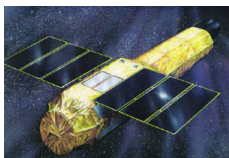


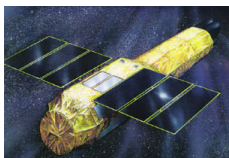
Suzaku processing, archive and software

Lorella Angelini
NASA/GSFC

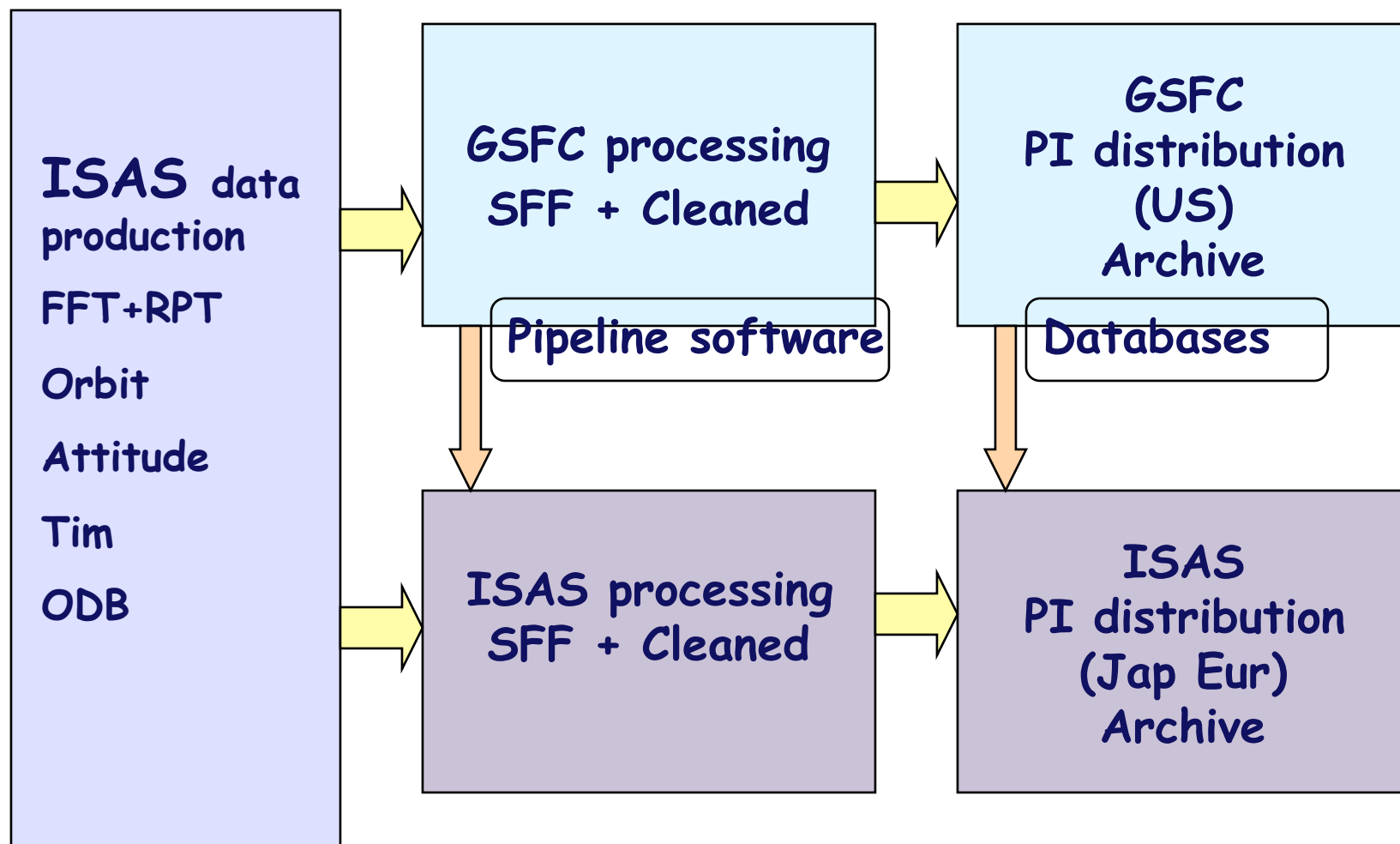


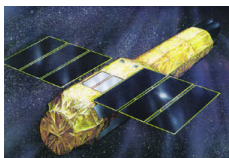
Highlights

- Data Processing
 - Operation and Status
- Archive
 - Content , Public data
 - Usage Statistic
- Software and calibration distribution



Data flow





Pipeline products (1)

o Starting from the FFF the pipeline produces

Science & housekeeping : data organized by observation on specific target

=> Level 1 (unfiltered) , 2 (cleaned), 3 (products) for the HXD and XIS ,
their HK, supporting files and log

- HXD :

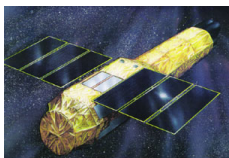
- Unfiltered events for the WELL, WAM (x RPT) and bursts
- Cleaned event files . WELL RPTs are merged to create GSO and PIN files one for each clock rate.
- Average spectra PIN & GSO; light curves PIN, GSO, WAM & bursts

- For each of the XIS units

- Unfiltered event files x RPT & edit modes. No sub-mode division
- Cleaned event files. All RPTs for specific edit mode are merged and splitted x sub-mode
- Average spectrum & light curve extracted for the XIS configuration with the longer exposure

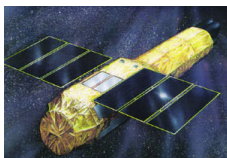
=> **These data are encrypted & distributed to the PI**

- All data are processed
- GSFC distributed to US PI , ISAS to Jap and Eur PI
- TOO , CAL , Large and Key project observations are public immediately



