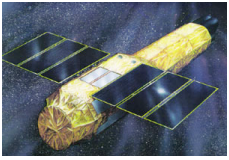


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# Suzaku processing and archive

Lorella Angelini/HEASARC

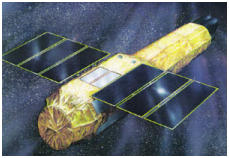


# Highlights

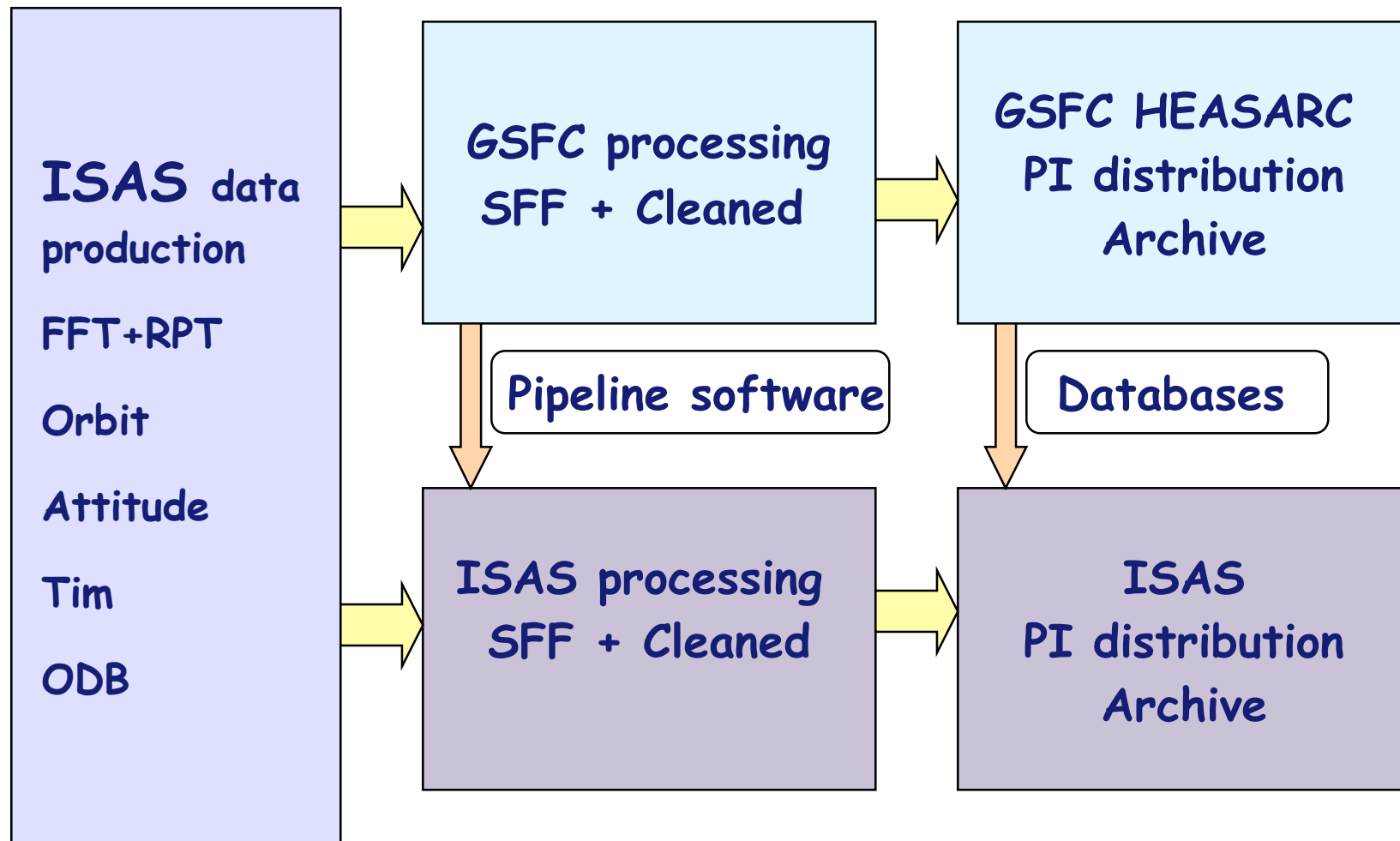
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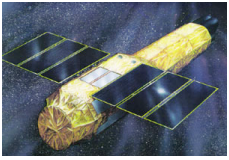
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- Data Processing
  - Operations and Data flow
  - Pipeline products & versions
  - Status of Version 2
- US Archive collocated with the HEASARC
  - Archive operations
  - Archive content and version 2
  - Public data
- Software and calibration distribution



