



Various ways to access the CSA

3rd IHDEA meeting, NASA/GSFC
17 October 2019

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Outline



1. Cluster Science Archive web application: Shock physics science case
2. Distribution functions
3. Different formats
4. Wget, IDL, Matlab, Python
5. Data Streaming

CSA Web GUI: <https://csa.esac.esa.int/>



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Cluster Science Archive

CSA 2.4.1

WELCOME TO THE CLUSTER SCIENCE ARCHIVE

The Cluster Science Archive provides access to all science and support data of the ongoing Cluster (2000-) and Double Star (2004-2008) missions. For each instrument on these missions, detailed documentation is available. Users are warmly invited to read the PI recommendations provided in the User Guide and Calibration Report of each instrument.

LATEST NEWS

Release csa-2.4.1
-Qtran has been rolled back instead of SPARTA in this patch release to convert CEF files to CDF. Differences in the way the data are stored in the CDF files have been indeed found when converting 2D and 3D datasets by Qtran vs. SPARTA. SPARTA will be deployed again in the near future, once fixed.
2019-09-04 12:40:00 CSA Team

SEARCH **GRAPHICS** **QUICKLOOKS** **INVENTORY** **DISTRIBUTION FUNCTIONS** **DOCUMENTATION** **COMMAND LINE** **CONTACT**

HOME **SEARCH** **GRAPHICS** **QUICKLOOKS** **INVENTORY** **DISTRIBUTION FUNCTIONS** **DOCUMENTATION** **COMMAND LINE** **CONTACT**

Basic dataset search



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Cluster Science Archive

CSA 2.4.1

Mission Cluster DoubleStar

DATA SEARCH

Time (begin/end) -
Duration Days Hours Minutes
 Clear Search

CLUSTER MISSION EXPERIMENTS

- All
- ASPOC active spacecraft potential control
- CIS ion spectrometer
- DWP wave-particle correlator
- EDI electron drift instrument
- EFW electric field double probe antenna
- FGM fluxgate magnetometer
- PEACE electron spectrometer
- RAPID energetic electron and ion spectrometer
- STAFF search coil magnetometer and spectrum analyzer
- WBD radio receiver - electric field waveforms
- WHISPER relaxation sounder
- Auxiliary, MAARBLE and ECLAT support data
- CAL Cross calibration products

DOUBLE STAR MISSION EXPERIMENTS

- All
- ASPOC spacecraft potential control experiment
- FGM fluxgate magnetometer
- HEED high energy electron detector
- HIA ion spectrometer
- HID high energy heavy ion detector
- PEACE electron spectrometer
- STAFF/DWP search coil magnetometer / wave-particle experiment
- Auxiliary and support data

