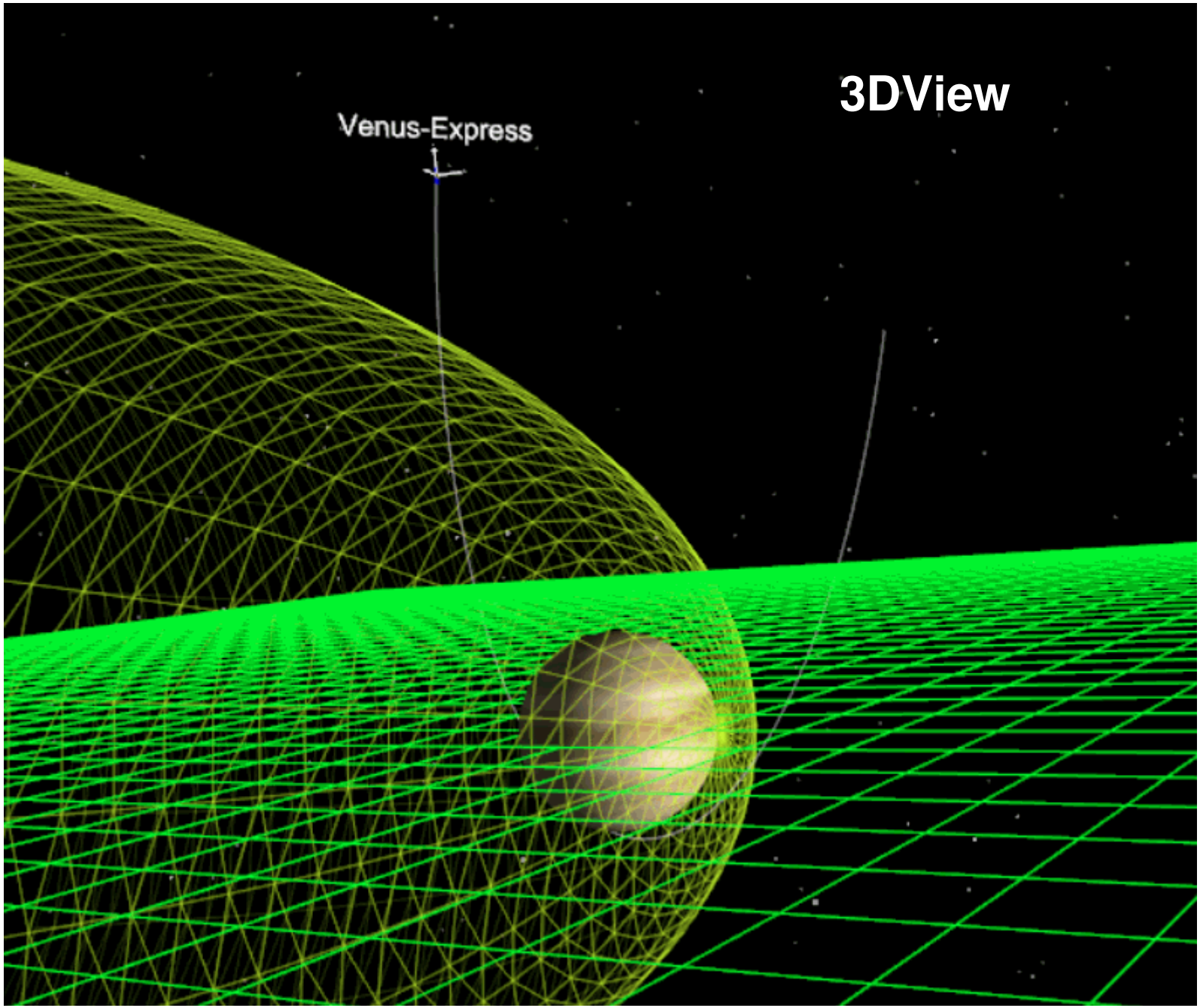
Saturn

Titan



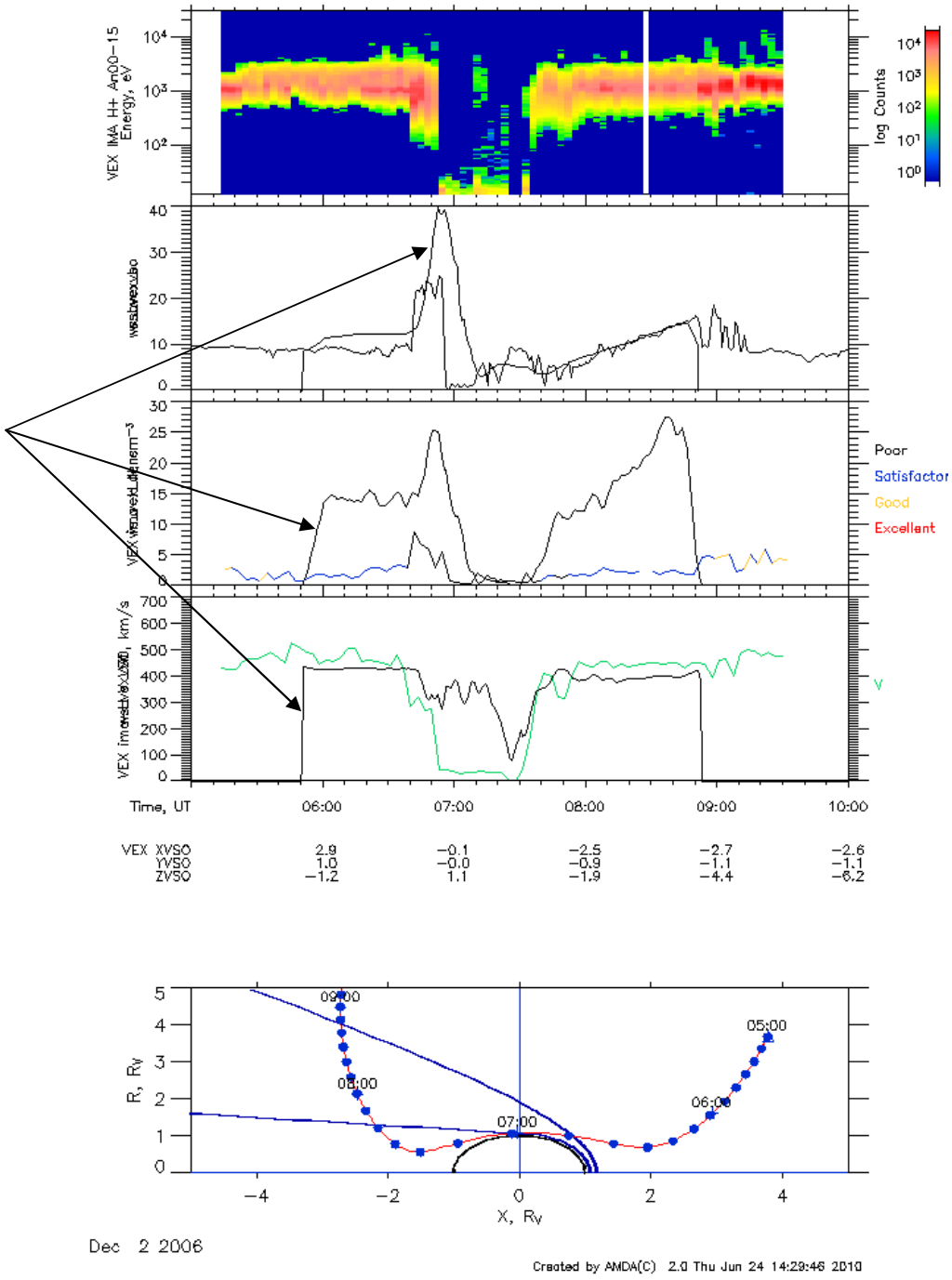
PMM

Fig. courtesy of NASA


3DView
Venus-Express

AMDA

observed .vs. simulated data



VEX orbit file from AMDA

2.28224e+07 7.20305e+06 -2.10821e+07
2.27701e+07 7.19066e+06 -2.08811e+07
2.27162e+07 7.17787e+06 -2.06768e+07
2.26621e+07 7.16496e+06 -2.04742e+07
2.26066e+07 7.15162e+06 -2.02683e+07
2.25508e+07 7.13818e+06 -2.00642e+07
2.24934e+07 7.12428e+06 -1.98568e+07