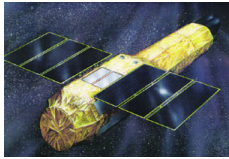
Pipeline products (2)

- **Starting from the FFF the pipeline also produces:**
 - Trend data**
 - ⇒ Data containing specific HK parameters or calibration information extracted from the event data
 - These data are organized by instrument and data type
 - These data are not encrypted and not distributed to the PI
- **Starting from the ODB the pipeline produces:**
 - Database tables ASCII (suzamaster and suzaxislog) :
 - Updated when a new sequences is processed
 - Distributed to ISAS
 - Used to select data via the archives search facility (BROWSE at HEASARC)
- **File format for outputs of the pipeline:**
 - Science, HK & calibration data are provided in FITS (OGIP standard)
 - Preview of summary products (e.g. GIF)
 - HTML used to record processing, ASCII for databases



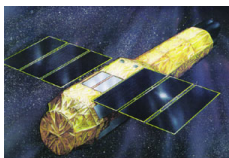
Processing Version

- **Version 2 processing started late August in 2007**
 - Several important fixes were included in the software and pipeline
 - All sequences from the start of the mission were reprocessed and redistributed
 - PI were notified for version 2 availability
- **The pipeline is developed and maintained at GSFC**
 - Each update is copied to ISAS & a procedure is in place to verify the equivalence of the outputs.
 - At any time both ISAS and GSFC run the same pipeline
- **For every new CALDB or new software release the pipeline is updated :**
 - CALDB : there is a lag between observation and the delivery of the appropriate CALDB files. Require users to reprocess the data
 - Old data are not reprocessed with software updates but since version 2 there have been mainly small bug fixes that do not require reprocessing
- **The pipeline does not generate the background for the XIS and HXD ;**
 - HXD and XIS background files are generated in Japan
 - XIS available as CALDB files
 - HXD available x sequences in the FTP area



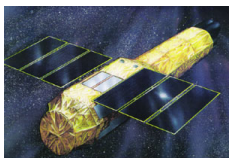
Pipeline versions updates

Processing version	Date	Description	Software release	Caldb release
V1.0.1.1	Pre-2006-06-12	Base version used to sync up/test pipeline	Hea_16May2006_V6.0.6_Suzaku_15May2006_V1.0	hxd20060321_xis20060407_xrt20060410_xrs20060419
V1.0.1.2	2006-06-12	First start up pipeline	Hea_16May2006_V6.0.6_Suzaku_15May2006_V1.0	hxd20060321_xis20060524_xrt20060410_xrs20060419
V1.1.1.2	2006-06-16	Many pipeline fixes. First data distribution to GO.	Hea_16May2006_V6.0.6_Suzaku_15May2006_V1.0	hxd20060321_xis20060524_xrt20060410_xrs20060419
V1.2.2.3	2006-10-06	New ftools/CALDB/additional functions/fixes. All data were reprocessed and redistributed	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20060829_xis20060913_xrt20060720_xrs20060410
V1.2.2.4	2006-11-13	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20060829_xis20061030_xrt20060720_xrs20060410
V1.2.2.5	2006-12-19	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20061031_xis20061114_xrt20060720_xrs20060410
V1.3.2.6	2007-02-01	New CALDB/fixes/additional functions	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20061226_xis20061226_xrt20060720_xrs20060410
V1.3.2.7	2007-02-16	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20070131_xis20070206_xrt20060720_xrs20060410
V1.3.2.8	2007-03-08	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20070302_xis20070302_xrt20060720_xrs20060410
V1.4.2.9	2007-04-13	New CALDB/xisconf.list upgrade	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20070302_xis20070302_xrt20060720_xrs20060410
V2.0.6.13	2007-08-06	New ftools/CALDB/additional functions/fixes. All data reprocessed and redistributed	Hea_27Jul2007_V6.3.1_Suzaku_24Jul2007_V6.0	hxd20070710_xis20070731_xrt20070622_xrs20060410
V2.1.6.14	2007-10-16	New CALDB/changes in the pipeline.	Hea_27Jul2007_V6.3.1_Suzaku_24Jul2007_V6.0	hxd20070914_xis20070807_xrt20070622_xrs20060410
V2.1.6.15	2007-11-01	New CALDB	Hea_27Jul2007_V6.3.1_Suzaku_24Jul2007_V6.0	hxd20071016_xis20071016_xrt20070622_xrs20060410
V2.1.6.16	2007-11-19	New CALDB	Hea_27Jul2007_V6.3.1_Suzaku_24Jul2007_V6.0	hxd20071101_xis20071101_xrt20070622_xrs20060410
V2.2.7.18	2008-02-19	New CALDB/changes in the pipeline.	Hea_06Dec2007_V6.4_Suzaku_06Dec2007_V7.0	hxd20080201_xis20080201_xrt20070622_xrs20060410
V2.2.8.20	2008-06-16	New CALDB. New suzaku tools v8.0.	Hea_15Apr2008_V6.4.1_Suzaku_15Apr2008_V8.0	hxd20080602_xis20080602_xrt20080602_xrs20060410
V2.2.11.22	2008-11-11	New CALDB. New suzaku tools v11.0.	Hea_18Sep2008_V6.5.1_Suzaku_30Oct2008_V11	hxd20081009_xis20081009_xrt20080709_xrs20060410
V2.2.11.24	2009-02-19	New CALDB	Hea_18Sep2008_V6.5.1_Suzaku_30Oct2008_V11	hxd20090109_xis20090109_xrt20080709_xrs20060410
V2.3.12.25	2009-04-27	New CALDB. New suzaku tools v12.0. Minor pipeline fix.	Hea_01Apr2009_V6.6.2_Suzaku_23Mar2009_V12	hxd20090402_xis20090402_xrt20080709_xrs20060410
V2.4.12.26	2009-06-05	New CALDB. Minor pipeline fix.	Hea_01Apr2009_V6.6.2_Suzaku_23Mar2009_V12	hxd20090511_xis20090402_xrt20080709_xrs20060410