NEW FEATURE

3x faster to make inventory queries

European Space Agency

Results + new features



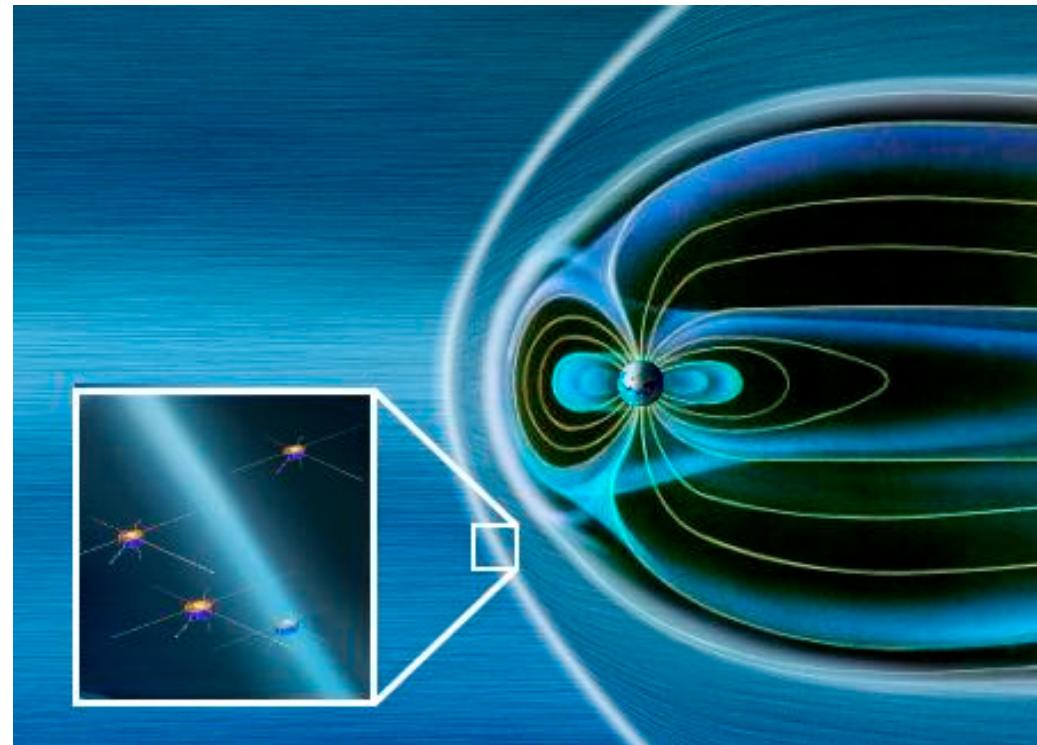
NEW FEATURES

- Experiments in tabs
- New ordering and grouping of datasets

The screenshot shows the Cluster Science Archive (CSA) version 2.4.1 interface. At the top, there are two tabs: "Data Request #1" and "Data Request #2". Below the tabs, there is a search bar and a sidebar with various icons. A red arrow points to the "Time (begin/end)" input field, which shows the range "2001-02-01T00:00:00Z - 2017-01-01T00:00:00Z". To the right of the time inputs are "Duration" fields for Days, Hours, and Minutes, all set to 0. Below the time inputs is a "Short List" checkbox followed by a dropdown menu set to "CEF", and several small icons. The main panel is titled "CLUSTER" and contains a horizontal tab bar with the following tabs: ASP, CIS, DWP, EDI, EFW, FGM, PEA, RAP, STA, WBD, WHI, AUX, and CAL. The "CIS ION SPECTROMETER" tab is selected. Under this tab, there are sections for "SCIENCE" (with sub-sections for MOMENTS, PITCH ANGLE, and PARTICLE DISTRIBUTION), "ANCILLARY", and "GRAPHICAL". The "GRAPHICAL" section is highlighted with a green border.

1. Cluster science archive

Science case on shock physics



83 quicklook plots (orbit long, 6h, PI plots)



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AMASSON

Cluster Science Archive

CSA 2.4.1

DATA SEARCH

2005-01-09T18:00:00Z Transversal type: Plot Time
Plots: 1 Size: 1.0

◀◀ Find Plot ▶▶ X

Cluster DoubleStar

AUX & ECLAT CIS Cross Calibration DWP EDI EFW RAPID STAFF WBD WHISPER

C1	C2	C3	C4	All	Interval	Product Name
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>		6 hour	6-hr CAA Summary Plot (Overview)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		6 hour	6-hr CAA Summary Plot (Fields)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		6 hour	6-hr CAA Summary Plot (Particles1)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		6 hour	6-hr CAA Summary Plot (Particles2)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		1 orbit	Orbit CAA Summary Plot (Overview)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		1 orbit	Orbit CAA Summary Plot (Fields)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		1 orbit	Orbit CAA Summary Plot (Particles1)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		1 orbit	Orbit CAA Summary Plot (Particles2)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		1 orbit	Orbit Summary Plot (Overview)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		1 orbit	Orbit Summary Plot (Fields)

QUICKLOOK DATASET DETAILS

2005-01-09T18:00:00Z / 2005-01-09T00:00:00Z

CD IOM generated 21 Aug 2018

CD EPW generated 21 Aug 2018

CD CIS MOMENTS generated 21 Aug 2018

CD HIA generated 21 Aug 2018

CD PIA generated 21 Aug 2018

CD STAS generated 21 Aug 2018

CD WHIS generated 21 Aug 2018

UT 18:00:00 19:00:00 20:00:00 21:00:00 22:00:00 23:00:00 00:00:00

NORMAL Frequency

overflow

CD IOM

CD EPW

CD CIS MOMENTS

CD HIA

CD PIA

CD STAS

CD WHIS

NM BM

Space Agency

Pre-generated plots (1h, 6h, 1day)



