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ESA Announcement of Opportunity (AO-10)

Suzaku
Guest Investigator Programme
11 December 2014

SRE-S/14/183/cb

1 OVERVIEW

This announcement solicits proposals for observations using the Japanese-US X-ray astronomy satellite *Suzaku*.

The X-ray Astronomy satellite *Suzaku* was developed under collaboration of Japan and the United States, and was launched by ISAS/JAXA on 2005 July 10. *Suzaku* has successfully carried out observations of celestial objects using the X-ray Imaging Spectrometer (XIS) and the Hard X-ray Detector (HXD). After the initial operation for instrument calibration and performance verification, which confirm the wide-bandpass, high-sensitivity, moderate spectral resolution capabilities of *Suzaku*, we entered the international AO phase of the mission in 2006 April, performing observations based on proposals received from the astronomical community world-wide.

In the meanwhile, however, *Suzaku* has suffered from a degradation of the electric power supply from the solar array since August 2011. In addition, the electric capacity of the batteries was reduced at around the beginning of this year due to aging associated with repeated charge/discharge operations, and as a result, the Project are not able to operate the XIS (X-ray CCD camera) and HXD (Hard X-ray Detector) simultaneously for the most of time.

Since then, the *Suzaku* operation team has monitored the electric power condition carefully, and has found no significant degradation of the power condition since last July. Accordingly, we hereby solicit submission of observation proposals for AO-10. Please note, however, that further degradation of the electric power supply may occur during the AO-10 observation period. ISAS/JAXA would like proposers to note the following points.

- The observation period of the AO-10 is **half a year** starting from 1 May 2015.
- We solicit observation proposals using the XIS. The HXD will be operated simultaneously with the XIS while *Suzaku* is in an orbit with a good electric power condition, such as with a high sunlit fraction. But such period is quite limited and is difficult to be predicted precisely. Accordingly, we cannot accept any proposal that cannot achieve its scientific goal without HXD data.
- We will do our best to continue observation by the end of the AO-10 period (October 31, 2015). Even if the electric power condition becomes more severe, we will continue observation as long as one of the three CCD cameras can be operated (in that case we extend the exposure time of each observation by a factor of three).
- We cease to solicit Key Project proposals for AO-10.

During the AO-10 period, observations on the basis of *Suzaku*-Fermi joint program initiated in AO-6 will be carried out. We refer those who are interested in this program to the Fermi home page. Note that ISAS/JAXA do not accept proposals of the Joint Chandra/*Suzaku* program.

We remark that the *Suzaku* project will undergo evaluation by an evaluation committee of ISAS for the mission extension in July 2015. Fulfillment of observations thereafter will depend on the result of this evaluation as well.

This is one of three parallel announcements, and solicits proposals from researchers affiliated with institutes or universities located in the 20 ESA Member States (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom). Details of the Announcement and links to mission descriptions etc. can be found at:

<http://cosmos.esa.int/Suzaku/>

Researchers in the US should consult the version at:

<http://astroe.gsfc.nasa.gov/>

Researchers based in Japan, and all other countries, should consult the version at:

<http://www.astro.isas.jaxa.jp/suzaku/>

2 THE SUZAKU X-RAY OBSERVATORY

The Suzaku satellite carries four modules of the X-Ray Telescope (XRTs) that focus X-rays up to ~10 keV with a high efficiency. In the focal plane of each XRT there is an X-ray CCD camera (XIS) module. The XIS has a high sensitivity and a moderate spatial resolution, and is particularly suitable for the studies of extended sources. The XIS also has a good spectral resolution for soft X-rays below 0.8 keV, which is superior to those of Chandra and XMM-Newton. Moreover, ISAS/JAXA have applied the so-called “Spaced-row Charge Injection” technique for the XIS since AO-2 to suppress the degradation of energy resolution. The HXD has unprecedented sensitivity in the wide energy range up to 600 keV, although it has no imaging capability. The wide bandpass coverage of 0.2 keV through 600 keV with the XIS and the HXD is an important characteristic of the Suzaku mission.