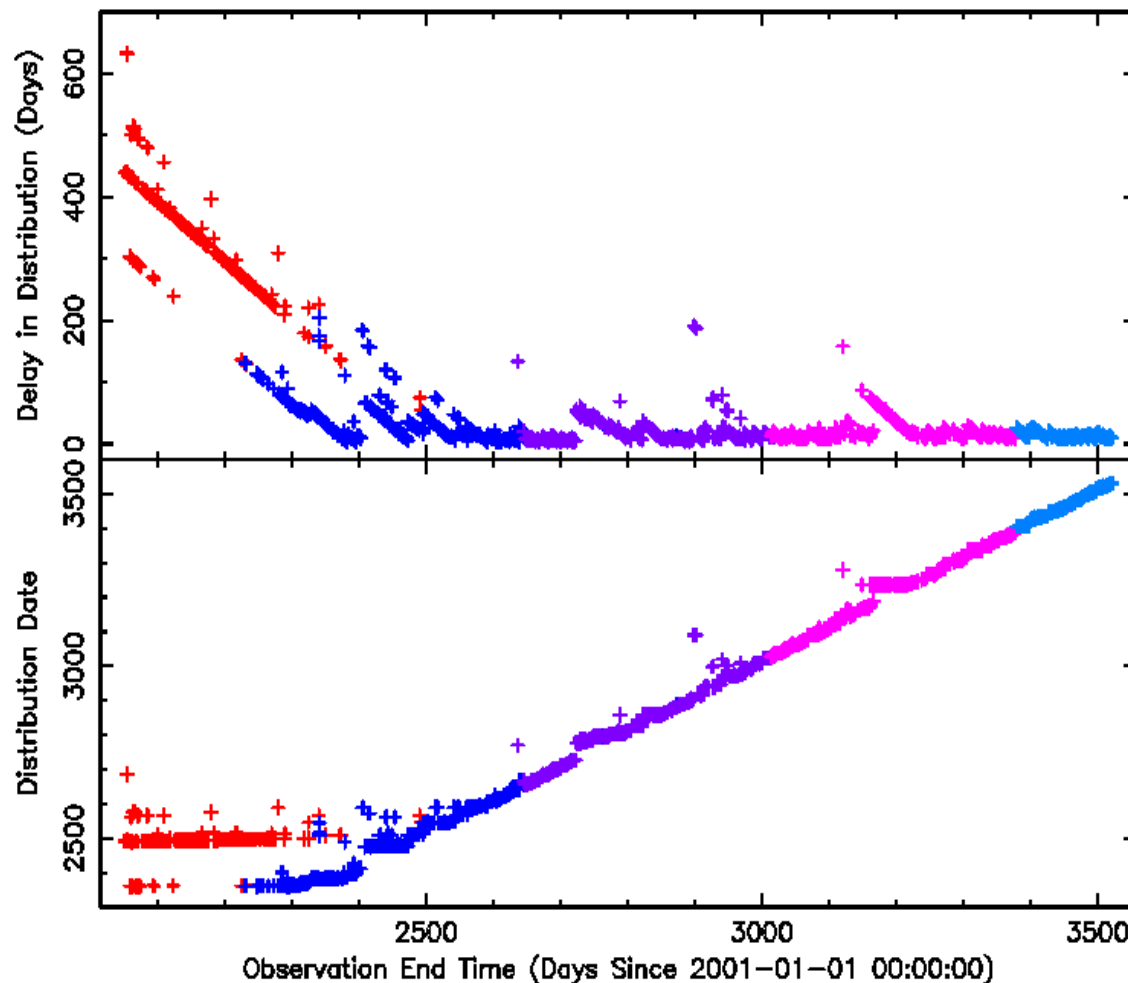
GSFC: Archive operations (1)

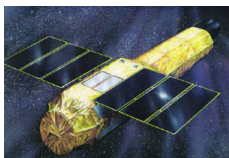
- o **After processing the data are transferred to the archive & distributed to the PI**
 - ⇒ The US SUZAKU archive is collocate at the HEASARC
- o **GSFC processing site transfer data to the HEASARC**
 - All science data (all PIs) populate the archive together with the trend data
 - The transfers and the archive population are automatized
 - Cron job is running hourly to transfer Science & Trend data
 - Science data are kept encrypted in the archive (but for TOO, CAL, Large and Key projects)
 - Databases are ingested in the W3Browse
 - Copies made available in the FTP area. ISAS uses the same copy
- o **Notification to US PI and Co-PI:**
 - HEASARC notifies the PI via E-mail when data are available in the archive
 - Same E-mail is 'bcc' to ISAS (that keeps record to when the data should be made public)
 - PI are also notified if their data are reprocessed, with a new pipeline version in their propriety period
 - PI are notified within 10 days before their data are going to be public
- o **At HEASARC users access data via Web Browse interface, wget or FTP**



Data lag before distribution

- Color scheme reflect the AO cycles
- Current average time lag between observation and distribution ~10-15 days



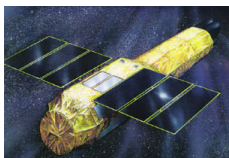


GSFC: Archive operations (2)

- o **Daily retrieval of the Suzaku timeline from Japan**
 - Copy placed in the Suzaku FTP area with the trend
 - Ingest also in the HEASARC timeline Tool