# 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 :

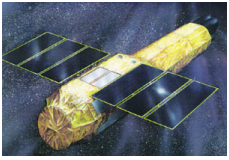
- Unfiltered events for the WELL, WAM (x RPT) and bursts
- Cleaned event files . WELL RPTs are merged to create *GSO* and *PIN* files one for each clock rate.
- Average spectra *PIN* & *GSO*; light curves *PIN*, *GSO*, *WAM* & bursts

### - 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**

- *TOO* & *CAL* observations are public immediately



# Pipeline products (2)

- Starting from the FFF the pipeline also produces:

## Trend data

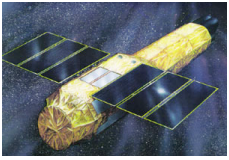
- ⇒ Data containing specific HK parameters or calibration information extracted from the event data
  - These data are organized by instrument and data type
  - These data are not encrypted and not distributed to the PI

- Starting from the ODB the pipeline produces:

- Database tables ASCII (suzamaster and suzaxislog) updated when a new sequences is processed
  - Used to select data via the Web based search facility (BROWSE)

- File format:

- Science, HK & calibration data are provided in FITS (OGIP standard)
- Preview of summary products (e.g. GIF)
- HTML used to record processing

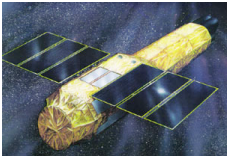


# Version 2 reprocessing

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- Version 2 processing started late August 7
  - All sequences from the start of the mission were reprocessed
  - On Aug 28, 607 sequences completed, additional 57 early October
  - PI were notified for version 2 availability
  - The RPT and FFF were all in house when started
  - While re-processing the newly observed data were done first
- Two hiccups while re-processing
  - On July 28 the HXD PIN diode anomalous voltage
    - GSFC was notified on Aug 29
    - 6 affected sequences were already sent out to the PI
    - After fix in place data were reprocessed and re-delivered
- 15 Sep 2007 XIS trend night and day changed screening criteria
  - Build separate pipeline to re-create ND files. The XIS NXB is generated from that
  - In place by the 1 Oct all data regenerated by the 15



## Version 2 Pipeline (2)

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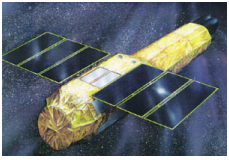
- Data format changed (mk1stfits) and new attitude files (longer in time)
- Version 6 of the software and new calibration data
- XIS Charge Injection data processed with the appropriate CALDB\* data
- XIS timing data (psum) processed (minimal) & transferred to the archives
- XIS extraction regions are appropriate for the window mode
- XIS minor modes added in the mkf file to allow minor mode selection
- HXD gain uses CALDB files (previously gain calculated in the pipeline)
- HXD new products: pseudo event files & a burst ID file
- More strict control on the processing version run at ISAS & GSFC
  
- Known issues :
  - The HXD background is not generated in the pipeline.
    - Time Lag to when the data are ready & HXD background available
  - Software bug in the GSO PI calculation (fix in software vs 7)
  - \* The XIS gain/CTI file released in November adjust for an energy shift
    - Applicable to data since Sep 2006. Users has to recalculate the gain for data processed with version < 2.1.6.16



