ABSTRACT
The FP7-SPACE project IMPEx was established to provide a web-based infrastructure to facilitate the inter-comparison of spacecraft in-situ measurements and computational models in the fields of planetary plasma science.

Within this project several observational databases (CDAWeb, AMDA, CLWeb), as well as numerical simulation databases (FMI, LATMOS, SINP) provide datasets, which can be combined for further joint analysis and scientific investigation.

The major goal of this project consists in providing an environment for the connection and joint operation of the different types of numerical and observational data sources in order to validate numerical simulations with spacecraft observations and vice versa.

This poster provides a complete guide through the set of tools and resources enabled by IMPEx.

DATA MODEL
As an important milestone of IMPEx a common simulation data standard was developed for the description of the current integrated simulation models and the archived datasets.

This standard is based on the SPASE XML data model (DM), which originated from the Heliospheric community. The SPASE DM was developed for the description of observational data, and that is why it was chosen as a basis within the scope of IMPEx.

SIMULATION MODELS
- 3D hybrid & MHD platforms (FMI, Finland)
- 3D hybrid code (CNRS/LATMOS, France)
- Paraboloid Magnetospheric Model (SINP, Russia)

CASE STUDY: PORTAL DATA SELECTION
The first official version of the IMPEx portal (http://impex-portal.oeaw.ac.at) will include a REST-based API to exploit the available metadata and web services. This will enable a low level access to the resources and pave the way for the creation of one central access point to access the full spectrum of available tools at once.

Figure 2 shows the IMPEx map which is a graphical representation of the REST-based API. The user will be able to search, select and download data selections in a step-by-step procedure. The data selections in VDOA/PDF format can be delegated to data analysis tools over the VDOA/SAMP protocol at the final stage as depicted in the figure below.

CONCLUSION
Besides the extension of existing web-based tools the IMPEx project has put a significant effort into the development of metadata and data access standards by using available and suitable frameworks known in the space community.

The IMPEx portal is one of the evolving success stories elaborated in the project which will complement the currently provided tools offered by the consortium member (FMI). More detailed use cases of the analysis tools mentioned here are found in poster B492 by Gangloff et al.

http://impex-fp7.oeaw.ac.at

MAIN FEATURES
- Selection, downloading, visualisation and analysis of data from observations and model runs
- Support in finding matching modelling runs and request of specific runs
- Superimposing modelling data with respective spacecraft measurements
- Scientific tools and functionalities for the support of preparation and operation of space missions

KEY REQUIREMENTS
- Extendibility (easily adding of new models, databases and analysis tools)
- Conforming with worldwide trends and established standards (e.g. SPASE, IVOA)
- Generality of approaches and interoperability with existing tools
- Web-based applications in a distributed, service-oriented environment

DATA ACCESS PROTOCOL
Each model provider implements the IMPEx protocol, which is made available via a SOAP-based web service interface. They additionally expose metadata trees based on the IMPEx DM. These trees are used to select specific elements of the data model (e.g. a NumericalOutput) which can then be accessed via web service calls.

IMPEx is using a centralised configuration file which identifies the currently available databases (data model trees and WSDL files) and tools: http://impex-portal.oeaw.ac.at

ANALYSIS TOOLS
For the visualisation and analysis of the archived datasets available within IMPEx and beyond, several tools (AMDA, 3DView, ClWeb) were upgraded to be able to work with the newly developed metadata standards and protocols.

In addition to that, the IMPEx portal is currently developed by IFW to provide a more general way to access data within IMPEx. Figure 1 below shows how the portal is using the IMPEx environment and how it connects to the tools over the IVOA/SAMP protocol.

PORTAL ARCHITECTURE

(1) Space Research Institute, Austrian Academy of Sciences, Graz, Austria (florian.topf@oeaw.ac.at)
(2) FMI, Finnish Meteorological Institute, Helsinki, Finland
(3) IRAP, CNRS/Université Paul Sabatier, 31028 Toulouse, France,
(4) LATMOS, CNRS/Université de Versailles Saint Quentin, Versailles France
(5) SINP, Skobeltsyn Institute of Nuclear Physics, Moscow State University, Moscow, Russian Federation,
(6) School of Electrical Engineering, Aalto University, Helsinki, Finland

IMPEx
A WEB-BASED DISTRIBUTED RESEARCH ENVIRONMENT FOR PLANETARY PLASMA SCIENCE

Image Credit: Venus radar mosaic by NASA/JPL

Florian Topf (1), Maxim Khodachenko (1), Esa Kallio (2,6), Vincent Génot (3), Tarek Al-Ubadli (1), Ronan Modolo (4), Sébastien Hess (4), Walter Schmidt (4), Manuel Scherf (1), Igor Alexeev (5), Michel Gangloff (3), Elena Budnik (3), Myriam Bouchemt (3), Benjamin Renard (3), Natacha Bourrel (3), Emmanuel Penou (3), Nicolas André (3), and Elena Belenkaya (5)