2.24359e+07 7.11028e+06 -1.96512e+07
2.23767e+07 7.09581e+06 -1.94419e+07
2.23166e+07 7.08105e+06 -1.92320e+07
2.22563e+07 7.06618e+06 -1.90241e+07
2.21943e+07 7.05082e+06 -1.88126e+07
2.21321e+07 7.03536e+06 -1.86029e+07
2.20681e+07 7.01938e+06 -1.83897e+07
2.20040e+07 7.00330e+06 -1.81785e+07
2.19380e+07 6.98668e+06 -1.79636e+07
2.18718e+07 6.96995e+06 -1.77506e+07
2.18037e+07 6.95266e+06 -1.75339e+07
2.17345e+07 6.93505e+06 -1.73166e+07
2.16652e+07 6.91732e+06 -1.71010e+07
2.15938e+07 6.89901e+06 -1.68819e+07
2.15222e+07 6.88058e+06 -1.66646e+07
2.14487e+07 6.86155e+06 -1.64437e+07
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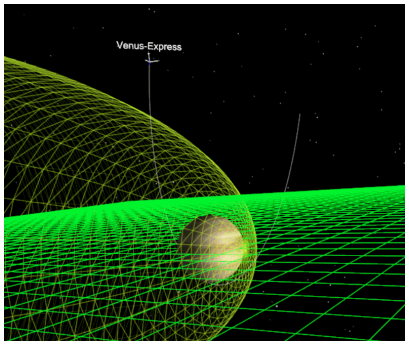
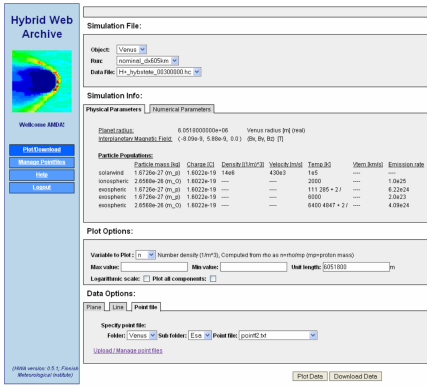
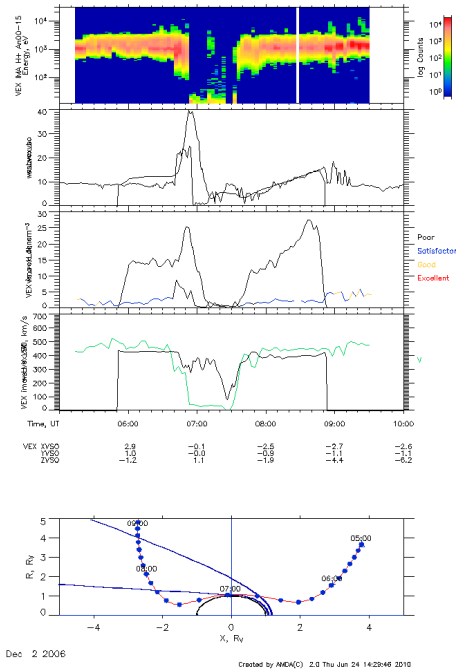
2.12988e+07 6.82263e+06 -1.60020e+07



Base de simulations



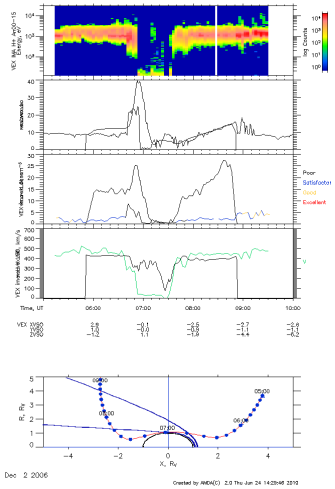
- Upload on HWA
- Choose simulation run
- Fly virtual S/C
- Obtain interpolated parameters
- Upload in AMDA