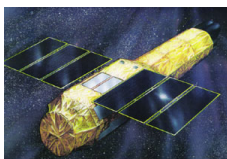
<http://legacy.gsfc.nasa.gov/cgi-bin/Tools/timeline/timeline.pl>

- o **PIN and GSO background**
 - Generated in Japan and copied at HEASARC
 - Daily cron job looks at the Japan site for new updates
 - Current PIN and GSO background consistent with Version 2 of the processing
 - PIN has two versions available generated with 1) a quick and 2) a tuned method
 - Last major release started in May 2008
 - There is a time delay ranging between 1-2 months compared to the observation date (typical 1 month)
 - At HEASARC the background is available in the FTP area at <http://legacy.gsfc.nasa.gov/suzaku/data/background/> (older version are kept also in the public area /background_old)



Archive content (1)

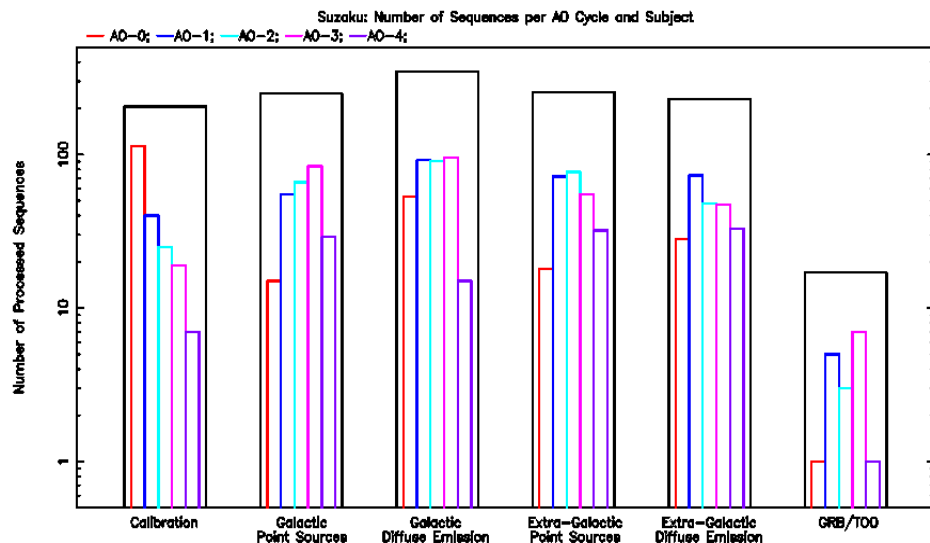
- The Suzaku database lists 1592 observations. These include:
 - 1316 observations already and processed from all AO (as for Sep 18)
 - 276 observations remaining for A04.
- The 1316 performed observations are divided as follows:
 - 224 AO-0
 - 342 AO-1 (107 US PI, 199 Japan PI, 27 Eur, 13 Japan-US US-Japan)
 - 310 AO-2 (147 US PI, 133 Japan PI, 22 Eur, 8 Japan-US US-Japan)
 - 307 AO-3 (91 US PI, 200 Japan PI, 12 Eur, 4 Japan-US US-Japan)
 - 133 AO-4 (52 US PI, 58 Japan PI, 3 Eur, 12 Japan-US US-Japan)
- The archive lag the observation log by 10-15 observing days
- The archive does not contain the slew data



Sequences and Archive size

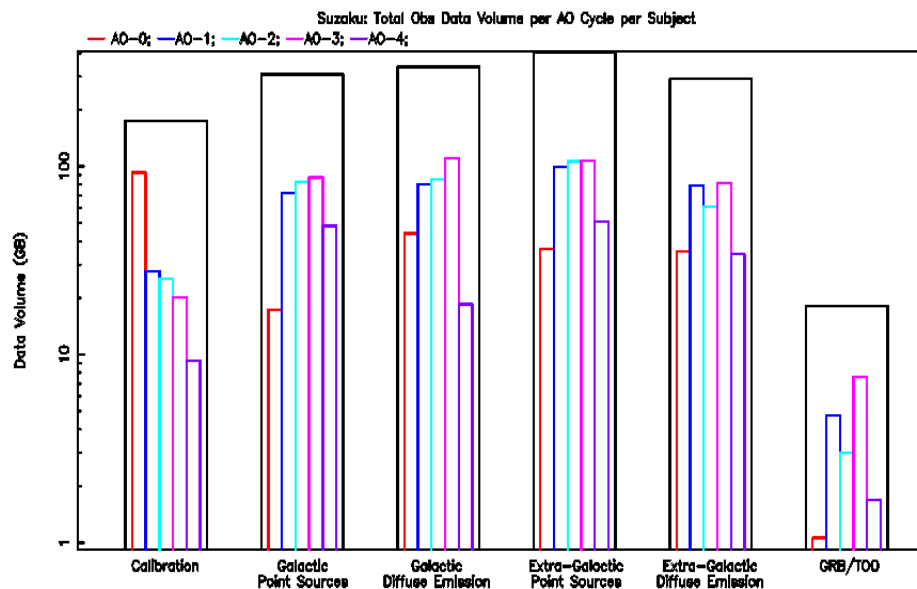
Sequences category

- 206 Calibration
- 251 Galactic Point Sources
- 349 Galactic Diffuse emission
- 254 Extra-Galactic point sources
- 238 Extra-galactic diffuse
- 18 GRB and TOO



