

・超高層大気長期変動の全球地上ネットワーク観測・研究 Inter-university Upper atmosphere Global Observation NETwork

Update of metadata and tools by the IUGONET project

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⁵ Institute for Space-Earch Environmental Research, Nagoya University, ⁶ Data Analysis Center for Geomagnetism and Space Magnetism, Graduate School of Science, Kyoto University,

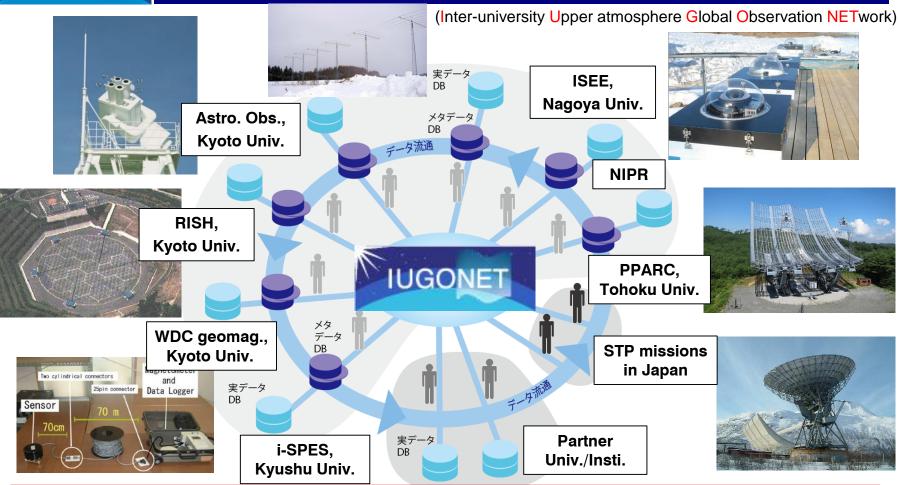


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 ⁸ Nagoya City University.

⁹ National Institute of Information and Communications Technology

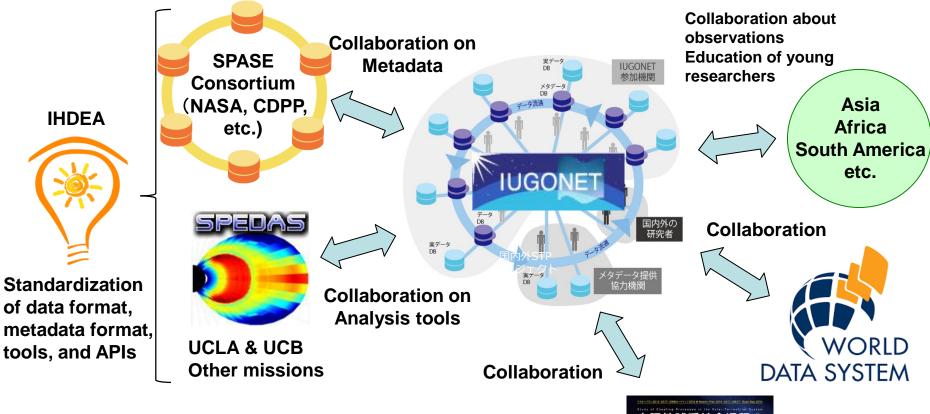
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IUGONET project



- The goals of the IUGONET project are to share the upper atmospheric data that have been separately archived by Japanese universities and institutes and to accelerate STP research.
- We have developed some advanced tools (metadata database and analysis tools), which enable data sharing and comprehensive data analysis.

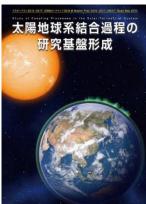
Domestic and International Collaborations



Data files, metadata, and tools created by IUGONET are based on the recommendations by IHDEA.

