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Databases and Tools for planetary sciences available at CDPP, the french Data Center for Space Plasma Physics
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The recent activities of CDPP, the french Data Center for Space Plasma Physics (http://cdpp.eu/) in terms of data access and scientific tools for planetary sciences will be presented. This includes AMDA, the Automated Multi-Dataset Analysis tool, 3DView a tool for observational/simulation data visualization in 3-dimensions, as well as new capabilities in term of solar wind propagation in the heliosphere. Further developments are foreseen in the coming years either related to infrastructures (Planetary Sciences Virtual Observatory in the Europlanet H2020 programme), future missions (Solar Orbiter, JUICE) as well as international partners (e.g., Rosetta/RPC consortium, NASA/PDS, CCMC); the role played by CDPP in this context will be discussed.

キーワード: Archive, Tools, Database, Plasma, Magnetosphere, Planets
Keywords: Archive, Tools, Database, Plasma, Magnetosphere, Planets

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日本の惑星探査におけるデータの相互運用性
Interoperability of data in Japanese planetary explorations

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One of the important keywords of the data archives in Japanese planetary explorations is standardization. Before Hayabusa mission, an asteroid sample return mission, the concept of data archives was quite different from the current one. For example, HITEN was a lunar orbiter launched in 1990, but there is no available data in our hand. NOZOMI, a Mars explorer, measured some scientific data although the explorer could not be put into orbit. Those NOZOMI data are not archived and published officially at present.

The first archives in Japanese planetary exploration with standardization is Hayabusa mission that adopted Planetary Data Archives (PDS) in its files. Hayabusa was also the first mission to use SPICE to manage their ancillary data like orbit and attitude. At first, the project team created their data not in PDS. However, NASA helped to make archives in PDS version 3 (PDS3) and published a part of data from PDS website.

The second challenge of PDS and SPICE is the SELENE lunar orbiter launched in 2007. It carried many of scientific evidence through 21 month's operation. The SELENE project prepared the data in PDS3 compatible format. The "compatible" meant it was not strict PDS3 because they believed preparing data in PDS compliant format was a hard task beyond their scientific analysis. The data themselves were well documented and available for science, but it is confusing because the project used a keyword in a wrong way.

Akatsuki, known as Venus Climate Orbiter (VCO), is currently flying and trying to perform the Venus orbit insertion in December 2015. The data is also steadily prepared in PDS3. Already PDS4 was released to start the discussion of archives when Akatsuki's data archive started, but they chose to make their data in PDS3. The reason was why the other Venus mission, Venus Express (VEX), made their archives in PDS3, and also the team could not have an actual picture of PDS4 implementation together with scientific analysis.

Hisaki is a satellite to observe Jupiter's magnetosphere using extreme ultraviolet spectroscope (EUV). These observational data are located between astronomical satellite and planetary explorer. The project team uses SPICE for ancillary data, but the data format is in FITS.

The first mission in Japan to support PDS4 is Hayabusa2 mission. The Hayabusa2 project declared that the data are prepared in PDS4, and the project is going to collaborate with OSIRIS-REx that is NASA's sample return mission from an asteroid. The concept and design of Hayabusa2 and OSIRIS-REx are very much like, and collaboration in data archiving task is expected from the point of view of interoperability.

Prior to Hayabusa2's PDS4 discussion, BepiColombo, Mercury Orbiters with ESA, have started a study of PDS4. The ESA's study encourages to make PDS4 archives directly and indirectly for the Japanese PDS4 archives. The JAXA's part of BepiColombo is a research of Mercury Magnetosphere where Common Data Format (CDF) is the most common format. Discussion of PDS4 and CDF are actively performed.

