

## Data Archive and Transfer System (DARTS) of ISAS

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**Abstract.** The Data Archive and Transfer System<sup>1</sup> (DARTS) is a central database for the scientific data obtained by satellites of the Institute of Space and Astronautical Science (ISAS) in Japan. We have archived and released the data from several past and current ISAS missions<sup>2</sup>. In the near future, the data from Astro-E2 (X-ray astronomy), Astro-F (Infrared astronomy), and Solar-B (solar physics) will be released from DARTS. These satellites will provide data sets much larger in quantity and quality than previous satellites. To manage these upcoming data, we are developing a new data management system. In addition, a new data distribution system on 'Super-SINET', which is an ultrahigh speed network dedicated to academic institutes in Japan, is under construction.

### 1. Introduction

The DARTS project commenced in 1995 and with the public release of data from 1997 is maintained by the PLAIN Center (Center for PLANNING and INFORMATION Systems) at ISAS in cooperation with various ISAS satellite teams. The objectives of DARTS are 1) to archive and release the ISAS mission data, 2) to provide search engines for the data users, 3) to provide an on-line data analysis system, 4) to provide information and links related to the data, and 5) to provide mirroring of the US and European mission data to Japanese and other Asian scientists.

The system consists of a file server, www server, proxy server and analysis server along with data storage devices (see Miura et al. 2000 for details). The total data size is several Tera bytes (TB) including the mirrored data. The main data catalogues are implemented in the Oracle database.

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<sup>1</sup><http://www.darts.isas.jaxa.jp>

<sup>2</sup><http://www.isas.jaxa.jp>

## 2. Current Services

The current DARTS services are summarized in Table 1. We have also provided mirroring services including the X-ray astronomical data of Beppo-SAX (SAX SDC, Italy) and ROSAT (MPE, Germany), solar observation data of TRACE and RHESSI, and CDAWeb. These data are mostly mirrored through NASA/GSFC.

## 3. Future Plan

Data from the forthcoming missions will be added to the DARTS archive in the near future.

**Astro-E2** A Japanese-US X-ray astronomical satellite has been constructed and tested for launch in early 2005. The satellite will provide excellent spectroscopic resolution together with a very wide energy band, ranging from soft X-rays up to gamma-rays (0.3–600 keV). The data will be processed at ISAS and NASA/GSFC. The calibrated data will be distributed from and archived at DARTS (at NASA/HEASARC for US observers). The amount of telemetry data and science data will be about 1 GB/day and a few TB for the whole mission time.

**Astro-F** This ambitious infrared mission is scheduled to be launched in late FY 2005. Astro-F will make an all-sky survey catalogue to much higher sensitivities (50 - 100 times higher at  $100\mu\text{m}$  and more than 1000 times that at mid-infrared wavelengths), better spatial resolutions and wider wavelength coverage than the Infrared Astronomical Satellite (IRAS). The data will be processed at ISAS in collaboration with UK and Dutch scientists and delivered via DARTS.

**Solar-B** A multi-wavelength solar mission planned to be launched in 2006. The observatory consists of a coordinated set of optical, X-ray and EUV telescopes. A new archive system, SODA (Solar Database and Archive) based on Java and XML software, is under development. This will provide a data analysis platform for multi-wavelength solar observations, a central data base for Japanese observatories, and an effective data mining system.

## 4. A New data storage system

To cope with future data expansion, we have been developing a system in ISAS based on the Storage Area Network (SAN) technology. In this system, all levels of the satellite data ranging from telemetry to public archive data are processed and stored. The system would provide not only fast access to data, but also cost reduction of the data administration. Fig.1 shows the system configuration.

The central data storage is a FUJITSU hard disk array ( $\sim 100$  TB in total, hardware-RAID) along with a StorageTek backup tape library. File servers are FUJITSU PRIMEPOWER (Solaris) and PRIMERGY (Linux). The storage, servers, and tape library are connected with each other by the fibre channel (G Bits/s) switches.

Table 1. The current DARTS services.