The details of the instruments (Technical Description document), and a list of targets that have been observed, or accepted, can be found at the following Suzaku homepage:

<http://www.astro.isas.jaxa.jp/suzaku/>

We plan to operate the HXD (sensitive in the band 10 to 600 keV) simultaneously with the XIS during the orbits of good electric power condition. However, since those periods are quite limited in time and difficult to be predicted precisely, we will not accept any proposal in which HXD data are mandatory to achieve its scientific goal.

3 MISSION PHASES AND TIME ALLOCATION

The *Suzaku* mission has been developed and maintained as a collaboration between Japan and the US. The Science Working Group (SWG), that consists of researchers involved in the development and operations, oversees the project overall. Since the end of the SWG phase of the mission (2006 March), all observation time except:

- (a) Observatory Time (3%) for satellite maintenance and related purposes
- (b) Calibration time (5%) for calibration of instruments
- (c) Director's Discretionary Time (DDT; 5%) for gamma-ray bursts or any genuinely unpredictable events and other important observations granted at the discretion of the mission director,

has exclusively been dedicated for AO observations. The AO-10 program (half a year period starting on 2015 May 1st) will be run under the same policy. ToO observations based on proposals from the MAXI team have been carried out within (c) DDT since AO-5.

The remaining 87% of the total time, which amounts to $180\text{d} \times 38 \text{ ksec/d} \times 0.87 = 5951 \text{ ksec}$, is open to the AO-10 observation program, and is distributed among Japan, US, ESA and other countries as follows:

- 1) Japan time:** 2975 ksec (of which ESA 476 ksec, Japan and other countries 2499 ksec)
- 2) US time:** 2232 ksec
- 3) Joint Japan-US time:** 744 ksec

Here the Japan time includes the joint Japan-ESA time, which amounts to 476 ksec. Accordingly, the remaining 2499 ksec is the time for Japanese scientists in AO-10. All proposals out of Japan, US and ESA member states should be submitted to the Japan time. Note, however, that the total approved exposure time of proposals whose PIs are not Japanese nor researchers from ESA member states should not exceed the joint Japan-ESA time. The joint Japan-US time will be used if proposals for the same targets are accepted both in Japan and US, and if both PIs accept such merging (the proposal form has a check box for the PIs to indicate whether they accept the merging). Observation time from Suzaku-Fermi joint program is included in either one category of (1)-(3), depending upon the PIs' affiliation.

4 PROPOSAL POLICIES

The complete list of the targets accepted until AO-9 can be found at the following URL:

<http://www.astro.isas.jaxa.jp/suzaku/accept/>

Observations of the priority A and B targets are guaranteed. New proposals for these targets are difficult to be approved unless there is a strong justification for an additional observation, such as much longer exposure, different pointing position on the same extended object, or a different phase of a variable object. As mentioned at the top of this document, it is possible that this AO-10 becomes the final one of the Suzaku mission. Accordingly, proposals that are similar to those submitted and accepted in the past AOs are welcome if the observations are expected to strengthen or finally establish excellent results from the past AOs. They include, for example, enhancement of statistics of a certain object by simply adding exposure time, completing a mapping observation to entirely cover a diffuse object, increasing the number of samples from a certain source category, and so on. In addition, the next generation X-ray observatory ASTRO-H will be launched in the Japanese fiscal year 2015. Proposals whose scientific purpose can be extended with ASTRO-H are also welcome.

<http://www.astro.isas.jaxa.jp/suzaku/log/>

Anyone can submit proposals for the C or ToO targets that are unobserved. It must be noted, however, that they are possible to be observed by the end of AO-9 period (April 30th, 2015). In this case, the observations of the C targets are regarded as being completed if the exposure time exceeds 70% of the proposed time, and no further observation will be carried out in AO-10. If, on the other hand, the exposure time is less than 70 %, a complementary observation will be carried out to fill the requested time, if a proposal for the same target from the same PI is accepted at a higher priority (A or B) in AO-10. Otherwise the observation carried out in AO-9 (less than 70% filled) is ignored, and the target is open for competition in AO-10.