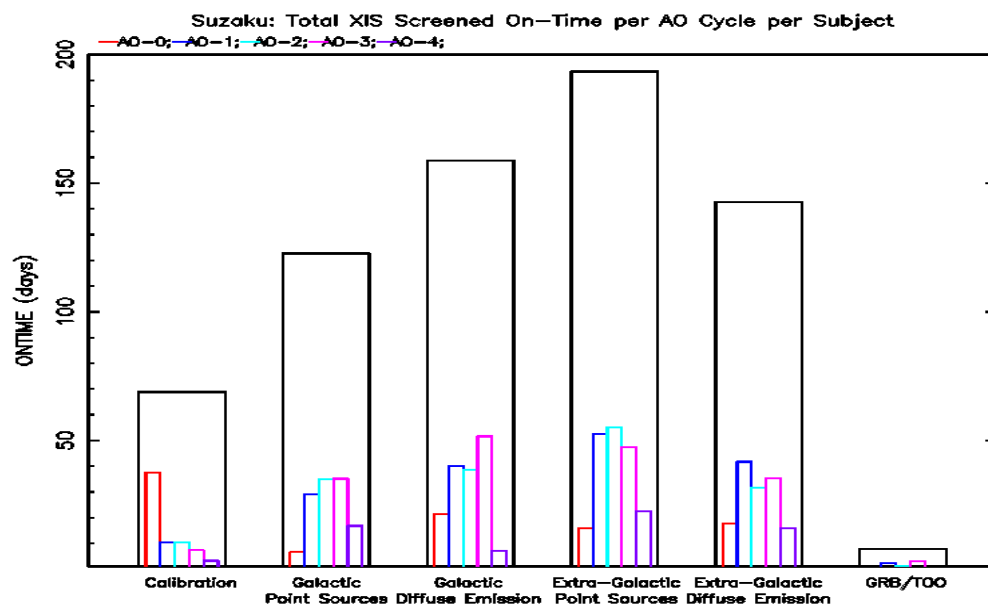
Archive size

- Obs total 1.53 TB
 - Plot shows distribution by AO & subject category
- Trend 836 GB
- Background 71 GB (only current version)





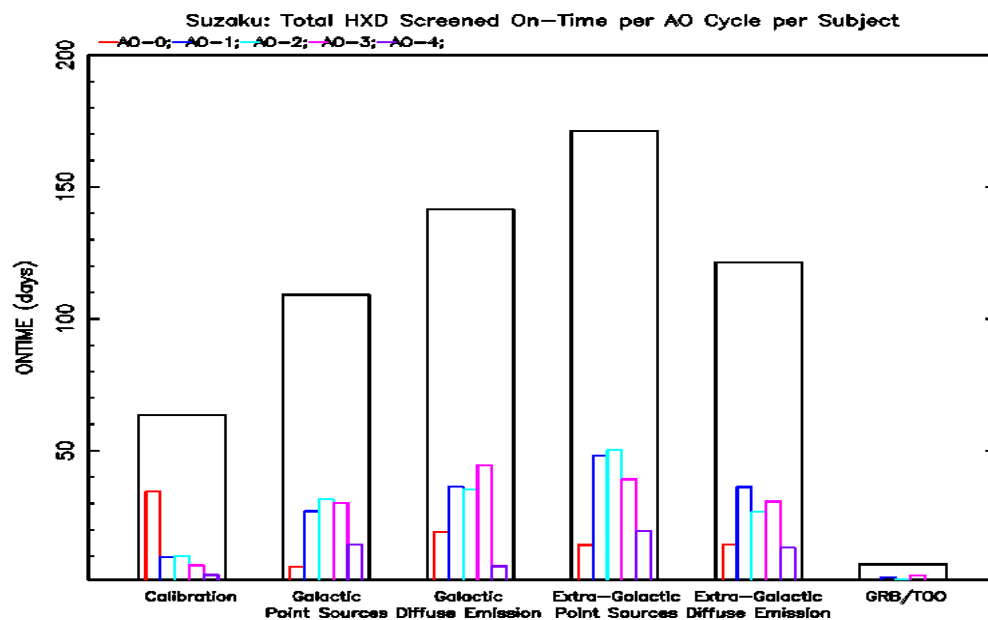
Total exposure

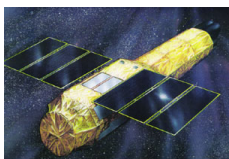


The exposure distribution derived from the XIS cleaned events :

- 68.8 d Calibration
- 122.6 d Galactic Point Sources
- 158.7 d Galactic diffuse
- 193.3 d Extra Galactic Point Sources
- 142.6 d Extra Galactic diffuse
- 7.8 d GRB and TOO