Missions <sup>a</sup>	target	Services & Contents
Astrophysics		
ASCA <sup>b</sup> (1993/2-2001/3) (340 GB)	x-ray	telemetry data screened/unscreened events <sup>c</sup> QL products <sup>c</sup> calibration data
Ginga <sup>b</sup> (1987/2-1991/11) (34 GB)	x-ray	telemetry data (LAC) analysis software <sup>d</sup>
Tenna (1983/2-1989/1)	x-ray	Observation log
HALCA <sup>b</sup> (1997/2-)	radio	public data
IRTS (1995/3-1995/4)	Infrared	point source Catalogue spatial intensity images
Solar Physics		
Yohkoh (1991/8-)	x-ray	raw and reprocessed data housekeeping data observation log daily images
Solar and Terrestrial Physics		
Geotail (1992-) (8 GB)	geomagnetosphere	magnetic field data plasma moment data
Akebono (1989/2-) (25 GB)	aurora	orbital and instrumental information observation data <sup>e</sup>

<sup>a</sup>Mission name following operation period and total data size in DARTS.

<sup>b</sup>Searchable by coordinate or target name.

<sup>c</sup>These products have been processed at NASA/GSFC.

<sup>d</sup>These tools were prepared by Ueda (ISAS) and others.

<sup>e</sup>Includes LEP, TED, SMS, RDM, ATV data.

## 5. DARTS on the Super-SINET

Super-SINET is an ultrahigh speed network dedicated to academic institutes in Japan and operated by the National Institute of Informatics. ISAS and the National Astronomical Observatory (NAO) lead a sub-division of space and astronomical science. A direct and fast access to DARTS and other data bases at ISAS can be provided to several key institutes in Japan (13 sites are connected so far). The DARTS and NAO databases are also directly connected, for developing and sharing multi-wavelength astronomical data bases. Examples of the collaboration are jMAISON<sup>3</sup> (Java-based Multi-wavelength Astronomical Image Service On line) and SODA (Solar Database and Archive).

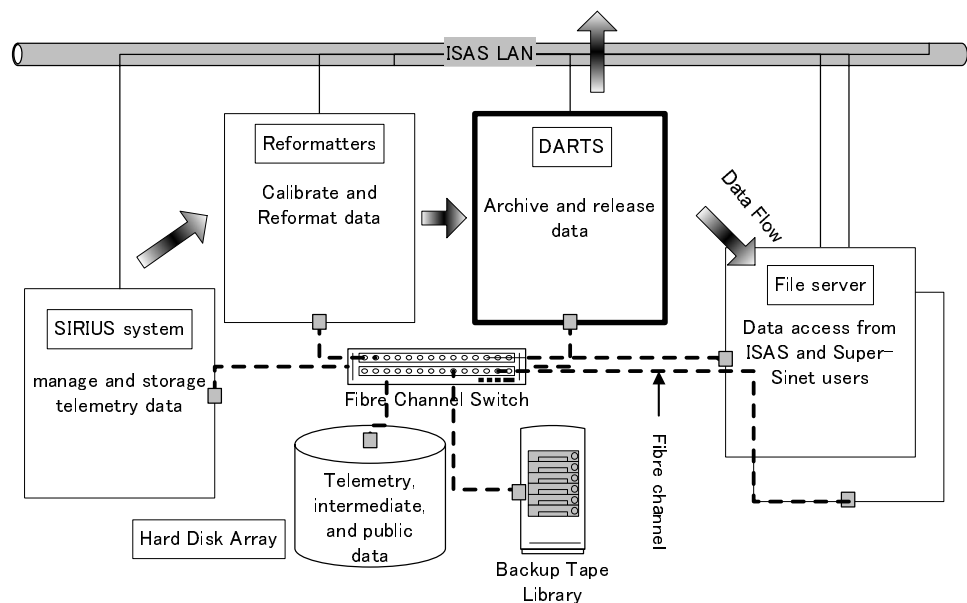


Figure 1. A new data management system at ISAS, including DARTS.

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## References

- Miura et al. 2000, in ASP Conf. Ser., Vol. 216, ADASS IX, ed. N. Manset, C. Veillet, & D. Crabtree (San Francisco: ASP), 180

<sup>3</sup><http://maison.isas.jaxa.jp>