Cluster Science Archive

CSA 2.4.1

KEY GRAPHICAL PRODUCTS

Time granularity 1 day 6 hours 1 hour On demand

Time (begin/end) - Duration Days Hours Minutes

<< >>

Cluster DoubleStar

ASPOC AUX CIS DWP EDI EFW FGM PEACE RAPID STAFF WBD WHISPER

C1	C2	C3	C4	All	Product Name
<input type="radio"/>	MAGNETIC FIELD - X COMPONENT IN GSE				
<input type="radio"/>	MAGNETIC FIELD - Y COMPONENT IN GSE				
<input type="radio"/>	MAGNETIC FIELD - Z COMPONENT IN GSE				
<input checked="" type="radio"/>	MAGNETIC FIELD - TOTAL FIELD				
<input type="radio"/>	MAGNETIC FIELD - AZIMUTHAL COMPONENT IN GSE				
<input type="radio"/>	MAGNETIC FIELD - POLAR COMPONENT IN GSE				
CAVEATS -- On Demand only					

PLOTS

PS PNG

09 January 2005

CSA(CG_PREGEN_1HOUR_amasson_20191015_183147_20050109220000.png)

CSA FGM
generated: 4 Dec 2015
C1 FGM
generated: 18 Nov 2013
C2 FGM
generated: 17 Oct 2015
C3 FGM
generated: 9 Oct 2015
C4 FGM
generated: 11 Nov 2015
C1 HAM HS
generated: 31 Dec 2017
C1 PEA
generated: 3 Feb 2017

On-demand plotting



Cluster Science Archive

CSA 2.4.1

KEY GRAPHICAL PRODUCTS

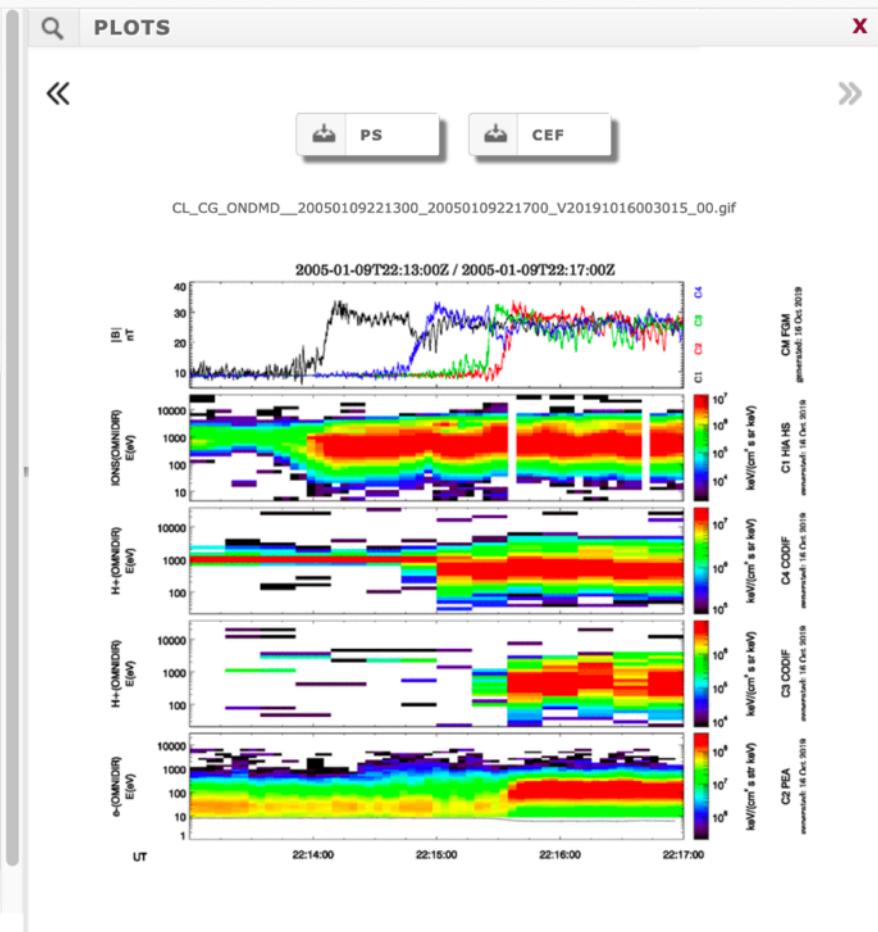
Time granularity 1 day 6 hours 1 hour On demand