IUGONET

未来の学術振興構想 2023/ Master Plan 2014, 2017, 2020/ Road map 2014 "Study of Coupling Processes in the Solar-Terrestrial System"

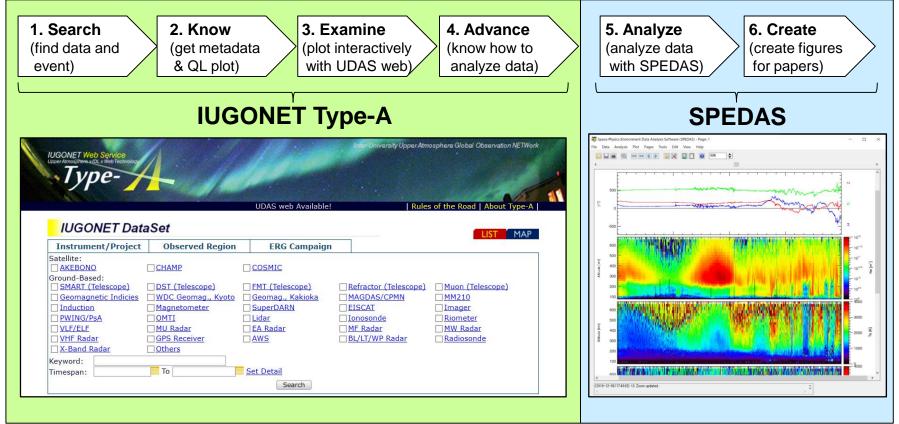




Tools Developed by IUGONET

Metadata Database

Analysis Tool





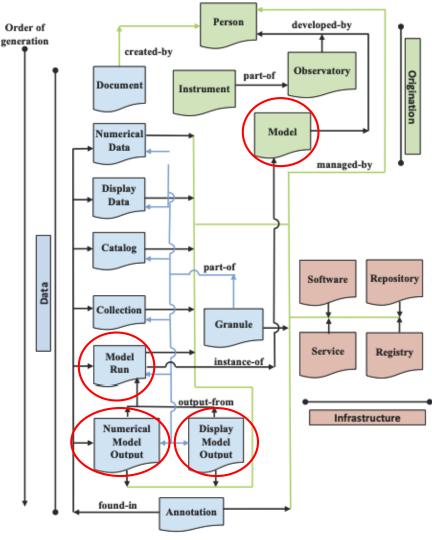
- IUGONET metadata database (IUGONET Type-A) provides one-stop web service for researchers to search data, get the information of data, and interactively visualize data.
- More than 1200 metadata for upper atmosphere data except for the "Granule" have been registered to IUGONET Type-A.



Update of IUGONET Metadata

- The current IUGONET metadata (2.4.0.1) is based on the SPASE 2.4.0 data model.
- These metadata have been converted to SPASE 2.6.1, and will be opened to public soon.
- The SPASE 2.6.1 schema can be used for simulation data.

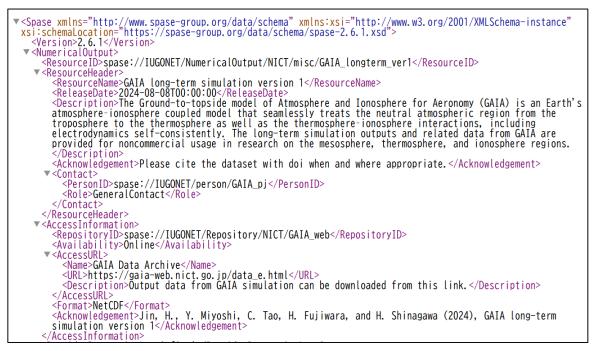
SPASE Information Model



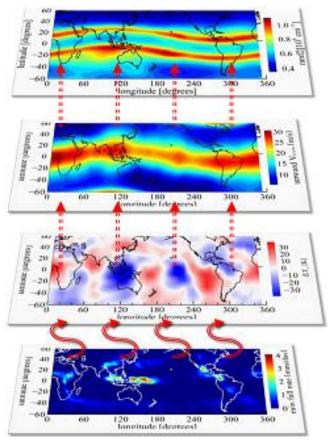
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Metadata for Simulation Data

A metadata for GAIA simulation data was created by National Institute of Information and Communications Technology (NICT) and will be registered to our database.



After discussion with the SPASE team, some modifications was made to the SPASE schema, e.g., new words such as GCM, AOGCM (Coupled atmosphere-ocean-sea ice global climate models), and NonHydrostatic were added to "Model Type".