These obtained scientific data are transferred from a project to DARTS, a scientific data archives managed by C-SODA/JAXA. The DARTS has the purposes of long-term preservation and distribution for scientific utilization. Most of the planetary data are directly accessed via the Internet using HTTP, and DARTS also provides the interface of Planetary Data Access Protocol (PDAP) for interoperability. PDAP is a kind of Web Service API to search products designated by International Planetary Data Alliance (IPDA). Search parameters are set in URL, and the response of HTTP is a format of VOTable by default. The response is available for further applications to search across planetary missions.
Keywords: PDS, SPICE, PDAP, archive

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複数局統合アーカイブに向けた飯舘木星電波スペクトルアーカイブの構築
Development of Iitate Jovian radio spectrogram archive for a unit of integrated archives of multiple ground stations

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Jovian radio emission in decametric wavelength range (DAM, 20-40MHz) observed by ground stations and spacecraft has brought us various information on Jovian magnetospheric activity: The source filed line of Io-related DAM is connected to Io in the inner magnetosphere. The energy of Io-related DAM is supplied by Io-Jupiter current system. The source field line of Non-Io-related DAM is connected to the outer magnetosphere. The intensity of non-Io-related DAM seems to be affected by the interaction between the outer magnetosphere and solar wind.

The merit of the ground-based observations is that high sensitivity antenna and high time resolution receiver can be employed without limitations of the equipment mass and downlink data rate, which often becomes issues in spacecraft observations. On the other hand, the demerit of the ground-based observation with single station is coverage: The ground station can not observe Jovian radio emission while the Jupiter is below the horizon. However, this demerit can be solved by combining datasets from multiple stations. Virtual Observatory (VO) could be a promising solution for such combined data analyses.

Wideband radio wave observation has been performed at Iitate station since 2000. The wideband radio spectrograms since 2004 have been already archived in CDF format. In addition, the metadata of them has been developed through the Inter-university Upper atmosphere Global Observation NETwork (IUGONET) project. They could be adapted to VO with a little modification. In the presentation, we will show the current status of the Iitate data archive and combined analysis results with Nancay Decametric Array (NDA) data as a sample use case.

キーワード: 木星デカメータ電波, Virtual Observatory (VO), IUGONET project, 飯舘惑星圏観測所, Nancay Decametric Array (NDA), メタデータ
Keywords: Jovian decametric radio emission, Virtual Observatory (VO), IUGONET project, Iitate observatory, Nancay Decametric Array (NDA), Metadata

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Sharing Low Frequency Radio Data in the Virtual Observatory
Sharing Low Frequency Radio Data in the Virtual Observatory

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CECCONI, Baptiste[1*] ; HESS, Sebastien[2] ; LE SIDANER, Pierre[1] ; ERARD, Stephane[1] ; COFFRE, Andree[3] ; THETAS, Emmanuel[3] ; ANDRE, Nicolas[4] ; GENOT, Vincent[4] ; THIEMAN, Jim[5] ; TYPINSKY, Dave[5] ; SKY, Jim[5]

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In the double frame of the preparation of the ESA JUICE (Jupiter Icy Moon Explorer) mission and the development of a planetary sciences virtual observatory (VO), we are proposing a new set of tools directed to data providers as well as users, in order to ease data sharing and discovery. We will focus on ground based planetary radio observations (thus mainly Jupiter radio emissions), trying for instance to enhance the temporal coverage of jovian decametric emission. The data service we will be using is EPN-TAP, a planetary science data access protocol developed by Europlanet-VESPA (Virtual European Solar and Planetary Access). This protocol is derived from IVOA (International Virtual Observatory Alliance) standards. The Jupiter Routine Observations from the Nancay Decameter Array are already shared on the planetary science VO using this protocol. We will first introduce the VO tools and concepts of interest for the planetary radioastronomy community. We will then present the various data formats now used for such data services, as well as their associated metadata. We will finally show various prototypical tools that make use of this shared datasets.

キーワード: Jupiter Radio Decametric emissions, Virtual Observatory
Keywords: Jupiter Radio Decametric emissions, Virtual Observatory