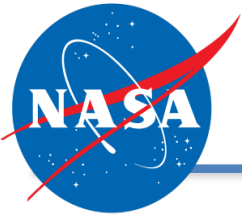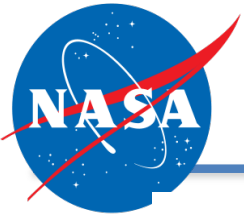# HEASARC
CALET archive status

Lorella Angelini

HEASARC Project Scientist

(NASA/GSFC)

HEASARC

- HEASARC is the NASA High Energy Astrophysics Science Archive

- Established in 1991 at NASA/GSFC with the following charter :
  - Maintain and disseminate data previous and past high energy astrophysics missions (from 2008 also cosmic microwave background data)
  - Provide software and data analysis support for these datasets
  - Maintain and provide the necessary scientific and technical expertise for the processing and interpretation of the data holding
  - Develop and maintain multi-mission approach analysis and support tools
  - Provide catalogs of observations and ancillary data for the data holdings
  - Coordinate data, software and media standards with other astrophysics sites

- HEASARC developed standards for data, software, calibration data and a common data access
  - Data are archived in FITS (mandate from NASA)
    - Standard FITS layouts to accommodate different data type and standard keywords
  - Software was designed as open source. Uses common libraries for reading/writing data, for user interface and access to the calibration data
    - The HEAsoft package includes: multi-mission software for analysis , tools to manipulate FITS files as well as mission specific specific software
  - Calibration data are stored in the calibration database
    => *These standards are in use in all high energy missions*
  - Data access is via a multi-mission Web interface to browse metadata linked to data products or https-ftp protocols
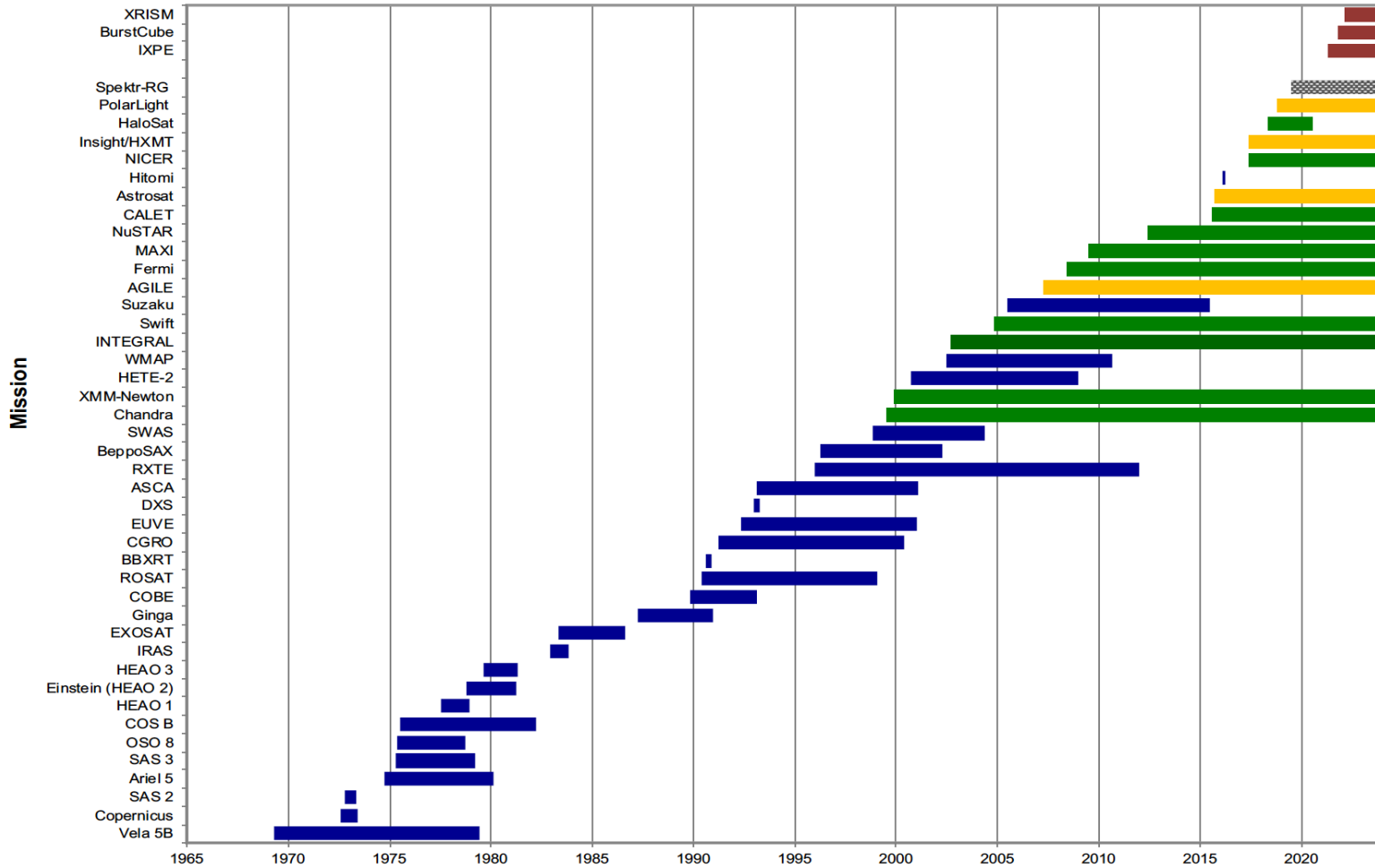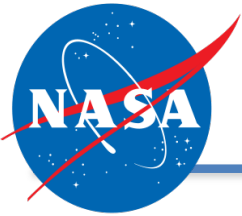
- Major space astrophysics missions since 1969.
- Data before 1991 were reformatted in FITS by the HEASARC.
- Data Host or will be at the HESARC   **Blue:** past mission **Green:** operating missions **Red:** future missions
- **Yellow:** Not host at the HEASARC