(2) The exposure time of the observation should be justified based on scientific objectives, preferably using simulations. The project team sets the minimum exposure time of a single pointing observation at 10 ksec, considering the observation efficiency. No upper limit of the total exposure time, on the other hand, is set in AO-10. Note that observations based on a proposal whose total

exposure time is equal to or longer than 300ksec will be opened to public immediately after the initial processing of the data is done. No proprietary period is awarded to the PI.

(3) An uninterrupted continuous observation is guaranteed for up to 100 ksec. This limitation originates from moon light constraint to the star trackers' field of view, conflict with other time critical observations (see item (5) below), and other operational/planning difficulty. The operation team accepts a request of an uninterrupted observation longer than the 100ksec, but conducts it on the best-effort basis.

(4) Target of opportunity (ToO) proposals are allowed for short-lived events on known objects whose timing is uncertain. This category is referred to as "Reserved ToO observation". In this case, condition to trigger the observation, estimated probability of the event to take place during the AO-10 period, and the expected duration of the event should be specified in the proposal as well as other information required for the ordinary observation proposals (see section 5-(2) of "Call for Proposals of the Suzaku AO-10 period" below). Any proposal without specifying a target name, such as "Observation of a forthcoming nearby supernova", or "Next nova explosion in M31", is not to be accepted. The number of targets that is allowed to be written in the target list is limited at most 5 per proposal. It is requested to specify in the scientific justification how many targets should be observed to fulfill the scientific goal of the proposal. In specifying the number of targets (trigger number), the proposers should be careful about the rule of awarding the proprietary period (see (2) above). If, for example, five targets with 100 ksec exposure for each are proposed, proprietary period of 1 year is awarded if the trigger number is 1 or 2. But if the trigger number is equal to or more than 3, no proprietary period is awarded to the proposers because the total proposed exposure time is equal to or more than 300ksec.

(5) It is possible to submit proposals specifying the time of observations as TC (Time Critical) observations. These include all the observations that require, of the operation team, consideration of operational/planning constraints other than the solar angle limitation. They include, for example, a roll-angle-constraint observation, multi-pointing observations of a variable target (even with a lax constraint of once per half a year, for example), a background observation planned closely in time with the main target observation, an observation of a certain binary phase, coordinated observations with other wavebands, and so on. The Suzaku operation team will do their best to perform the observations as requested. In all these cases, the PI has to raise the TC flag in the application form. Even if the coordination with other instruments is not planned in detail at the time of the proposal submission, the PIs are requested to check the TC box if they would like to do so after the approval of the proposal. The Suzaku longterm/shortterm schedules are possible to be revised even just before the observation starts, due to interruption by a ToO observation. The operation team cannot guarantee the coordination if the TC flag is off, even in the case that the other instruments follow the Suzaku schedule.

(6) Any genuinely unpredictable events such as, gamma-ray bursts and supernovae and so on, can be observed as part of the DDT. This category is referred to as a "Realtime ToO observation". The observation proposals of this category are received at any time and are refereed out of the ordinary proposal selection process. Any proposer who would like to propose a Realtime ToO observation is requested to fill the form

<http://www.astro.isas.jaxa.jp/suzaku/planning/gtoo/>

and send it to the *Suzaku* managers by e-mail

suzaku_managers@astro.isas.jaxa.jp

The proposer has no proprietary rights to real-time ToO observation data. Note that real-time ToO observations of gamma-ray bursts will be accepted from any investigators worldwide in AO-9, which had been planned by the *Suzaku* Science Working Group in AO-6, by referring to information from various other observation networks.

(7) The *Suzaku* project team will accept proposals using P-sum/timing mode for the XIS, as well as the normal imaging mode. In the P-sum/timing mode, photon pile-up scarcely occurs, and a time resolution as fast as 7.8 msec can be achieved, although only 1-dimensional images can be obtained. Note, that the P-sum/timing mode can be used only for XIS3, and neither Spaced-row Charge Injection, nor CTI correction can be applied. Hence the energy resolution is significantly worse than in the normal imaging mode. The calibration accuracy of the energy response is not as good as that in the normal imaging mode, either. Refer to the technical description document for the P-sum/timing mode for more details.