Time (begin/end) 2005-01-09T22:13:00Z - 2005-01-09T22:17:00Z Duration 0 Days 0 Hours 4 Minutes

Cluster DoubleStar

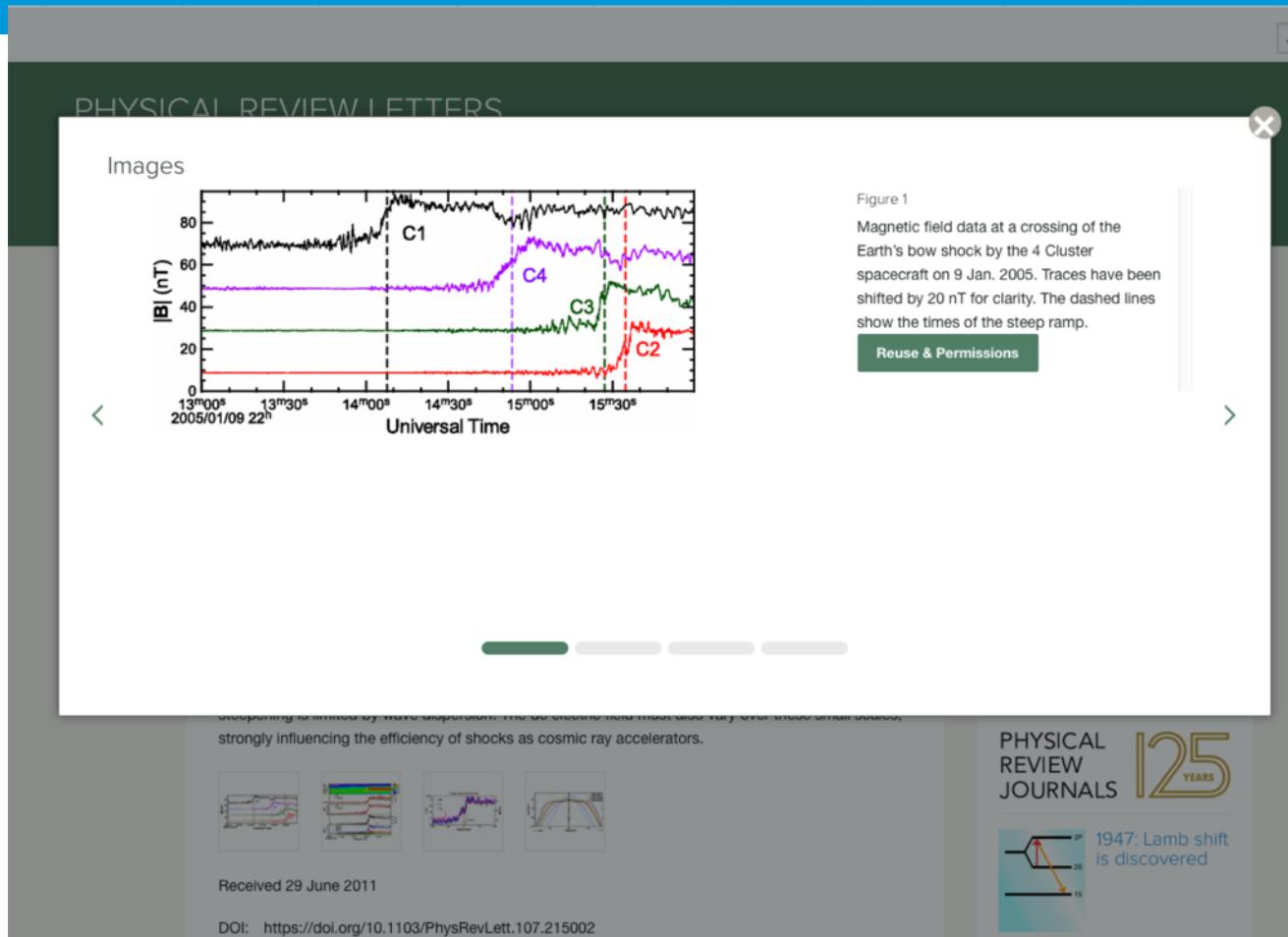
ASPOC AUX CIS DWP EDI EFW FGM PEACE RAPID STAFF WBD WHISPER

C1	C2	C3	C4	All	Product Name
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	MAGNETIC FIELD - X COMPONENT IN GSE
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	MAGNETIC FIELD - Y COMPONENT IN GSE
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	MAGNETIC FIELD - Z COMPONENT IN GSE
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	MAGNETIC FIELD - TOTAL FIELD
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	MAGNETIC FIELD - AZIMUTHAL COMPONENT IN GSE
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	MAGNETIC FIELD - POLAR COMPONENT IN GSE
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	CAVEATS -- On Demand only
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	DATA GAPS -- On Demand only
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	VALIDATION GAPS -- On Demand only



1. Cluster science archive

Science case on shock physics



1. Cluster science archive *Science case on shock physics*



PHYSICAL REVIEW LETTERS

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Electron Temperature Gradient Scale at Collisionless Shocks

Steven J. Schwartz, Edmund Henley, Jeremy Mitchell, and Vladimir Krasnoselskikh
Phys. Rev. Lett. 107, 215002 – Published 14 November 2011

Article References Citing Articles (32) PDF HTML Export Citation

ABSTRACT

Shock waves are ubiquitous in space and astrophysics. They transform directed flow energy into thermal energy and accelerate energetic particles. The energy repartition is a multiscale process related to the spatial and temporal structure of the electromagnetic fields within the shock layer. While large scale features of ion heating are known, the electron heating and smaller scale fields remain poorly understood. We determine for the first time the scale of the electron temperature gradient via electron distributions measured *in situ* by the Cluster spacecraft. Half of the electron heating coincides with a narrow layer several electron inertial lengths (c/ω_{pe}) thick. Consequently, the nonlinear steepening is limited by wave dispersion. The dc electric field must also vary over these small scales, strongly influencing the efficiency of shocks as cosmic ray accelerators.

Received 29 June 2011

Issue Vol. 107, Iss. 21 — 18 November 2011

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PHYSICAL REVIEW JOURNALS 125 YEARS