AMDA

Les challenges « VO »

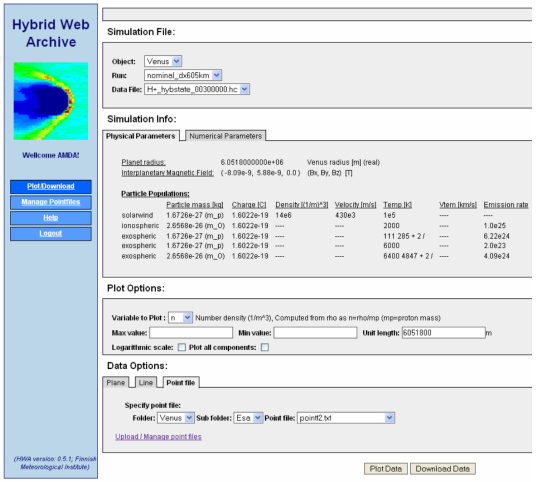
Connexion : AMDA (outil de d'analyse de données) → bases de données de simulation



AMDA

Web services

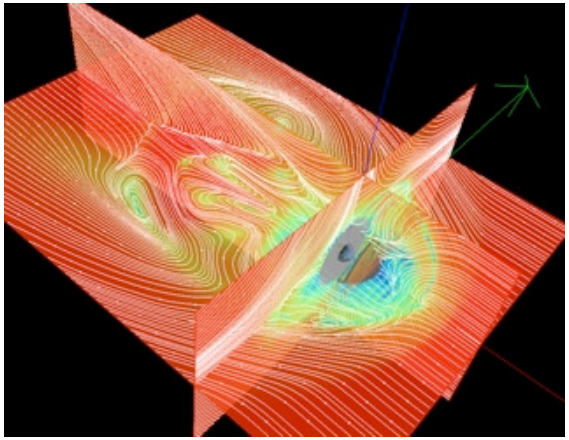
Volume de données : faible/moyen



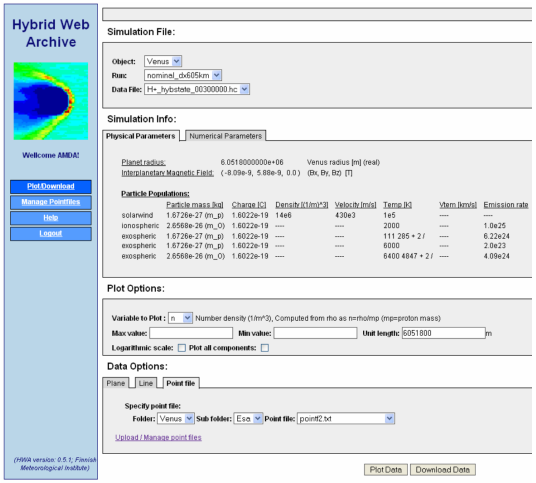
Base de simulations

Les challenges « VO »

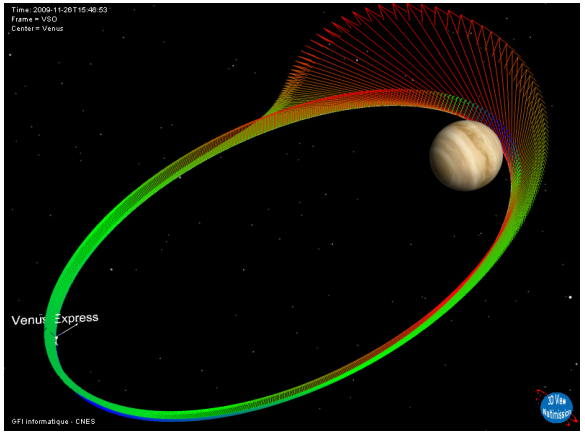
Connexions : 3DView → AMDA + bases de données de simulation



