# Using JAXA's Space Science Data for Education and Public Outreach

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#### About JAXA and ISAS

- JAXA (Japan Aeronautics eXploration Agency) is Japan's sole organization of space development
- ISAS (Institute of Space and Astronautial Science) is for space science such as astronomy, solar physics, solar-terrestrial physics, lunarplanetary sciences.
- PLAIN center (center for Planning and Information Systems)
  - In charge of archiving JAXA's public scientific satellite data

#### JAXA's Scientific Satellite Database

- http://darts.isas.jaxa.jp
  - Data Archives and Transmission System
  - Public archives of JAXA's current and past scientific satellites
- Public data of Hinode (solar satellite), Suzaku (X-ray satellite), Akari (infrared satellite) etc may be freely obtained



- 1. Using JAXA's X-ray satellite data in education
- 2. Public Outreach using JAXA's archival data

#### Using X-ray satellite data in education

- X-ray data: each photon ("event") is stored in the event table (binary table FITS; event file)
  - Each row corresponds to one event
- Each column corresponds to physical parameter
  Event arrival time, position, energy etc.
- "Histogram" made from each column
  - $X, Y \text{ positions} \rightarrow \text{sky image}$
  - TIME histogram →light curve
  - ENERGY histogram→energy spectrum



#### Characteristics of X-ray satellite Data

- Large volume of archival data available
  - Almost all the X-ray astronomical satellite data archived
    - Usually proprietary period is one-year
  - High processed
    - Users do not need data "reduction"
    - Users can immediately start data "analysis"
- A field Japan is strong at
  - Japan has launched five X-ray satellites in the past
  - Hakucho (1979), Tenma (1983), Ginga (1987), ASCA (1993), Suzaku (2005)

#### Example of lesson plans

- Timing analysis of X-ray pulsars
  - Understand Doppler effects using binary Xray pulsars
- Search for black hole candidates from Galactic Plane scan
  - "Players" may have fun like a game

### Timing Analysis of Crab pulsar

- X-ray event file of Crab pulsar
- Running simple "folding" program
- P~30 msec pulse profile is seen
- Currently available only on Unix/Linux



#### X-ray Galactic Plane Scan Data



## Public Outreach using JAXA's archival data

- DARTS for professional scientists.
- Not easy to use for general public, educators, students.
- We are developing systems to make DARTS more accessible to general users.
- UDON
  - Universe via Darts ON-line
- JUDO

- JAXA's Universe Data Oriented

🛃 ION Script Test – Microsoft Internet Explorer

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http://darts.isas.jaxa.jp/cgi-bin/ion-p?page=suzaku/XISql.ion

#### SUZAKU XIS Quick Look Trivial Search



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- E1: 2.000 keV
- E2: 4.000 keV
- E3: 10.000 keV

### http://darts.isas.jaxa.jp/astro/judo

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#### **Collaboration with Planetarium**

- A joint venture program in the "OpenLab" frame work
  - Program leader Mr. Ohira (developer of Megastar)
  - Display FITS images in planetarium
- Project JAXA's satellite data in planetariums
  - All sky monitor satellite Akari (infrared), MAXI (X-ray)



Akari's all sky survey data