

Europlanet Integrated and Distributed Information System (IDIS)

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ABSTRACT

To overcome the current fragmentation of the EU Planetary Science community, the EU commission is funding via its Framework Program 7 the development of the “Europlanet Research Infrastructure - Europlanet RI”. The Europlanet RI will consolidate the integration of the European Planetary Science community which started with Europlanet’s FP6 project and will integrate major parts of its distributed European infrastructure. A central part of Europlanet RI is the “Integrated and Distributed Information Service” (IDIS). The task of IDIS is to provide an easy-to-use web-based platform to locate teams and laboratories with special knowledge needed to support the own research activities, give access to the wealth of already available data, initiate new research activities needed to interpret accumulated data or to solve open questions and to exploit synergies between space-based missions and capabilities of ground based observatories. The IDIS portal will be made to evolve towards an information access system providing interoperability of a wide range of different information and data sources and access tools, located in different data centres, including virtual observatory-like access services to data sets. IDIS is organized as Service Activity, structured in thematic Nodes, and a supporting Joint Research activity.

INTRODUCTION

During the past decades the various disciplines in planetary sciences have developed to a very high international standard, but coordination and collaboration between the different fields are still at a very early stage. To overcome the current fragmentation of the EU Planetary Science community and thereby to increase the scientific return of the related investment, the EU commission is funding via its Framework Program 7 the development of the “Europlanet Research Infrastructure - Europlanet RI”. The Europlanet RI will consolidate the integration of the European Planetary Science community which started with Europlanet’s FP6 project and will integrate major parts of its distributed European infrastructure to be shared, fed and expanded by all planetary scientists. This infrastructure encompasses as diverse components as space exploration, ground-based observations, laboratory experiments and numerical modelling teams.

A central part of Europlanet RI is the “Integrated and Distributed Information Service” or Europlanet-IDIS (<http://www.idis.europlanet-ri.eu>). The task of IDIS as central part of Europlanet is to provide an easy-to-use Web-based platform to locate teams and laboratories with special knowledge needed to support the own research activities, give access to the wealth of already available data, initiate new research activities needed to interpret accumulated data or to solve open questions and to exploit synergies between space-based missions and capabilities of ground based observatories. It also offers to

a wide range of teams and laboratories the possibility to share their data, advertise their capabilities and increase the scientific return by cooperation.

THE STRUCTURE OF IDIS

IDIS is an integrated and distributed information service, that will provide remote access to data produced by space missions, ground-based telescopes, laboratory and field facilities, and sample collections. Additionally it will provide tools to use, combine, and analyze the data, and compare them to numerical simulation and model predictions. Thanks to an IDIS-dedicated joint research activity, JRA4, towards the end of the proposed Europlanet RI project SA IDIS will evolve into an information access system providing interoperability of a wide range of different information and data sources and access tools, located in different data centres, including virtual observatory like access services to data sets suitable for this approach.

A continuous enhancement of the on-line offered capabilities will take place, thanks to the work of a set of supporting Joint Research Activities.

- **JRA-4** will directly develop the tools necessary for this expansion, developing the necessary functionalities to access, analyze, manipulate, and assimilate into models etc., any kind of planetary data.
- **JRA-1** will specialize on improving the basic scientific tools and models for the support to the preparation and operation of space planetary missions.
- **JRA-3** will for the first time lead an effort to collect and upgrade for general use advanced software tools such as numerical simulation models and advanced data analysis tools as well as access to detailed numerical results from simulations and modelling efforts at many different institutes.

IDIS is organized as an EU FP7 Support Activity (IDIS Service Activity) + a devoted Joint Research Activity (JRA-4).

The IDIS Service activity

The Service Activity consists of different access Nodes which are connected by integrated search facilities, compatible structures and a common management (fig. 1). A Node is a web portal taking care of a well defined thematic field. It will manage all the products related to that field being offered both from the Joint Research Activities and from the community. Each of these Nodes concentrates on a special field of planetary sciences, has its own team of related international experts and is responsible for the access to information and data centres related to its area of competence.