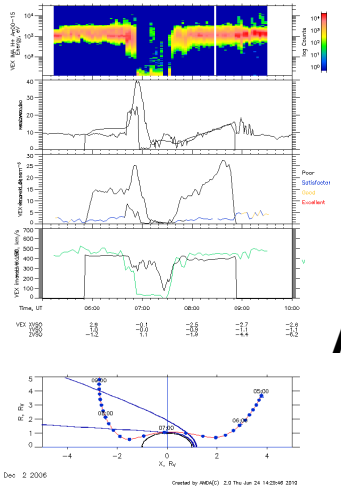
Web services



Base de simulations



Web services



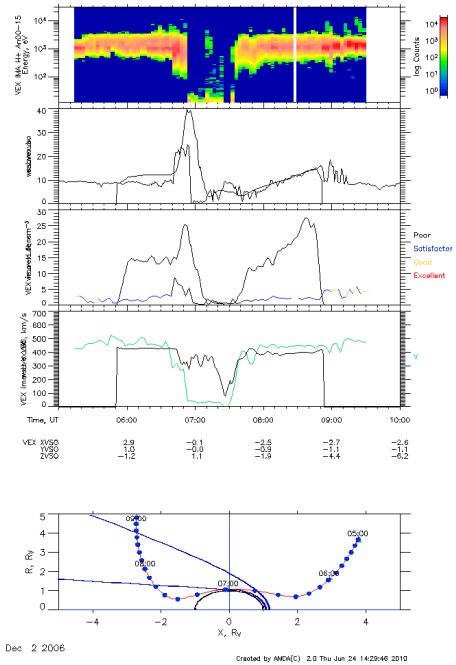
AMDA

Volume de données : moyen/important

Les challenges « VO »

Description standardisée des résultats de simulation

→ Faciliter la conception des outils de recherche (sur AMDA, 3DView, autres)



?

Contexte observationnel :
-vent solaire
-conditions ionosphériques/exosphériques

Les challenges « VO »

Description standardisée des résultats de simulation

→ Faciliter la conception des outils de recherche (sur AMDA, 3DView, autres)

```
# Object: Venus
# Run: nominal_dx605km
# Data file: H+_hybstate_00300000.hc
#
# Simulation Info; Physical Parameters:
#
# R_P 6.0518000000e+06,  Venus radius [m] (real), R_V
# dx R_P 10.0 /
# dt dx 15129.5e3 /
# SW_Bx -8.09e-9
# SW_By 5.88e-9
# SW_Bz 0.0
#
# population
#    type uniform
#    1.6726217160e-27,  Proton mass [kg] (real), m_p
#    1.6021765300e-19,  Electron charge magnitude [C] (real), e
#    n 1.5e6
#    T 1e5
#    V 0
#
# population
#    type solarwind
#    1.6726217160e-27,  Proton mass [kg] (real), m_p
#    1.6021765300e-19,  Electron charge magnitude [C] (real), e
#    n 14e6
#    V 430e3
#    T 1e5
#
# population
#    type ionospheric
#    2.6567625437e-26,  Atomic oxygen mass [kg] (real), m_O
#    1.6021765300e-19,  Electron charge magnitude [C] (real), e
#    T 2000
#    totalRate 1.0e25
#
# population
#    type exospheric
#    1.6726217160e-27,  Proton mass [kg] (real), m_p
#    1.6021765300e-19,  Electron charge magnitude [C] (real), e
#    T 111 285 + 2 /
#    totalRate 6.22e24
#
# x y z n vx vy vz v Bx By Bz B
.....................................................
```