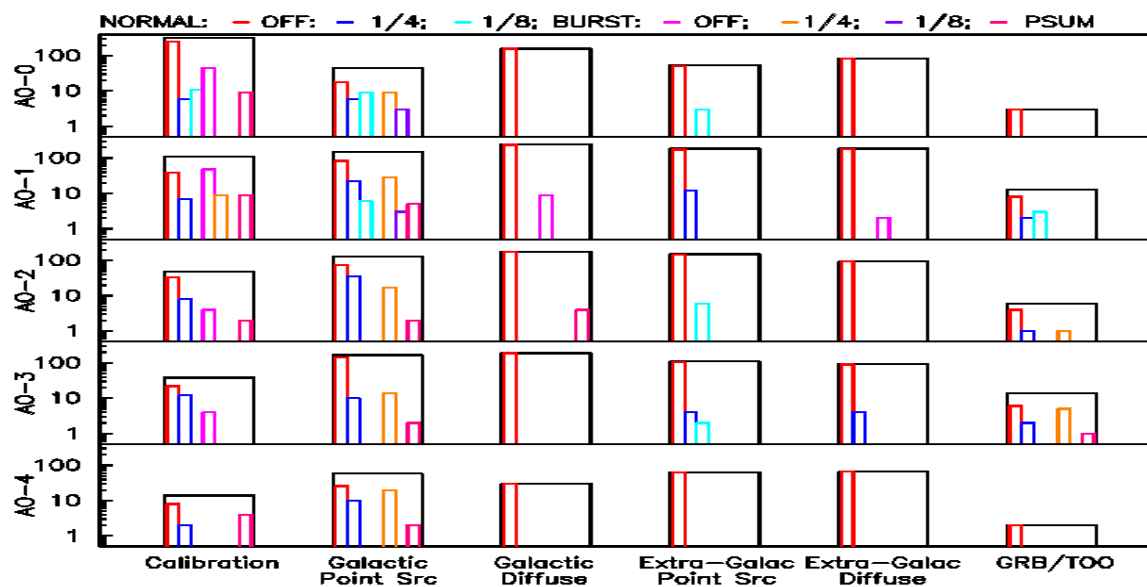
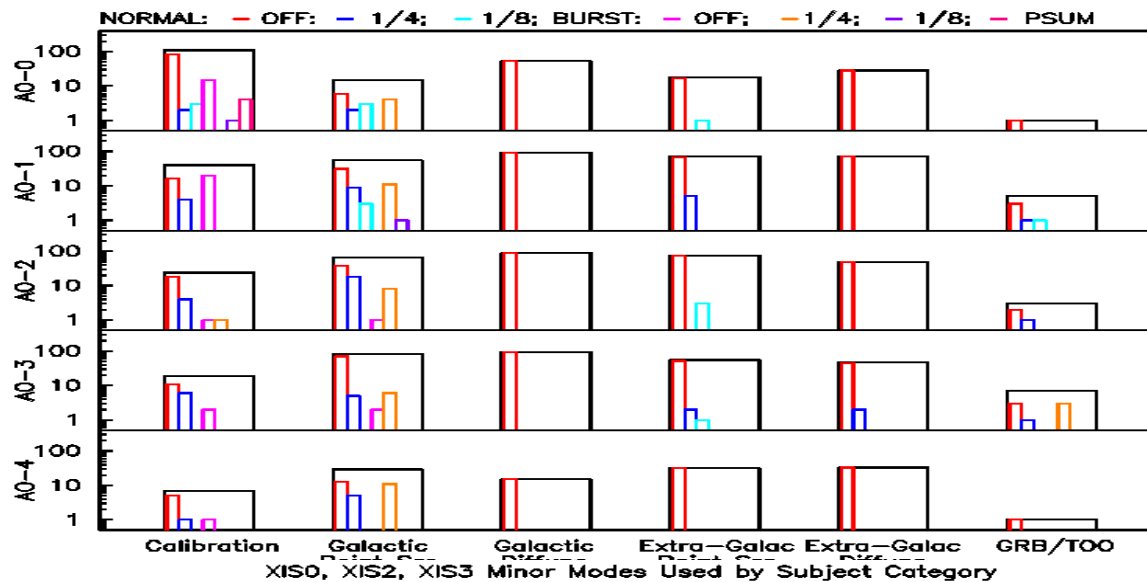
Similarly using the HXD cleaned exposure. The different HXD cleaning criteria give a 10% difference to the XIS cleaned exposure.

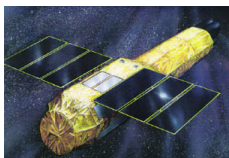




Statistics XIS modes

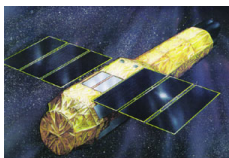
XIS1 Minor Modes Used by Subject Category



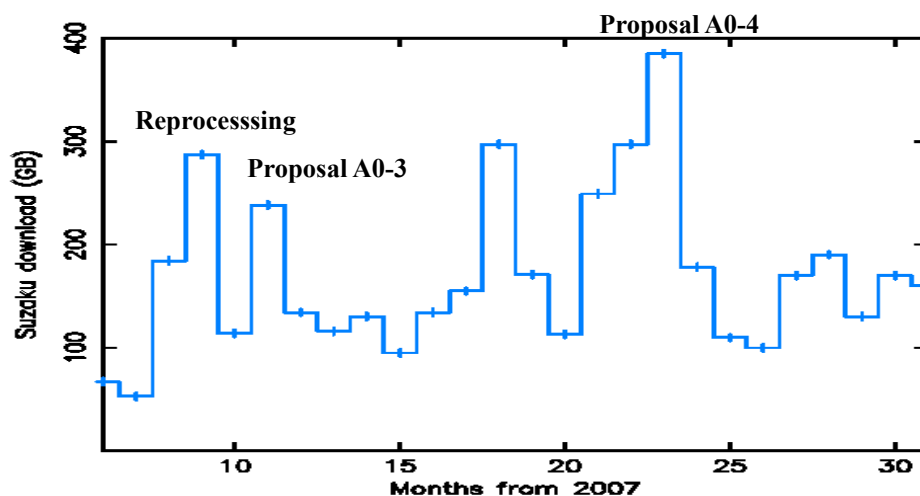


Archive and Public data

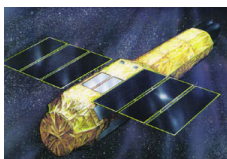
- Public archive opened on 1 June 2007
 - Operationally : ISAS sends to GSFC list observations to become public 15 days ahead their public date.
 - GSFC notify US PI & Co-PI within 10day , before data are decrypted
 - At the end of the propriety period both archive sides decrypt the observation. It is expected up to 2 days difference .
- Currently the archives includes 1104 public sequences data
 - 224 AO-0 (SWG)
 - 342 AO1
 - 310 AO2
 - 199 AO3 (out of 307)
 - 29 AO4 (out of 133 mainly Large and Key projects)
 - Total TOO 18 (all AO)