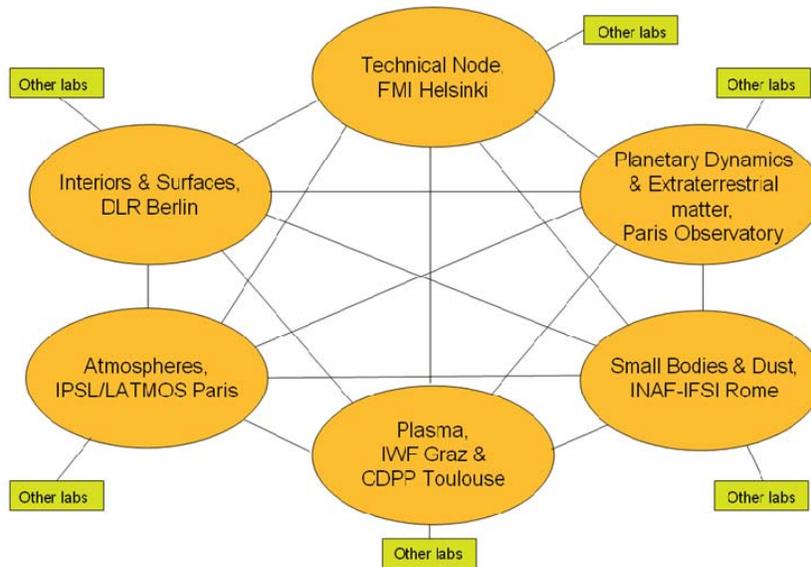


Figure 1: IDIS network structure

IDIS Service Activity is structured in a Technical Node and 5 thematic Nodes:

- **Technical Node (TN)** (<http://www.idis.europlanet-ri.eu>), hosted by the FMI (Helsinki, Finland)
The tasks of this Node are to coordinate IDIS development and network activities and provide information about general aspects of planetary sciences not directly related to one of the thematic Nodes.
- **Planetary Interiors and Surfaces Node (PISN)** (<http://www.idis-interiors.europlanet-ri.eu>), hosted by the DLR(Berlin, Germany)
- **Planetary Atmospheres Node (PAN)** (<http://www.idis-atmos.europlanet-ri.eu>), hosted by the CNRS/IPSL(Paris, France)
- **Planetary Plasmas Node (PPN)** (<http://www.idis-plasma.europlanet-ri.eu>), hosted by the CNRS/CDPP (Toulouse, France) and the IWF (Graz, Austria)
- **Small Bodies and Dust Node (SBDN) + Virtual Meteor Observatory (VMO)** (<http://www.idis-sbdn.europlanet-ri.eu>), hosted by INAF (Rome, Italy)
- **Planetary Dynamics and Extraterrestrial Matter Node (PDN)** (<http://www.idis-dyn.europlanet-ri.eu>), hosted by VO Paris (Paris, France)

Integrated keyword-based search-possibilities direct inquiries to those node(s), most likely to return the wanted information. The Nodes will receive inputs (resources) both from the other Europlanet activities and the scientific community. These resources can have many forms: Contact information for scientists, institutes and laboratories associated with this field of research, technical demonstrator reports, interactive catalogue access to computer models and analysis algorithms, routines enabled for high-performance computing, and access to calibrated data from international data centres, laboratories and modelling activities.

The IDIS Joint Research Activity

JRA-4 plays a pivotal role in transforming the current IDIS Service Activity into a Planetary Virtual Observatory, preparing essential tools so that the planetary science community can interrogate the

relevant datasets and visualize the results in a simple and effective way. The key objectives of this JRA are:

- To produce data models that will allow planetary scientists to make use of them in a coordinated fashion.
- To define the standards required to enable the services provided by SA IDIS to work in an interoperable fashion.
- To provide added value services to users that go beyond the provision of raw datasets, bringing the interrogation process much closer to the actual scientific aims of European planetary scientists.