(8) The project team has supported the two default pointing positions since AO-1 - the XIS nominal and HXD nominal positions. Of these, the team ceased to support the HXD nominal position from AO-7. As a result, the standard HXD response matrices will not be supplied, and XIS observations with a non-standard readout clock (P-sum/timing mode and window/burst options) have not been available since AO-7. Proposers should make the response matrices at the HXD nominal position by themselves by utilizing the response builders of the XIS and the HXD. In AO-10, HXD data are not guaranteed. Hence the proposers are advised to refrain from adopting the HXD nominal position should they have no special reason.

5 REVIEW PROCESS AND SCHEDULE

(1) Researchers affiliated with institutes located in the ESA Members States should submit their proposals to ESA according to this AO document. The deadline is **3 February 2015 at 16:00 CET**. After the ESA review, the Japan-US merging committee will be convened in mid April 2015. The final observing program of AO-10 will be released soon thereafter.

(2) Accepted proposal are classified into three categories according to their priorities (A, B, and C) which are assigned on the basis of their mark given by the referees. The priority A targets will be preferentially observed during the AO-10 period (2015 May 1 to the October 31), and the observation is regarded as completed if the exposure time is more than 90% of the requested time. The priority B targets are tried to be observed during the AO-10 period. This is on the best-effort basis, and hence, they may be carried over to the following AOs. Observations of the priority B targets are regarded as completed if the observation covers more than 70% of the requested time. The priority C targets will be used as fillers if there remains a room in the time line after scheduling the priority A and B targets. Of the total available time T ($= 5951 \text{ ksec} = 180 \text{ d} \times 38 \text{ ksec/d} \times 0.87$), we will accept $0.6T$ ($= 3570 \text{ ksec}$) for A, $0.3T$ ($= 1785 \text{ ksec}$) for B, and $0.5T$ ($= 2975 \text{ ksec}$) for C proposals. This implies the oversubscription fraction of 40%. The oversubscribed targets will be scheduled if observing time remains after the observatory time, the calibration time, and DDT are assigned.

(3) Reserved ToOs and TC observations pose constraint on scheduling observations. Hence total fraction of them is limited to some 15% of the total available time. Note, however, that this number may be reduced in the discussion of the Japan-US merging committee meeting (mid April 2015), based on the prospect of the electric power supply status of *Suzaku*.

6 DATA RIGHTS

The data taken in the ordinary observation programme are immediately delivered to the proposer. The proposer has proprietary rights to the data for 1 year after the data are ready for scientific analysis. This does not apply to the data based on real-time ToO proposals and proposal whose total exposure time is equal to or more than 300 ksec, which are immediately opened to the public after the initial data processing is completed.



Call for Proposals of the Suzaku AO-10 period

1 OBSERVATIONS SOLICITED IN AO-10

We solicit submission of X-ray observation proposals using the X-ray CCD camera (XIS) onboard the Suzaku observatory for half a year period from May 1st, 2015 through October 31st.

2 APPLICANT ELIGIBILITY FOR SUBMITTING PROPOSALS TO THE ESA TIME

Principal investigators who submit their proposals to ESA have to be affiliated with institutions or universities located in one of the ESA Member States.

U.S. based proposers should submit their proposals through NASA.

European researchers who spend most of their time during the AO-10 period in Japan can submit their proposals to ISAS/JAXA. PIs in the other countries should submit their proposals to ISAS/JAXA in Japan. Proposals submitted to ISAS/JAXA and NASA can include US/ESA researchers as Co-Is.

It is not permitted to submit identical proposals to any of ESA, ISAS/JAXA or NASA. They will be ignored on all sides.

There are no restrictions on the countries of co-investigators on proposals submitted to ESA.

3 DUE DATE OF PROPOSALS

The observation proposals should be submitted to ESA by 16:00 CET on 3 February 2015. Only electronic submission through the Remote Proposal-submission System (RPS) is allowed (see below for details).

4 PROPOSAL SUBMISSION

The forms summarized in the next section should be submitted electronically with the Remote Proposal-submission System (RPS). The RPS will be ready for use shortly.