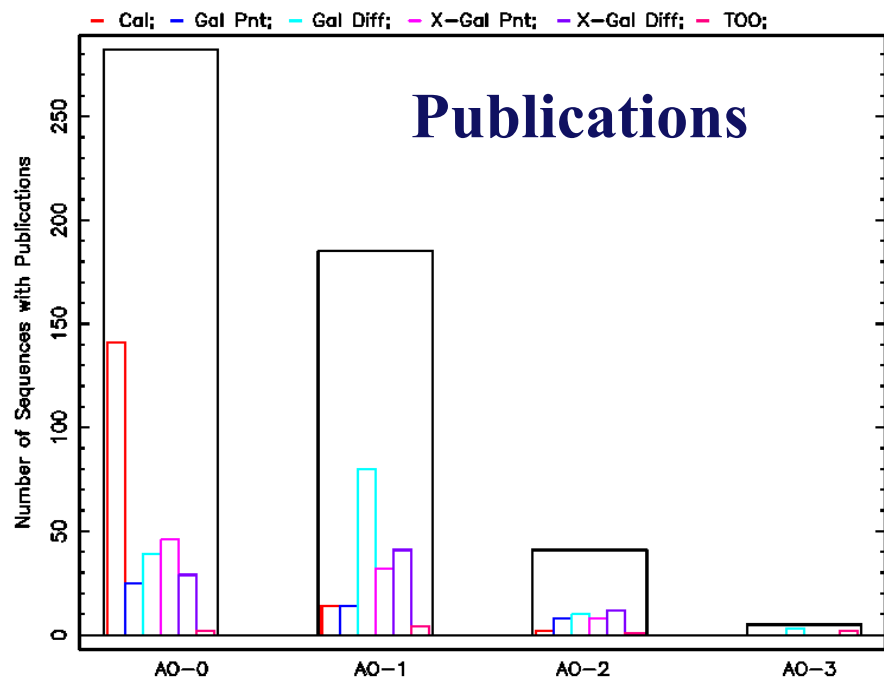
Data download



- Typical size sequence 800 MB compressed largest is 3 GB
- Total downloads :
 - 2007 : 1.4 TB (4.8% of the total HEASARC download)
 - Swift 47 % XMM 7.8%
 - 2008 : 2.32 TB (5.87% of the total HEASARC download)
 - Swift 25.98 % XMM 8.21%
 - 2009 (up 2 Aug) : 1.2 TB (3.3% of the total HEASARC download)



Publications



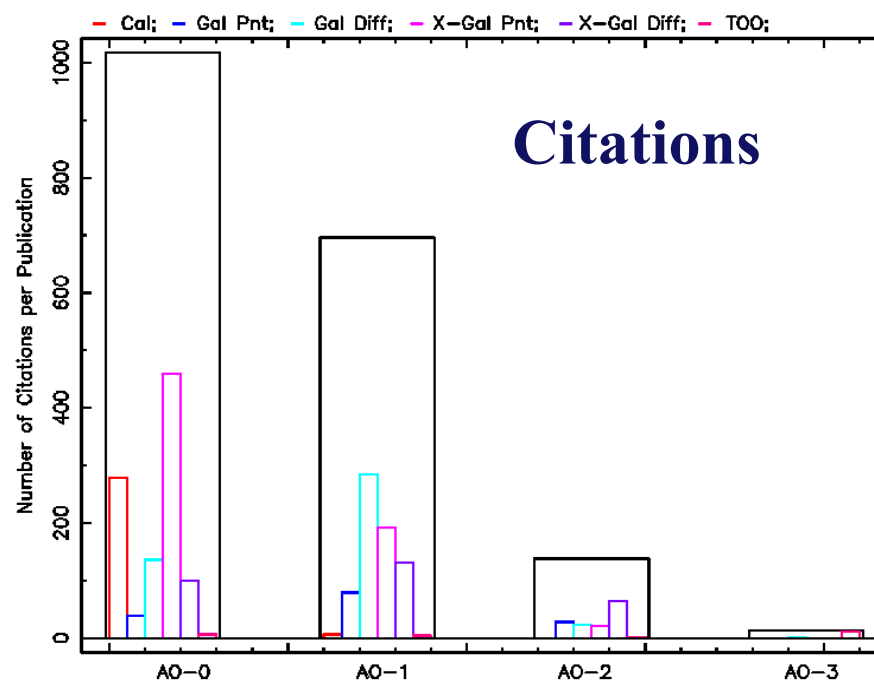
Publications

Total citations 954

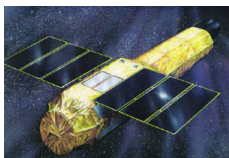
- o Updated at 1 Sep 2009
 - Change daily
- o Derived from ADS

Total publications 221

- o Updated at 1 Sep 2009
 - Includes only referee papers
- o Derived searching ADS with SUZAKU in the title or abstract
- o Publications linked to observations in W3Browse
- o Data linked to publications in ADS

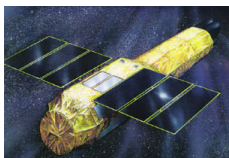


Citations



Software and CALDB

- **Calibration data distributed via the HEASARC CALDB**
 - Deliveries from Japan arrive to the GOF
 - GOF checks the agreed file standards and requires CALDB keywords
 - GOF delivers the file to the HEASARC for ingest into CALDB and distribution
 - CALDB updates one a month (end of the month, if any)
- **Software distributed in the HEASoft package**
 - Suzaku tools are developed in Japan & delivered to the HEASARC by the Software Team via CVS
 - General support software is provided by the HEASARC
 - GSFC performed the software testing before distribution :
 - Individual tool test bed provided from Japan
 - Within the pipeline with test bed generated at GSFC
 - Software updated on 3 months timescale (if needed)
 - Software allows to reprocess the data (all the steps in the pipeline are reproducible)
 - Software available from the HEASARC software distribution page