# Pipeline versions updates

Processing version	Date	Description	Software release	Caldb release
<a href="#">V1.0.1.1</a>	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
<a href="#">V1.0.1.2</a>	2006-06-12	First start up pipeline	Hea_16May2006_V6.0.6_Suzaku_15May2006_V1.0	hxd20060321_xis20060524_xrt20060410_xrs20060419
<a href="#">V1.1.1.2</a>	2006-06-16	Many pipeline fixes. First data distribution to GO.	Hea_16May2006_V6.0.6_Suzaku_15May2006_V1.0	hxd20060321_xis20060524_xrt20060410_xrs20060419
<a href="#">V1.2.2.3</a>	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
<a href="#">V1.2.2.4</a>	2006-11-13	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20060829_xis20061030_xrt20060720_xrs20060410
<a href="#">V1.2.2.5</a>	2006-12-19	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20061031_xis20061114_xrt20060720_xrs20060410
<a href="#">V1.3.2.6</a>	2007-02-01	New CALDB/fixes/additional functions	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20061226_xis20061226_xrt20060720_xrs20060410
<a href="#">V1.3.2.7</a>	2007-02-16	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20070131_xis20070206_xrt20060720_xrs20060410
<a href="#">V1.3.2.8</a>	2007-03-08	New CALDB	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20070302_xis20070302_xrt20060720_xrs20060410
<a href="#">V1.4.2.9</a>	2007-04-13	New CALDB/xisconf.list upgrade	Hea_11Sep2006_V6.1.1_Suzaku_11Sep2006_V1.2	hxd20070302_xis20070302_xrt20060720_xrs20060410
<a href="#">V2.0.6.13</a>	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
<a href="#">V2.1.6.14</a>	2007-10-16	New CALDB/changes in the pipeline.	Hea_27Jul2007_V6.3.1_Suzaku_24Jul2007_V6.0	hxd20070914_xis20070807_xrt20070622_xrs20060410
<a href="#">V2.1.6.15</a>	2007-11-01	New CALDB	Hea_27Jul2007_V6.3.1_Suzaku_24Jul2007_V6.0	hxd20071016_xis20071016_xrt20070622_xrs20060410
<a href="#">V2.1.6.16</a>	2007-11-19	New CALDB	Hea_27Jul2007_V6.3.1_Suzaku_24Jul2007_V6.0	hxd20071101_xis20071101_xrt20070622_xrs20060410



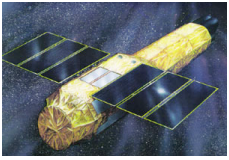


# GSFC: Archive operations

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- o In US the Suzaku archive is collocate at the HEASARC
  
- o The GSFC processing site transfer data to the HEASARC
  - All data (US & Japan) populate the archive
  
  - For US PI and Co-PI :
    - HEASARC notifies the PI via E-mail when data are in the archive
    - Same email is 'bcc' to ISAS.
    - PI are also notified if data are reprocessed within their propriety period with a new pipeline version.
    - PI are notified 15 days before their data are going to be public
  
  - 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
    - Databases are ingested in the W3Browse
      - Copies made available in the FTP area. JAXA uses the same copy
  