CALET archive (1)

- Discussions on the CALET archive at the HEASARC started in March 2018
  - HEASARC was identified as the US archive in the LOA between JAXA and NASA
  - DARTS and HEASARC collaborate on the CALET archive
- Data to archive include the CGBM data, Space weather data from the CHD and the cosmic-ray spectra from the Calorimeter
  - HEASARC started discussion with the CGBM team to define the archive structure, filename convention, data format and the calibration data
  - After the first release of the CHD data in ASCII, HEASARC wrote a converter to translate data in FITS.
- The CALET data will/are available from the HEASARC archive with the following archive structure.
  - Currently routinely populated with the CHD FITS files
    https://heasarc.gsfc.nasa.gov/FTP/calet/
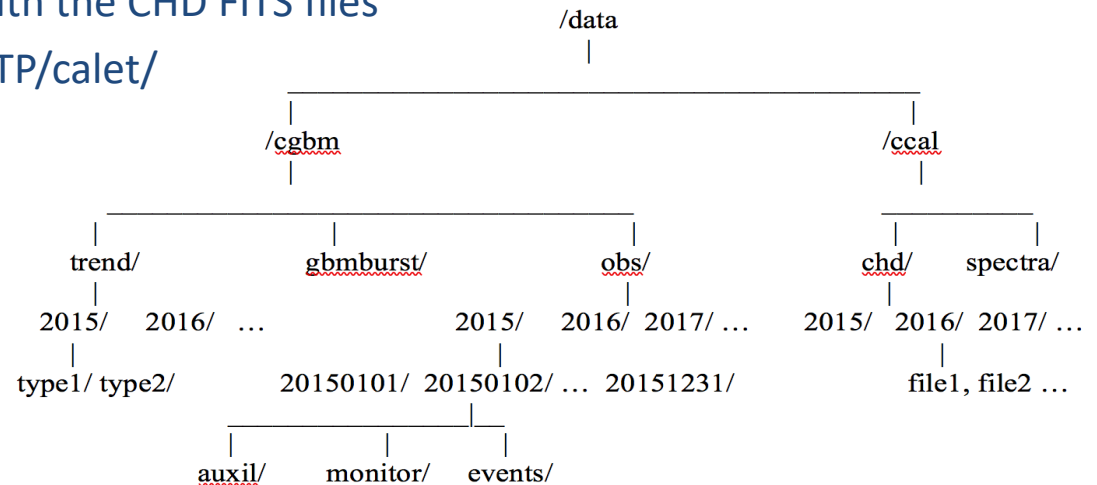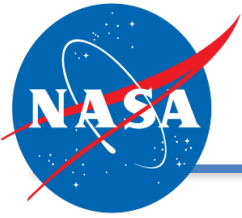
CALET archive access