1947: Lamb shift is discovered

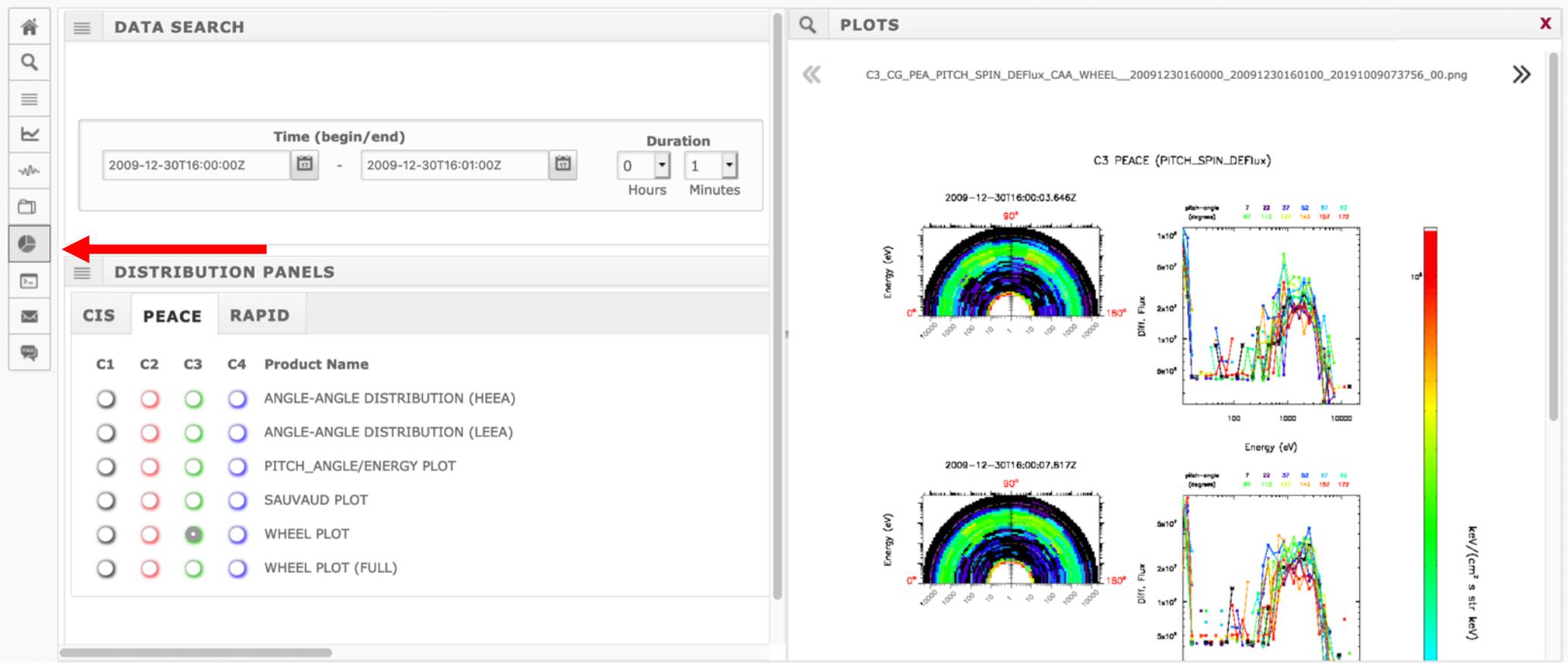
European Space Agency

2. Distribution functions



Cluster Science Archive

CSA 2.4.1



3. Different data formats



The screenshot shows the Cluster Science Archive (CSA) version 2.4.1 interface. The top banner features the "Cluster Science Archive" logo and "CSA 2.4.1". The main window is titled "Data Request #1".

Time (begin/end): 2017-10-05T00:00:00Z - 2018-10-06T00:00:00Z

Duration: 0 Days, 0 Hours, 0 Minutes

