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Kyoto University
The IUGONET project - objectives

- Since exchanges of materials, momenta, and energies in the upper atmosphere take place through complicated physical processes at different layers, integrated analysis by using various kinds of observational data is essential for investigating the mechanism of long-term variations in the upper atmosphere.

- However, the databases of such observations have been managed and maintained by each institution that conducted the observations. The data have been used by only a very few researchers who were involved in the observation campaign. There is no way to cross-search these databases due to lack of information on the data.

- The purpose of this project is to build a metadata database (MDB) of the upper atmospheric data acquired by ground-based observations, and then to promote effective use of the observational data spread across universities and institutes, which will lead to new interdisciplinary, comprehensive studies regarding the upper atmosphere.

Project timeline

- Inter-university collaboration

  - A six-year research project, Inter-university Upper atmosphere Global Observation NETwork (IUGONET), was launched in 2009 by the five Japanese universities and institutes (NIPR, Tohoku Univ., Nagoya Univ., Kyoto Univ., and Kyushu Univ.) that have been leading ground-based observations of the upper atmosphere for decades.

  - The MDB will be of great help to researchers in efficiently finding and obtaining various kinds of observational data we have obtained for many years by the global network of radars, magnetometers, optical sensors, helioscopes, and so on.

Problem of data use

- There is no way to cross-search these databases due to lack of information on the data.

Solution by metadata

- Easy to search various kinds of data from other disciplinary data.

Metadata format

- IUGONET common metadata format = SPASE + modifications

Problem of data use

- Additional words to represent non-digital archives
- Additional words to represent heliospheric coordinates
- New metadata elements to describe observation location and range

Through frequent discussions online, the IUGONET common metadata format has been designed, and our MDB system and data analysis software are now in process of being developed.

IUGONET metadata archiving

- Through frequent discussions online, the IUGONET common metadata format has been designed, and our MDB system and data analysis software are now in process of being developed.
Development of MDB system

- We adopted DSpace as the IUGONET MDB platform. DSpace is a free software widely used by digital repositories in many universities over the world. We can find so many case examples using DSpace. It matches the IUGONET project since we need to develop a stable MDB system in a short period of time.

- DSpace consists of PostgreSQL, Tomcat, Lucene, and so on. It can provide fundamental functions of registering, retrieving, providing and harvesting of metadata written in the IUGONET common metadata format.

- Users will be able to access the IUGONET MDB by using any browsers and get information of various kinds of observational data through the metadata registered there. For example, if “AccessURL” is available, they can get to the web site of the data.

Development of analysis software

- In addition to the MDB system, the IUGONET project provides a data analysis software to facilitate effective use of our observational data.

- The data analysis software (named UDAS) is written in IDL (Interactive Data Language), which is widely used in the fields of solar and terrestrial physics. We are developing the software on the basis of TDAS (THEMIS Data Analysis Software suite). The IDL routines of TDAS enable users to easily download, visualize, and analyze various kinds of time series data.

- The UDAS will provide both the GUI (Graphical User Interface) and the CUI (Character User Interface). By using GUI, even beginners will be able to utilize its functions. order to enable even beginners to utilize its functions.

- Our software development is conducted in collaboration with the ERG (Energization and Radiation in Geospace) mission since TDAS is also adopted as their analysis software.

Interface for cross-searching MDB

- The IUGONET project will prepare an interface for arbitrary software to cross-search our MDB.

- Case example 1: cross-searching from external DBs

- Case example 2: cross-searching from external data analysis software

- The API is soon to be determined.

Summary

- The IUGONET project builds e-infrastructure (metadata database and analysis software) to promote effective use of upper atmospheric data by ground-based observations.

- Current development status:
  - The initial version of IUGONET common metadata format was designed based on SPASE.
  - The IUGONET MDB system is being built on the basis of DSpace.
  - The development of IUGONET analysis software (UDAS) is in progress by using TDAS.

- The IUGONET products will be beta-released in April or May in 2011.

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References