  - Data access via HEASARC Browse , wget or FTP

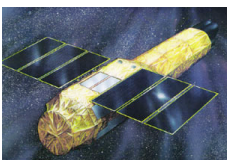


# Additional data

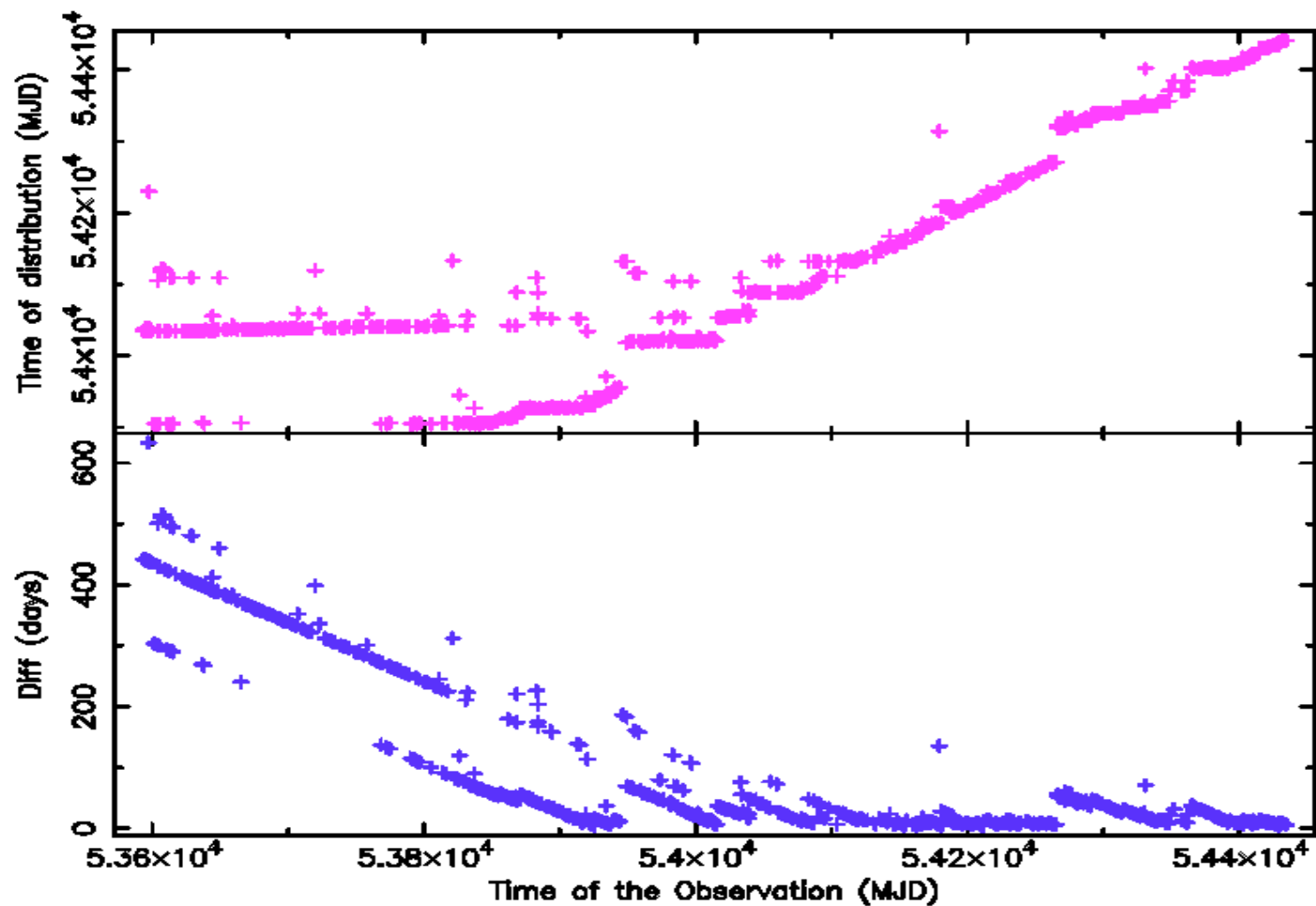
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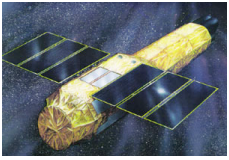
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- Daily retrieval of the Suzaku timeline from Japan
  - Place on line in the HEASARC timeline Tool  
<http://legacy.gsfc.nasa.gov/cgi-bin/Tools/timeline/timeline.pl>
- PIN background
  - Generated in Japan and retrieved at HEASARC
    - Background consistent with version 2 processing
    - First available on 24 September
      - A newer version after Oct 1 (Fix in the GTIs)
    - Available in the HEASARC FTP area  
<http://legacy.gsfc.nasa.gov/suzaku/data/background/>
    - Cron job looks at the Japan site for new updates daily
- GSO background is not yet available (end of December)