Search Options: Short List, CEF, All

Search Results (CLUSTER):

- CEF
- CDF
- CDF_2_7

Filter Buttons: FGM, PEA, W, SCIENCE, ANCILLARY

Legend: TER

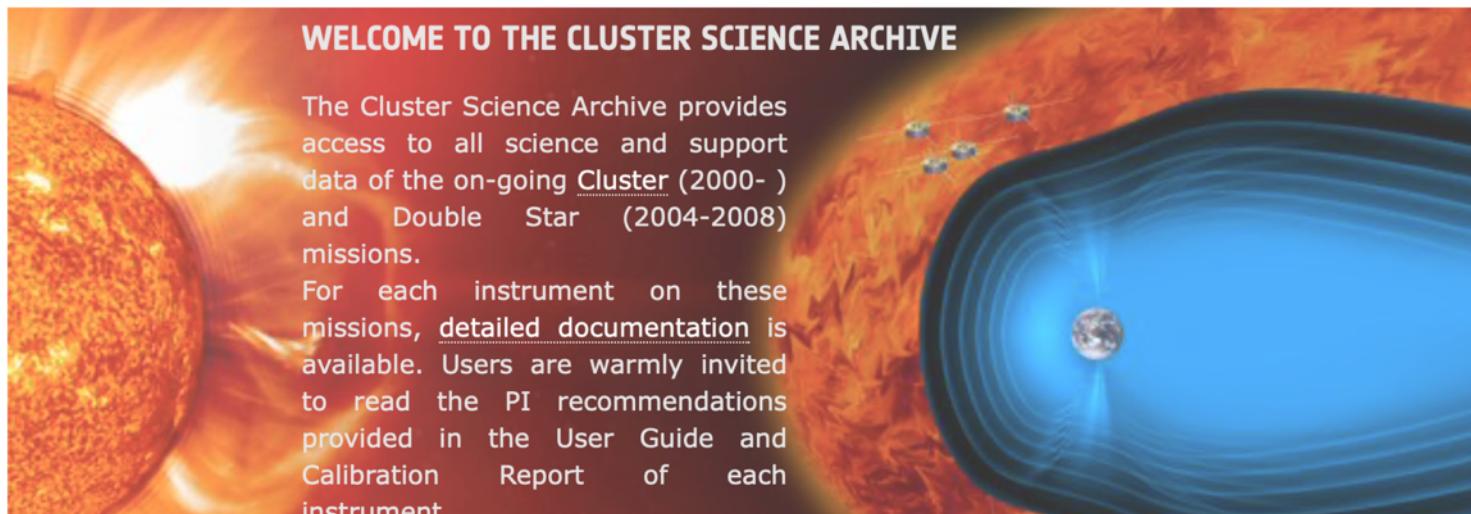
European Space Agency

4. Rest API: <https://csa.esac.esa.int/csa/aio/>



Cluster Science Archive

CSA 2.4.1



WELCOME TO THE CLUSTER SCIENCE ARCHIVE

The Cluster Science Archive provides access to all science and support data of the on-going Cluster (2000-) and Double Star (2004-2008) missions.

