Astronomical Data Analysis Software and Systems VII
ASP Conference Series, Vol. 145, 1998
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ASCA: An International Mission

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Abstract. The ASCA X-ray satellite mission involves scientists from Japan, America, and Europe. Each year more than 400 targets are observed by ASCA. The process starts with the electronic submission of a proposal and ends with the delivery of a data tape. A successful observation depends on organization within the operations team and efficient communication between the operations team and the observers. The methods used for proposing, scheduling, coordinating observations, quick-look plots, and data delivery are presented. Cooperation is the key to success in an international mission

1. Introduction

ASCA is an X-ray satellite which was launched by Japan in 1993. While the platform is Japanese, the hardware was a joint effort by US and Japanese teams. The entire processing cycle from proposal submission through data delivery is a joint effort between the two countries. In short, the ASCA project must coordinate across continents and languages. To help with the coordination, NASA has agreed to support one person on site at ISAS.

Observation time is allocated 50% Japan only, 25% US-Japan, 15% US only, and 10% ESA-Japan. The ESA time is granted by Japan to encourage international collaboration. A typical observation is for 40 kiloseconds, or about one day of satellite time. Some pointings are as short as 10 ksec; some are as long as 200 ksec. Over the course of a year over 400 observations are made by ASCA, many of these are coordinated with other astronomical platforms.

In order to produce science, these 400 observations must be proposed, coordinated and scheduled, and observed. Then, quicklook and production data must be delivered to the scientists.

2. Announcement and Proposals

The entire process begins with a coordinated announcement by ISAS, NASA, and ESA, 90 days before the deadline. Requests for proposals are made in the vernacular of each country. A proposal has two parts: a cover page and scientific justification. The cover page includes contact information about the proposer and co-investigators, the abstract, target data, and observational requirements. English is used for the cover page while either English or Japanese is acceptable for the scientific justification in Japan.

ASCA is one of the first missions that required electronic submission of the cover page. Electronic submission of proposals allows the database to be populated automatically. The database then serves as the common reference point for each country's efforts, and thus the e-mail proposals are used throughout the observation cycle.

In order to get 100% compliance with electronic submission, we had to provide multiple avenues and make it easy for users. Proposers can construct their cover page via a form on the World Wide Web or a blank e-mail form. About 70% of the Japanese proposals submitted in 1996 used the blank form, while 70% of the US proposers used Web forms. The Web version has many pull-down menus and on-line help. The e-mail method continues to be supported because it still has an active user base.

The Remote Proposal System (RPS) developed at Goddard for preparing, checking, and sending proposals is used. RPS, which is used by other missions including XTE and ROSAT, is available over the Web. RPS is used to check each proposal for format accuracy before it is accepted.

3. Re-order/Review, and Approval

After the proposal deadline, invalid proposals such as duplicates or withdrawn ones are eliminated. Proposals are re-ordered according to category and postal code. A five digit number is assigned to each proposal. This number starts with the AO, and the PI's country code. The proposal number is the key reference through the observation and data distribution.

Formal panels in Japan, America, and Europe review the proposals. A merging meeting convenes to decide the final target list. Email is then used to notify the PIs that their target has been selected. The list of accepted targets is also made public via the Web. This provides both an active and a passive electronic disbursement of the final selection, and reduces miscommunication and communications breakdowns. Selected targets are assigned a sequence number which serves as the main identifier of the observation.

4. Long-term Scheduling

ASCA uses a schedule planning program called SPIKE which was developed at MIT for the Hubble project. The details of SPIKE are beyond the scope of this paper. In general, we plan the time criticals according to the proposal requests and we use a sun angle constraint of +/- 25 degrees.

SPIKE produces a one-year schedule which is divided into weekly periods. One output file is a nice readable ASCII file, which is run through a Perl script to make an HTML file for use on the Web. The long-term schedule displays the list of targets and the planned or observed date. Each target has a hyperlink to its proposal summary.

The proposal summary displays the abstract and the successful targets from the proposal. Comments are listed when they are included with the proposal. There are e-mail hyperlinks to the PI and primary Co-I. This summary serves both the community and the operations team.