# Data delay before distribution



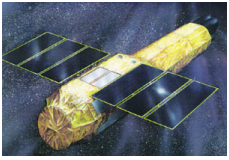


# Archive content (1)

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- There are 769 observations at the HEASARC
  - 220 are SWG
  - 330 are AO1 & 190 AO2
  - 7 real TOO (public immediately)
  - 9 are SWG-TOO, 3 AO1-TOO, 10 AO2-TOO
- There are 208 US observations (PI 198 & 10 Co-PI)
  - AO1 and AO2
- What is missing :
  - 13 observations not in the archive compared with the timeline
    - 2 non science in the data recorded (402089010, 702042030)
    - 1 invalidated because never made to the source (800013010)
    - 10 are from > Nov 30
  - Steps pointing (short observations)
  - Slew data

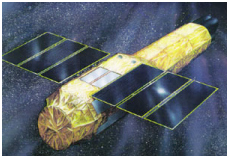


# Archive and Public data

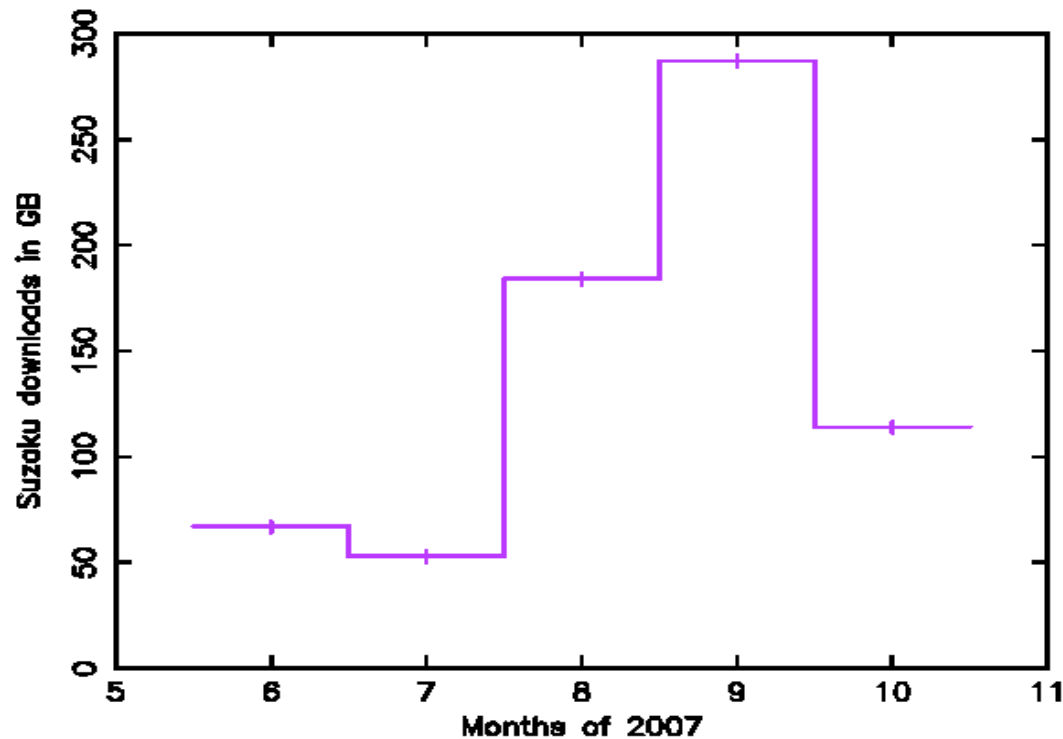
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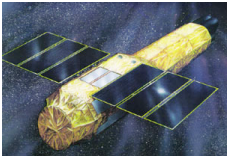
- May 27 the propriety period for the SWG data ended
  - All SWG data were decrypted, checked for data corruption & put on-line
- The public archive opened on 1 June
- AO1 data also start going into the public archive
  - Operationally : ISAS sends to GSFC list observations to become public 15 days ahead 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 393 public sequences data
  - TOO , AO1 and SWG data