For each instrument on these missions, detailed documentation is available. Users are warmly invited to read the PI recommendations provided in the User Guide and Calibration Report of each instrument.

LATEST NEWS

Next release csa-2.5

- Option to download CDF ISTP compliant files

2019-09-15 23:30:00 CSA Team



SEARCH

GRAPHS

QUICKLOOKS

INVENTORY

DISTRIBUTION FUNCTIONS

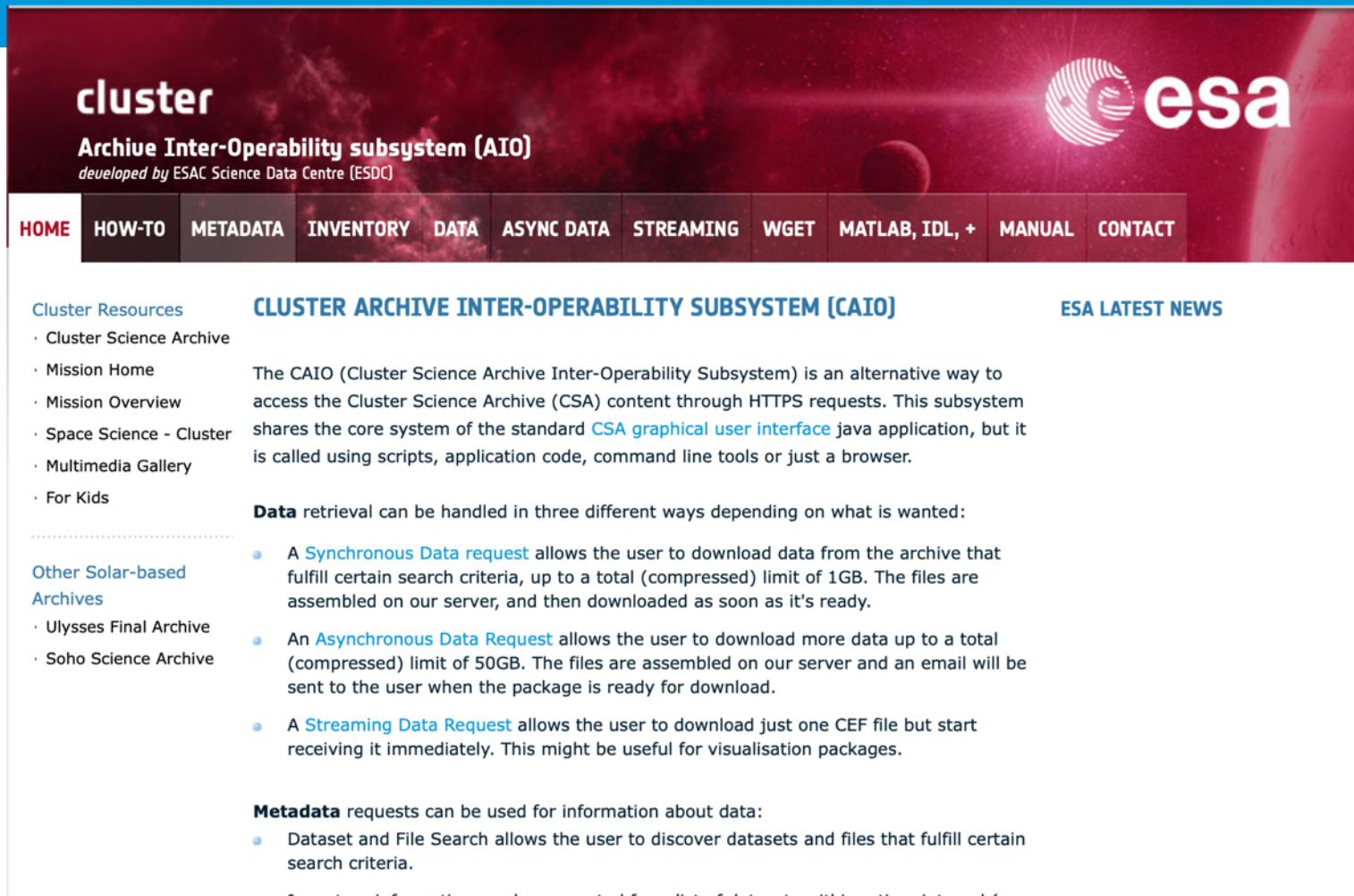
DOCUMENTATION

COMMAND LINE

CONTACT



4. Rest API: <https://csa.esac.esa.int/csa/aio/>



The screenshot shows the Cluster Archive Inter-Operability Subsystem (CAIO) homepage. The header includes the "cluster" logo, the title "Archive Inter-Operability subsystem (AIO)", and the subtitle "developed by ESAC Science Data Centre (ESDC)". The navigation menu at the top includes links for HOME, HOW-TO, METADATA, INVENTORY, DATA, ASYNC DATA, STREAMING, WGET, MATLAB, IDL, +, MANUAL, and CONTACT. The main content area has three columns: "Cluster Resources" (with links to Cluster Science Archive, Mission Home, Mission Overview, Space Science - Cluster, Multimedia Gallery, and For Kids), "CLUSTER ARCHIVE INTER-OPERABILITY SUBSYSTEM (CAIO)" (describing the CAIO as an alternative way to access the Cluster Science Archive content via HTTPS requests, sharing the core system of the standard CSA graphical user interface), and "ESA LATEST NEWS". Below the CAIO description, there is a section about data retrieval methods (Synchronous, Asynchronous, Streaming Data Requests) and metadata requests. The footer contains a copyright notice for the European Space Agency.

cluster
Archive Inter-Operability subsystem (AIO)
developed by ESAC Science Data Centre (ESDC)

HOME **HOW-TO** METADATA INVENTORY DATA ASYNC DATA STREAMING WGET MATLAB, IDL, + MANUAL CONTACT

Cluster Resources

- Cluster Science Archive
- Mission Home
- Mission Overview
- Space Science - Cluster
- Multimedia Gallery
- For Kids

Other Solar-based Archives

- Ulysses Final Archive
- Soho Science Archive

CLUSTER ARCHIVE INTER-OPERABILITY SUBSYSTEM (CAIO)

