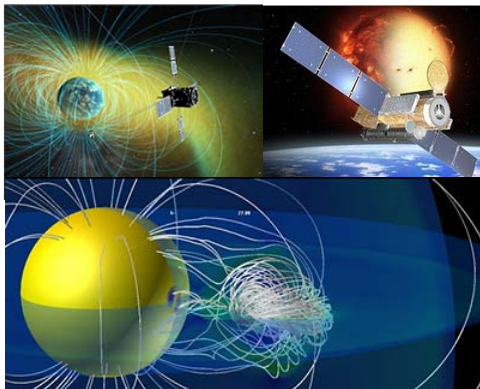


Center for Integrated Data Science (CIDAS)



- Hinode Science Center
- ERG Science Center
- Research and development of advanced simulations (SUSANOO, CReSS, Monte Carlo simulations for high-precision age calculations, etc.)
- Construction of various databases (IUGONET, WDS-CR, etc.)
- Operation of CIDAS supercomputer system
- Membership activity of HPCI consortium

The Center for Integrated Data Science (CIDAS) aimed to construct infrastructure and conduct research and development to realize a cutting-edge scientific study of the space–Earth environmental system through integrated analyses using various observational data and advanced computer simulations. CIDAS operates many projects in cooperation with the research divisions and centers of ISEE, as well as other universities and institutes.

Science centers for space missions: Hinode and ERG

The Hinode Science Center is operated as a joint project with NAOJ and developed the database and analytical environment for the data provided by the Japanese solar observation satellite Hinode. At the same time, it plays an important role in considering research topics of oncoming solar missions such as Solar-C EUVST. In addition, ERG Science Center operates as a joint research center in cooperation with the Institute of Space and Astronautical Science/Japan Aerospace Exploration Agency (ISAS/JAXA), which releases the data files from ERG (Arase) and ground-based observations. The ERG Science Center also develops the data analysis software. The CIDAS computer system has been used for the data analysis environment for Hinode and ERG projects.

Cooperative research program for database construction and supercomputing

CIDAS produces various databases for space–Earth environmental research and provides supercomputing facilities in collaboration with the Information Technology Center (ITC) of Nagoya University and other universities and institutes. CIDAS has also joined the inter-university network project (Inter-university Upper atmosphere Global Observation NETwork: IUGONET) with Tohoku University, NIPR, Kyoto University, Kyushu University, and Nagoya University to develop a metadata server and data analysis software. CIDAS is in charge of activities in ISEE as a member of the High-Performance Computing Infrastructure Consortium (HPCI) in Japan.

Research and development of advanced simulations

CIDAS plays a leading role in research and development of the following advanced computer simulation models: Space Weather Forecast Usable System Anchored by Numerical Operations and Observations (SUSANOO), the Cloud Resolving Storm Simulator (CReSS), and Monte Carlo simulations for accurate Th-U-Pb dating. The CReSS model is designed for all types of parallel computers to simulate a detailed structure of clouds and storms. CReSS is free to use for scientific community. It has been used for meteorological research and real-time weather forecast experiments, for example, simulation experiments of tropical cyclones, heavy rainfall events, snow clouds, tornados, and downscaling experiments of future tropical cyclones.

Main Activities in FY2018

Development of data analysis system for the ERG (Arase) project

The scientific data from the ERG (Arase) satellite, ground-network observations and modeling/simulation are archived at the ERG Science Center, which is operated by ISAS/JAXA and ISEE/Nagoya University. The format of these data files is CDF, which includes metadata of each file, which is a de facto format for the solar-terrestrial physics community. The Space Physics Environment Data Analysis System (SPEDAS), which is common software for the solar-terrestrial physics community can easily read and manipulate the CDF files. The ERG Science Center has developed CDF files for the ERG project, as well as a SPEDAS plug-in software for the ERG project. The ERG Science Center has organized the training sessions for SPEDAS in Japan and Taiwan, which provided important opportunities to learn SPEDAS and the ERG data. The ERG Science Center also develops a data analysis environment in the CIDAS system, and users can access the CIDAS system via the Internet and analyze the ERG project data using SPEDAS.

Coronal mass ejection arrival time forecasting system using IPS observations

CMEs cause disturbances in the environment around the Earth. CIDAS has installed a dedicated computing system for CME forecasting, and developed a CME forecasting system under a collaboration study with the Division for Heliospheric Research of ISEE and NICT. In this system, the propagation of CME is calculated by a global MHD simulation SUSANOO-CME. The IPS response is estimated by the 3D density distribution of the inner heliosphere derived from the MHD simulation. The simulated IPS response is compared with the actual IPS observations performed by the Division for Heliospheric Research, which gives a forecasting with better accuracy than before. This system will be included in the real-time forecasting system in NICT.

Activity of Inter-university Global Upper atmosphere Observation NETWORK (IUGONET)

We have promoted the use and application of upper atmospheric observation data through database and analysis software in collaboration with other institutions (e.g., the Research Organization of Information and Systems (ROIS)), and developed a foundation for a universal infrastructure for disclosing and citing data rapidly. We also abstracted a database design and have now provided these developments to each institute and committee to promote data activity. We have held several international data analysis workshops in developing countries such as Indonesia, Malaysia, and Nigeria in collaboration with several international programs, VarSITI and World Data System (WDS) affiliated with the International Council for Science (ICSU), and supported the construction of infrastructure for disclosing data and data integrity to them.

Operation of the CIDAS supercomputer system

The CIDAS supercomputer system for integrated data analysis is under operation since FY2016. The system consists of 20 compute nodes, with each node having two Intel Xeon E5-2660 v3 CPUs and 256 GB memory. In FY2018, 150 researchers/students were registered as users of the CIDAS supercomputer system and data analyses related to the Hinode Science Center and ERG/Arase Science Center as well as computer simulation studies were conducted.

Development of CReSS model

The CReSS model has been developed and improved for physical processes. It is open for scientific research from CIDAS. CReSS is used for simulation experiments and daily weather forecast. The simulated data of the daily forecast are open at the website of the meteorological laboratory. It is also planned that the simulation output data using CReSS model will be open from CIDAS.