5 PROPOSAL FORM

The proposal form consists of the following items.

(1) Cover Page: general information including investigators' name, title and abstract of the proposal.

(2) Target Form: information on the proposed targets including target name, its celestial coordinates, expected counting rate, and preferred observation mode. The target information in this form is automatically registered in the observation database and utilized in making the long-term observation time line of AO-10. The proposers are therefore strongly required to provide accurate information. All information that is indispensable for operation planning should be provided in the electronic form. The PIs are advised to utilize the “Remarks” area if they have detailed requests that cannot be expressed with the check boxes/pull-down menus. Special care should be paid in the following points;

(a) From AO-6, the XIS3 can be used in the P-sum/timing mode (the other two modules XIS0 and XIS1 can be operated only in the normal imaging mode). In using the P-sum/timing mode for the XIS3, the PI is required to select “PSUM” in the XIS mode pull-down menu, and describe the mode setting of the other XIS modules, such as window or burst options in the “Remarks” area

(b) Be sure to mark the TC check box if the proposed observation is time critical (see section 4-(5) of “Announcement of Opportunity (AO-10) of Suzaku” above). Provide all information necessary to plan/conduct the observation in the “Remarks” area.

(c) Provide in the “Remarks” area the conditions to initiate the ToO observation, and probability of those conditions being met within the period of AO-10. If there is no description on the trigger probability, the project team cannot help assuming the probability of 100%, and accordingly, accumulating the exposure time as written in the proposal. This will hamper acceptance of other ToO proposals with lower mark that would have been accepted if there were description on the trigger probability. In order to utilize valuable Suzaku time among the community, the project strongly asks proposers of ToO observations to specify the trigger probability.

(d) It will take ~3 days to start a reserved ToO observation in the P-sum/timing mode since the trigger from the PI, during which the operation team prepares the mode setting commands.

(3) Scientific Justification (SJ): Background of the proposal, scientific issues to be resolved, and technical feasibility of the proposed observation should be summarized within 4 pages including text, figures, charts, tables, and references. It is possible that the number of the XIS modules is reduced from the current three to one eventually. The proposers are asked to mention in SJ on the following points.

(a) The Suzaku project will increase the exposure time of each observation according to the number of available XIS modules; if the number of the modules is reduced to one, the exposure time will be increased by a factor of three. The proposers should evaluate the effect of such treatment on achieving their scientific goals. While there will be no effect for targets with no time variation, the project team is afraid that there may be significant damage for a time critical observation of a short-lived event.

(b) If the proposers wish P-sum/timing mode operation, they will obtain ordinary normal imaging data as well if the three XIS modules are alive. The proposers should write which of the P-sum/timing data and the normal imaging mode data they prefer to have, in case the number of available modules is reduced to one.

Of them, the forms (1) and (2) should be created electronically by accessing:

<http://www.rssd.esa.int/RPS/SUZAKU/RPS.pl>

The form (3) can be made off-line. The PIs can use any editors/word processors they like. It should be, however, either in PDF or PS formats at the time of submission. The allowed language for (3) is either Japanese or English. The PI should submit the forms (1) and (2) through the RPS first, and after confirming the acceptance of them (the proposal ID number is provided), the form (3) is allowed to be uploaded. If the proposer would like to revise (3) after submission, it is possible to re-submit it by adding a revision index (a, b, or c) following the proposal ID number. Note that the revision is allowed up to three times. For example, if the ID number is 110, the revised file of (3) should be tagged as 110a, 110b, 110c.

6 SUPPLEMENT INFORMATION

Detailed information on the Suzaku instrumentation, such as capabilities of scientific instruments, is summarized in the Technical Description (TD) document, which can be found at

http://www.astro.isas.jaxa.jp/suzaku/doc/suzaku_td

For those who are not familiar with Suzaku data, we summarize how to “walk through Suzaku analysis” and a few set of test data (of Crab and other typical X-ray objects) at

<http://www.astro.isas.jaxa.jp/suzaku/pub/20051201.html>

If you have questions, please contact

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