- Data will/are accessible via the web Browse interface or https access

- HEASARC generates the metadata necessary to the Browser

- W3Browse allows to query more than one mission and table simultaneuosly

Browse access

- https://heasarc.gsfc.nasa.gov/cgi-bin/W3Browse/w3browse.pl

Http access

- https://heasarc.gsfc.nasa.gov/FTP/calet/

CGBM data

- The CGBM archive includes two data sets:
  - 1st data data set
    - TH Monitoring data : 4 energy sampled data every 0.125 sec in low gain and high gain
    - PH Monitoring data : low gain 102 chan spectra & high gain 410 chan spectra sampled every 4 sec
    - Event data in low and high gain when a trigger occurs (~1500000 events collected 100 sec before the event and ~512 sec after the events.
    - Images from the ASC
  - 2nd data set
    - High level products from the GRBs and other events
- Calibration data to be stored in CALDB
  - Channel boundaries and responses
- Plan to delivery :
  - The 1st data set is underway.
    - The TH and PH data will be delivered first (within Feb 2020), follow by the EVENT data
    - CALDB populated with the Channel boundaries files
    - HEASARC will generate metadata to allow access via the Web Browser
  - 2nd data set
    - Plan still under discussion
- HEASARC do not plan to archive the web software interface now available at DARTS
  - However the data format of the CGBM data is similar to other data from different mission to allow usage of the existing software and/or scripting existing routine to reproduce the web interface capability
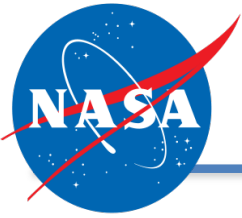
Calorimeter data

- The Calorimeter archive includes:
  - Space weather data from the CHD
    - The original files (version 1.0 were delivered to DARTS is ASCII
    - HEASARC wrote a converter to translate the data in FITS and uncover few anomalies
    - The converter is now running at DARTS on version 1.2 and HEASARC rsyn the archive routinely
      - Data are verified before made public for transmission problem and/or anomaly in the FITS file
    - Data files can be plot and viewed with standard ftools (e,g, lcurve , fplot or fdump)
    - When data are at the HEASARC , metadata are generated and ingested in the database to allow data selection via the Browser

View All	Sort	Parameter (Unit)	Query Terms	Min Value	Max Value	Value Type
☑	○	obsid		20151013	20200130	string
☑	○	time		2015-10-13 00:00:27	2020-01-30 00:03:49	date
☑	○	end_time		2015-10-14 00:00:26	2020-01-30 15:03:47	date
☐	○	exposure (s)		0.00000	86400.50450	float
☐	○	processing_date		2019-12-19 09:12:48	2020-01-31 04:16:06	date
☐	○	processing_version		v3	v3	string
☑	○	rate_mean (ct/s)		0.00	23839.67	float
☑	○	rate_min (ct/s)		0.00	410.95	float
☑	○	rate_max (ct/s)		0.00	1017947.44	float

  - Spectra
    - The ascii file were delivered at DARTS
    - Need to work out a suitable FITS format and translate them in FITS
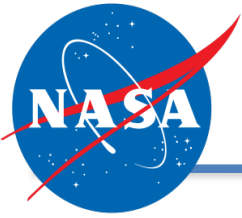
Conclusions and Future

- Currently HEASARC hosts and gives access to the CHD space weather data

- Future :
    a) Waiting for the first delivery of the CGBM and made them public
    b) Create metadata for the CGBM
    c) Made public CALDB for the CGBM
    d) Ingest the CGBM EVENTS
    e) Derive a format for the Calorimeter spectra
    f) Finalize the plan for the CGBM products and responses
       (and ingest when ready)
    g) Create dedicated web pages for CALET similarly to all other missions