5. Co-ordination

Sometimes a PI will request observation time on more than one platform, or with a ground station. Since the observation cycles of each platform are different and in general independent, it is the responsibility of the PI to note that a co-ordinated observation is required.

Then, it becomes necessary to communicate with other schedulers. Usually, an e-mail conveys the list of common targets and a general schedule is discussed. Email has low overhead and fast response time. The primary disadvantage, of course, is that it is ultimately people-based. No mechanism exists (or has ever been proposed) to unify satellite scheduling. Once a coordinated observation is approved, it is solely the responsibility of the schedulers (in consultation, as needed, with project PIs) to make sure the coordination happens.

There is a network of schedulers that was organized by Dave Meriwether when he was at EUVE. Unfortunately, we have not kept the system going after Dave's departure from EUVE. We need to get this network back on track.

6. Short-term Schedule

Short-term schedules of 10-13 days are made about one month in advance. ASCA uses a short-term schedule editor called Needle that was developed in-house at GSFC/ISAS. The primary considerations for a short term schedule are time-critical requests, unofficial time critical requests, bright earth, and star tracker.

After the short term schedule is made, some post processing of the file to be distributed takes place. The latest e-mail address and institute name of the PI are added for the convenience of the contact scientist. Also, relevant comments from the proposal are added. This file is sent to the operations teams in both Japan and the US via e-mail.

After the schedule has been finalized, PIs are notified in English about their upcoming observation. This gives the PI a chance to prepare for the observation in advance of hearing from the contact scientist. By the time the contact scientist notifies the PI, we will have completed several other short term schedules. This means that late notification of a PI could affect the scheduling process. Early notification seems to work in the best interest of both the operations team and the PI.

After the targets have been scheduled and the PIs have been notified, changes are sometimes required. It is important to notify a PI when an observation schedule is changed. ASCA TOOs are subjected to review before approval by two team members in Japan and two in the US. Rapid communications via e-mail or fax means that a gamma ray burst can be reported, discussed, scheduled, and observed by ASCA within 36 hours.

7. Observation and Quick-look Plots

A week or two prior to an observation, the PI is contacted for detailed arrangements. The Japanese contact Japanese PIs, while the US team contacts US and ESA PIs. Email is the primary method of contact.

The ASCA operations ground control center is located at Kagoshima Space Center (KSC) on the south island of Japan. KSC is operated six days a week. When the station is manned, it is possible to do a quick-look plot of data. These plots are distributed via fax.

Electronic delivery would be a useful method to pass the quicklooks along to the PIs. However, the current system is not set up for this, and so a fax machine is used.

8. Data Delivery

After the observation has been made, first reduction files (frf) are sent to ISAS and to Goddard. Japanese PIs are able to process their own data before the CDs are sent out. Finally, the observation data tapes are made and the data are sent to Goddard for storage and distribution. Data are placed on a CD-ROM and mailed to the PI. Because the data have been tagged with the same ID as the schedule products, cross-correlating is trivial. And, the community is automatically aware (by reading the schedule) what products are available in the archive. Data are made public after 1-2 years. This means that the Web-based notification we provide also serves as a "promotional teaser" for upcoming data. The electronic transfer process ensures that data are not lost, misplaced, or wrongly labeled.

The process does require manipulation of the data at different stages, and some manual intervention. A more automated pipeline would be an asset. The most important aspect is that the entire process is transparent to the user. The user sends in an e-mail or Web proposal, and later receives their data (as a CD in the mail, or electronically from the archive.)

9. Summary

ASCA is a very successful mission. Part of the success of the ASCA mission is due to the rapid communication channels that are available to us. We require that all proposers use a standard e-mail format in English. We use the language of each country, when appropriate. English is used as the common language.

When we need to coordinate with other schedulers, we receive timely support. We use the Internet, e-mail, and faxes for communications within the ASCA community. The ultimate strength of the electronic process is that it facilitates better communication, and eliminates the geographic boundaries of this project.

The true reason for ASCA's success is the cooperation of the guest observer teams in Japan, the US, and Europe. We can have the best communications system, but without the cooperation of the operation teams, we would have little.