JRA-4 is broken down into four tasks. The first of these is coordination of the work package, whilst tasks 2-4 provide the main inputs to transforming IDIS SA into a Planetary Virtual Observatory.

- **Task 1 *Coordination of JRA4*** (Leader CNRS/IPSL – Paris, France, Deputy Leader INAF/IASF – Rome, Italy)

It will take care of the coordination with SA IDIS and with other Joint Research Activities.

- **Task 2 *Interoperable Data Access*** (Leader CNRS/CESR – Toulouse, France, Deputy Leader INAF/IASF – Rome, Italy)

Task 2 will establish the basis allowing the evolution of SA-IDIS towards a future Virtual Observatory (VO) for planetary sciences.

The first step is to develop a datamodel, i.e., a structured and standardized way of describing resources which will allow applications to search, retrieve and use them in an automated fashion. The second step is to develop and provide tools allowing the providers (i) to describe their resources accordingly with the datamodel and (ii) to build an interoperability layer on their server, i.e., to make publishing registries accessible and to implement web-services for remotely exploiting these registries and eventually to extract data. The following step is the construction of the VO architecture which includes searchable registries which will be fed directly or from the provider's publishing registries through a harvesting process, search engines, interfaces to external VO or databases, and eventually high level tools and services exploiting on-the-fly the functionalities of the VO.

Meanwhile Task 2 will also provide a web-based general inventory of resources associated with a search engine. This inventory will allow users to search resources based on general keywords.

- **Task 3 *Added Value Services to Users*** (Leader DLR/IPR – Berlin, Germany, Deputy Leader OBSPARIS – Paris, France)

Task 3 will work in close conjunction with Task 2 to enable users to extract information from several data sets and compare them. It will develop interactive tools, which facilitate the retrieval of data set for given regions, times, or data types. It will create interfaces for existing databases that currently have complex query and access procedures, making them widely accessible by the Planetary Science community.

Therefore Task 3 will: (i) develop tools to register different images of the same planetary regions, to characterize features such as impact craters, tectonic features, geological units and chemical composition; (ii) develop a versatile software to access Planetary Data System (PDS) data archives (from space-borne instruments) in a non-commercial environment; (iii) develop or adapt VO tools to register and mosaic 2D data (images and derived products) of the same planetary regions.

- **Task 4 *New databases*** (Leader CNRS/LPG – Grenoble, France, Deputy Leader DLR/IPR – Berlin, Germany)

A growing part of Planetary Science involves the spectroscopic study of solids present at the surface or in the atmosphere of solar system bodies. A well identified need from the observational community is the easy access to laboratory data for the analysis of their spectroscopic observations. These data exist in a few European laboratories but a specific database infrastructure to deliver them to the community still needs to be developed.

Task 4 will develop a generic infrastructure of spectroscopic databases for solids (ices, minerals, organic molecules, extraterrestrial and synthetic organic matter). This infrastructure will be VO compliant and will enable the implementation of added value services as web services. Three specific databases will be developed on this infrastructure during the present contract: UV-to-FIR transmission spectroscopy of ices and organics, UV-to-NIR bidirectional reflection spectroscopy of solid surfaces (planetary analogue materials), and NIR-MIR Emission spectroscopy of minerals.

CONCLUSION

The EU commission is funding via its Framework Program 7 the development of the “Europlanet Research Infrastructure - Europlanet RI”, in which IDIS plays a central role. Towards the end of the project, IDIS will evolve into a Planetary Virtual Observatory. For the success of the project, the active support of the scientific community is of vital importance. In exchange for this support, IDIS will be useful in many ways. It will:

- locate resources for research projects
- get support data and useful software for data analysis
- combine data from different sources
- locate modelling teams and useful facilities in a given research area
- offer wide advertisement for your own resources and capabilities
- new cooperation possibilities with so far unknown teams

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