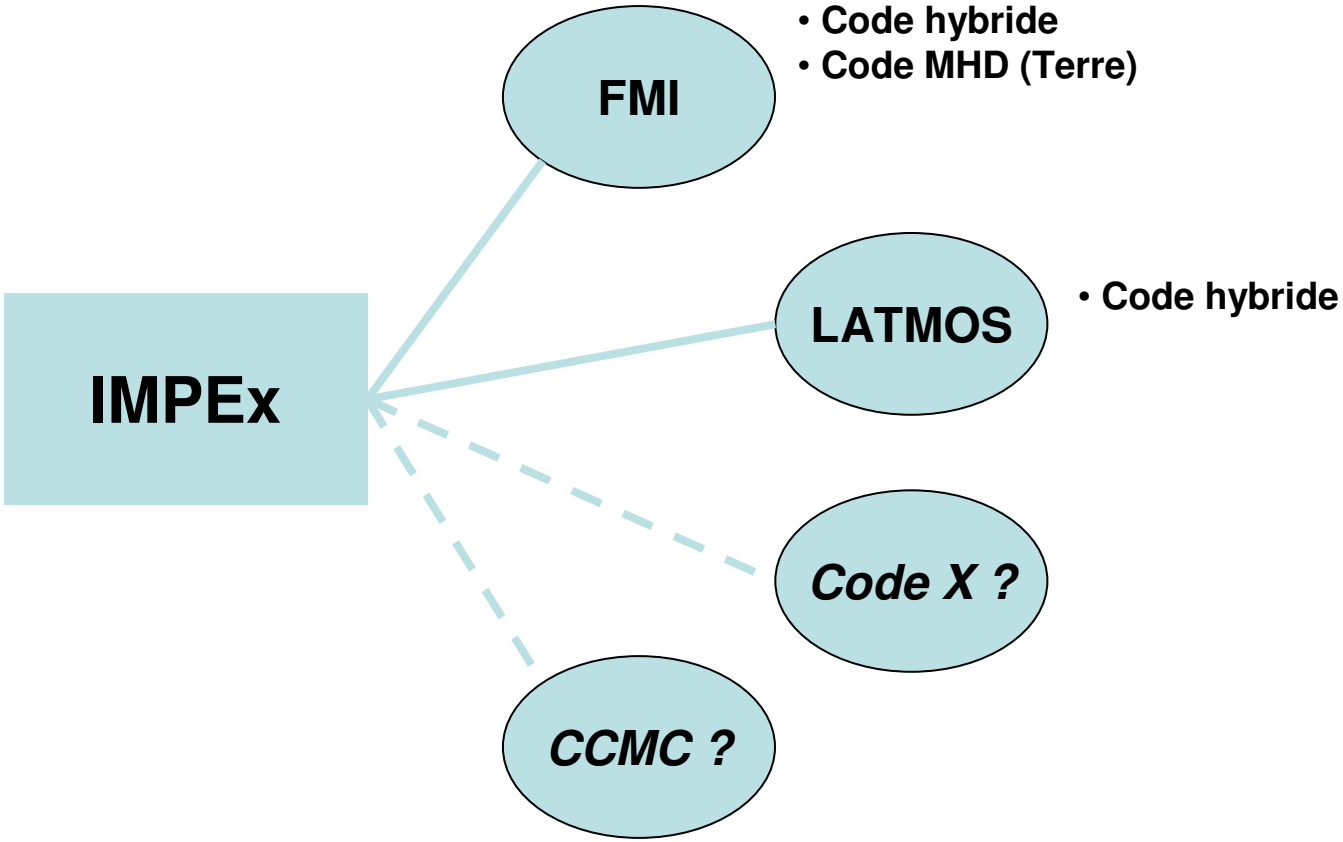
Description à définir (SPASE ?) pour

-Le code
-Les paramètres physiques (Input)
-Les paramètres numériques

Les challenges « VO »

Diffusion du « standard »

→ Faciliter/encourager l'intégration de nouvelles bases / nouveaux code dans IMPEx



Autre contexte / **problématique équivalente** (données – simulations/modèles)

- spectres stellaires : Pollux (calculés) / Castor (observés @Narval)
- Cassis

Retour d'expérience ?
Quel niveau de détails dans la description des paramètres des codes ?
Utilisation de SDM (Spectrum Data Model) ?