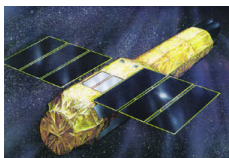


Software distribution

- 12 Software releases. First public software release May 2006
- Most of the software is used within the pipeline
 - (e.g. the pipeline does not include software that is not in distribution)
 - Version 3: tools updates not relevant to the pipeline processing
 - Version 4 : tools updates mostly in parameter file adjustment and CALDB query
 - Version 5 : New tools & updates, support for CI , attitude library, Support for new/old version of the science and CALDB files.
 - Version 6: minor bug fixes (running in the pipeline)
 - Version 7 : new XIS background generator, GSO bug fix and minor updates
 - Version 8-12 : Bugs fixing

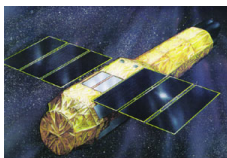
Software release date	Description
2009-04-01	Suzaku Software ver 12.0 (HEAsoft 6.6.2) Current Release
2008-11-25	Suzaku Software ver 11.0 (HEAsoft 6.6).
2008-09-18	Suzaku Software ver 10.0 (HEAsoft 6.5.1).
2008-06-26	Suzaku Software ver 9.0 (HEAsoft 6.5).
2008-04-15	Suzaku Software ver 8.0 (HEAsoft 6.4.1).
2007-12-07	Suzaku Software ver 7.0 (HEAsoft 6.4).
2007-07-30	Suzaku Software ver 6.0 (HEAsoft 6.3.1).
2007-07-05	Suzaku Software ver 5.0 (HEAsoft 6.3.0).
2007-03-07	Suzaku Software ver 4.0 (HEAsoft 6.2.0).
2006-12-06	Suzaku Software ver 3.0 (HEAsoft 6.1.2).
2006-08-30	Suzaku Software ver 2.0 (HEAsoft 6.1.1).
2006-05-17	Suzaku Software ver 1.0 (HEAsoft 6.0.6).

- Next software freeze ~25 October 2009



Software Updates

- The October freeze expected to include:
 - Several scripts :
 - To re-process the data from the unfiltered to filtered event both HXD and XIS
 - To calculate the GTI for the XIS Burst modes (*)
 - To calculate the PIN background spectra
 - To evaluate the Background / Source in the GSO
 - To calculate the burst event time in the WAM (*)
 - { New tools to calculate an ARF using Calibration files rather than retracing }
 - Update of the "cleansis" routine (*)
- => Software distribution expected ~ end of November
- Next freeze expected in January 2010
 - New software to calculate the GSO PI (*)
 - To evaluate Pile-up in the XIS
 - {New tools to calculate an ARF using using Calibration files rather than retracing}
If not included in the October release



CALDB distribution

- 37 CALDB releases
 - First release April 2006
- Include all files necessary for processing or for the spectral analysis . Update once a month
- Current typical updates include
 - HXD GSO gain file
 - XIS gain file
 - Update XIS NXB file
- Pipeline always run the latest CALDB if relevant to processing
- Expected major changes for the GSO : responses, gain as well as GSO background



REMOTE ACCESS DOCUMENTATION KEYWORDS CROSS-CALIBRATION MISSION-SPECIFIC CALIBRATION INFO

Suzaku Calibration Files

This page contains a summary of the Suzaku Calibration files which are currently in the Suzaku Calibration Database (CALDB). For each instrument, each table links to the latest CALDB release, from where individual files can be downloaded as well as the CALDB index file. The tables also link to the current CALDB tar files which users can install on their local machines. Instructions for installing the CALDB for Suzaku or other missions are available from the CALDB [Installation](#) page.

Caldb access for Suzaku requires an updated version of the [caldb.config](#) file which is available at <ftp://heasarc.gsfc.nasa.gov/caldb/software/tools>. Please replace your current \$CALDBCONFIG file with this updated version.

Note: The Suzaku software currently support the automatic queries to CALDB only in some of the tasks. Therefore the full path and filename to CALDB files has to be explicitly given in the Suzaku software task parameters that require CALDB files.

Note: The tar files for the HXD, XIS and XRT already include the XRS CALDB file (the teldef) necessary to run some of the software tools. Also [download](#) the [multimission](#) calibration tar file since it is required to run xissimargen.

HXD Calibration Products

Item	Date	Comments
Current CalDB Release	2007-04-10	GSO Gain and responses
Documentation	2007-04-10	
Retrieve TAR file	2007-04-10	Size 222 MB compressed

XIS Calibration Products

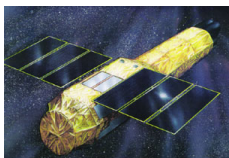
Item	Date	Comments
Current CalDB Release	2007-04-10	Microcode
Documentation	2007-04-09	
Retrieve TAR file	2007-04-10	Size 303.6 MB compressed

XRT mirror Calibration Products

Item	Date	Comments
Current CalDB Release	2006-07-20	Several updates
Documentation	2006-08-01	
Retrieve TAR file	2006-08-30	Size 82.4 MB compressed

Latest news

- Current CALDB : HXD (20070409), XIS (20070409) and XRT (20060720)
- Latest CALDB update on 2007-04-10 : HXD XIS
- [History of Suzaku CALDB releases](#)
- The pre-launch XRS calibration files are archived in CALDB and a [TAR file is available](#). There will be no updates since the [XRS is not longer operating](#).



Conclusions

- o Data processing and distribution is on-going
 - Pipeline routinely updates for new CALDB files
 - Pipeline major version update is expected with the new GSO PI calculation
 - Next major reprocessing is TBD

- o Next Software release ~ about end Nov
 - This release includes scripts to facilitate data reprocessing
 - Calibration data released when necessary (time scale 1 month)

- o The archive contains about 3.5 year of public data
 - Most of data download are from users other than PI