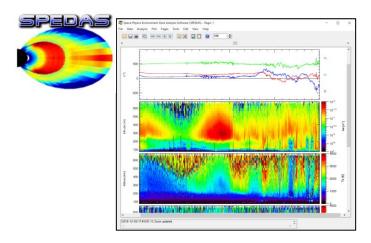


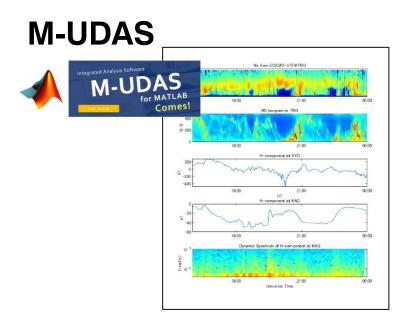
GAIA (Ground-to-topside model of Atmosphere and Ionosphere for Aeronomy) simulation data



Integrated Data Analysis Tools

SPEDAS/UDAS





- Space Physics Environment Data Analysis Software (SPEDAS) is a grass-roots data analysis software for the Space Physics community.
- Written in Interactive Data Language (IDL).
- About 40 kinds of load procedures for IUGONET data are included in SPEDAS.
- The latest version of the plug-in is available at the IUGONET website (http://www.iugonet.org/).
- Written in MATLAB, which is widely used by researchers in European and African countries.
- Approximately 20 different data loading functions are available on GitHub (https://github.com/iugonet/UdasMatlab)



Development of IUGONET Plugin for PySPEDAS



Python-based iUgonet Data Analysis Software (PyUDAS)

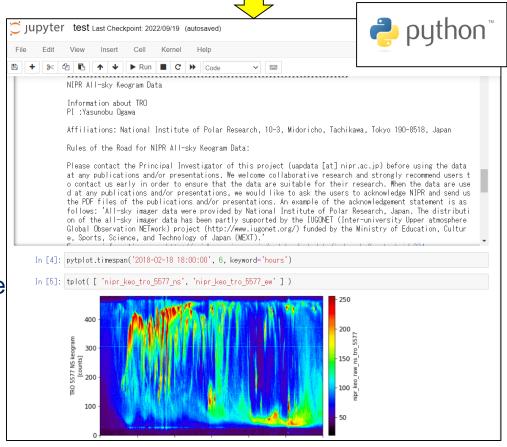
https://github.com/iugonet/pyudas

- We started to develop a plug-in software (called PyUDAS) for PySPEDAS in 2022, and the development is still ongoing.
- As of September 2024, more than 20 load routines for the upper atmosphere data (from magnetometers, all-sky imagers, radars, riometers, etc.) are available on GitHub.
- We hope to incorporate the plugin into PySPEDAS in future.



Python-based Space Physics Environment Data Analysis Software (PySPEDAS)

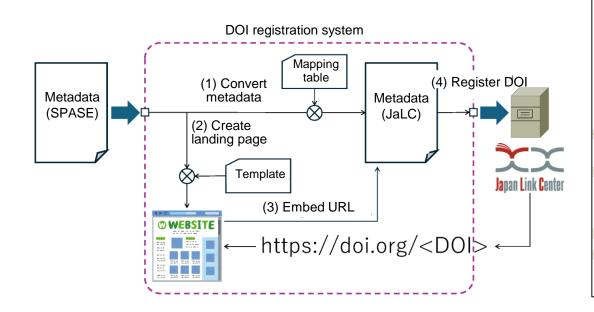
https://github.com/spedas/pyspedas





DOI Registration System

- Around 2013, several WDS institutions in Japan and NICT created a mapping table between the IUGONET metadata schema (based on SPASE 2.2.2) and JaLC (Japan Link Center) metadata schema, and developed a system that can register data DOIs using the IUGONET metadata.
- Recently, NICT updated the mapping table and replaced the system with new one that can register data DOIs using SPASE 2.6.0 metadata. IUGONET also entered to a search member of JaLC.