# Data download



- Typical size sequence 800 MB compressed largest is 3 GB
- 4.2% of the total HEASARC download in the last 10 months (but archive opens only in June)
  - largest is Swift with 48%

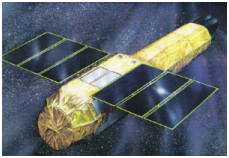


# Software and CALDB

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- **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 HEAssoft 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



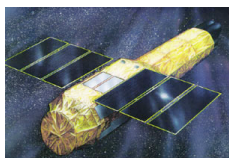
# Software distribution

- Seven Software releases. First public software release May 2006
- Most of the software is used within the pipeline
  - 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
    - To be import in the pipeline

Software release date	Description
<a href="#">2007-12-07</a>	Suzaku Software ver 6.0 (HEAsoft 6.4). CURRENT VERSION
<a href="#">2007-07-30</a>	Suzaku Software ver 6.0 (HEAsoft 6.3.1).
<a href="#">2007-07-05</a>	Suzaku Software ver 5.0 (HEAsoft 6.3.0).
<a href="#">2007-03-07</a>	Suzaku Software ver 4.0 (HEAsoft 6.2.0).
<a href="#">2006-12-06</a>	Suzaku Software ver 3.0 (HEAsoft 6.1.2).
<a href="#">2006-08-30</a>	Suzaku Software ver 2.0 (HEAsoft 6.1.1).
<a href="#">2006-05-17</a>	Suzaku Software ver 1.0 (HEAsoft 6.0.6).

- Next software freeze end of February





# CALDB distribution

- 21 CALDB releases
  - First release April 2006
- Include all files necessary for processing or for the spectral analysis . Update if any once a month
- Pipeline always run the latest CALDB if relevant to processing
- Last delivery released with software v7 includes :
  - First release of the XIS NXB file (based however on older processing version)
  - New XIS gain file (to be applied to all data taken from sep 2006 and processed with version < 2.1.6.16)
  - New HXD GSO gain file
- Next release expected end of December
  - Updates on contamination
  - Updates on HXD gain



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 <http://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 telfdef) necessary to run some of the software tools. Also [download the multimission](#) calibration tar file since it is required to run xissimarfgen.

### HXD Calibration Products

Item	Date	Comments
<a href="#">Current CalDB Release</a>	2007-04-10	<a href="#">GSO Gain and responses</a>
<a href="#">Documentation</a>	2007-04-10	
<a href="#">Retrieve TAR file</a>	2007-04-10	Size 222 MB compressed

### XIS Calibration Products

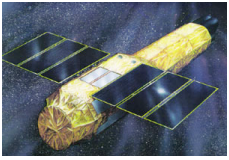
Item	Date	Comments
<a href="#">Current CalDB Release</a>	2007-04-10	<a href="#">Microcode</a>
<a href="#">Documentation</a>	2007-04-09	
<a href="#">Retrieve TAR file</a>	2007-04-10	Size 303.6 MB compressed

### XRT mirror Calibration Products

Item	Date	Comments
<a href="#">Current CalDB Release</a>	2006-07-20	Several updates
<a href="#">Documentation</a>	2006-08-01	
<a href="#">Retrieve TAR file</a>	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

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- o Data have all been processed with version 2
  - Pipeline routinely updates for new CALDB files
  - Next major reprocessing is TBD
  
- o Just released software version 7 and Calibration file
  - Next software release expected in March
  - Calibration data released when necessary (time scale 1 month)
  
- o Several Suzaku data are now public