DOI:10.17591/55838dbd6c0ad

Mesospheric wind velocity data (30min. mean) observed with MF radar at Poker Flat, Alaska

Horizontal wind velocity in the altitude range of approx. 60-90 km is observed with Poker Flat MF (medium frequency) radar, using the radar wave at 2.43 MHz. The radar receives weak radio echo signals returned from the weakly ionized atmosphere (ionospheric D-region) at the target altitudes, to deduce horizontal air motions (Murayama, Y., K. Igarashi, D. D. Rice, B. J. Watkins, R. L. Collins, K. Mizutani, Y. Saito, and S. Kainuma, Medium Frequency Radars in Japan and Alaska for Upper Atmosphere Observations, IEICE Trans., E83-B, pp.1996-2003, 2000). Poker Flat MF radar has been constructed as part of Japan-US joint research program of Arctic middle & upper atmosphere ("Alaska Project") in collaboration between National Institute of Information and Communications Technology, Japan (formerly Communications Research Laboratory), and Geophysical Institute, University of Alaska Fairbanks.



2019-01-28T17:18:17+0900 2016-03-16T13:24:28+0900 2015-06-19T13:10:39+0900 2015-06-19T12:55:24+0000

Registration of IUGONET Metadata in Institutional Repositories

- Converted metadata from SPASE to JPCOAR (metadata schema for institutional repository) in collaboration with ISEE, Nagoya Univ., i-SPES, Kyushu Univ., Nagoya University Library, and Kyushu University Library.
- 284 ground-based observation data from ISEE, Nagoya University and 180 ground-based observation data from i-SPES, Kyushu University were registered in the institutional repositories of each university.
- Metadata registered in institutional repositories were automatically harvested into the Institutional Repositories DataBase (IRDB) of National Institute of Informatics (NII), and can be searched using Google Dataset Search.

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A example of metadata registered in Nagoya Repository

IUGONET

Metadata is registered in various databases by Harvest.

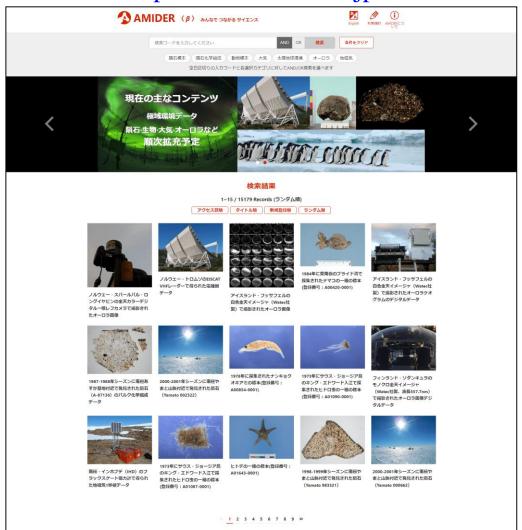
Details of this topic will be presented by Nose-san this evening.

Collaboration with Different Fields

https://amider.rois.ac.jp/

IUGONET

AMIDER



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- Collaboration with AMIDER project in Polar Environment Data Science Center (PEDSC), DS-ROIS.
- Registered IUGONET metadata on the AMIDER database that integrates data from various research fields and aims to promote interdisciplinary study.
- Currently, the AMIDER database contains biological, geoscience, meteorological, glaciological, and upper atmospheric data.
- Provides a service for downloading CDF, netCDF, and ASCII files, displaying visualized data, and showing related data.



Summary

- IUGONET has supported the metadata creation and data publication and developed the visualization and analysis tools. The data formats (CDF, NetCDF, FITS), metadata (SPASE), and tools (SPEDAS, PySPEDAS) used by IUGONET are based on the recommendations by IHDEA.
- The current IUGONET metadata was created based on SPASE 2.4.0.
 We converted the metadata to the SPASE 2.6.1 format and will opened them to public soon.
- We successfully created the metadata for GAIA simulation data in SPASE 2.6.1.
- We have developed the IUGONET plug-in tool (PyUDAS) for PySPEDAS. More than 20 load routines are available on GitHub.
- NICT developed a new system that can register data DOIs using SPASE 2.6.0 metadata, so we can use it to register DOIs for the upper atmosphere data.
- We registered the IUGONET metadata in the AMIDER database and institutional repositories to promote inter-disciplinary study and improve searchability.