The CAIO (Cluster Science Archive Inter-Operability Subsystem) is an alternative way to access the Cluster Science Archive (CSA) content through HTTPS requests. This subsystem shares the core system of the standard [CSA graphical user interface](#) java application, but it is called using scripts, application code, command line tools or just a browser.

Data retrieval can be handled in three different ways depending on what is wanted:

- A [Synchronous Data request](#) allows the user to download data from the archive that fulfill certain search criteria, up to a total (compressed) limit of 1GB. The files are assembled on our server, and then downloaded as soon as it's ready.
- An [Asynchronous Data Request](#) allows the user to download more data up to a total (compressed) limit of 50GB. The files are assembled on our server and an email will be sent to the user when the package is ready for download.
- A [Streaming Data Request](#) allows the user to download just one CEF file but start receiving it immediately. This might be useful for visualisation packages.

Metadata requests can be used for information about data:

- Dataset and File Search allows the user to discover datasets and files that fulfill certain search criteria.

European Space Agency

4. Rest API: <https://csa.esac.esa.int/csa/aio/>



IDL

Below you can find two IDL routines developed by Andrew Walsh, that use the CAIO to download data directly from IDL. They work with Linux, Mac and Windows enabling login ([csa_login.pro](#)) and product actions ([csa_product.pro](#)). The error handling will be improved in the near future, together with the actions for unpacking the downloaded tar files.

Important note: if you have IDL with an older version than 8.4, these programs may not work and display an error message as follows:

```
% Loaded DLM: URL.  
% IDLNETHURL::GET: CCURLException: Error: Http Get Request Failed. Error = SSL certificate problem:  
self signed certificate in certificate chain, Curl Error Code = 60..  
% Execution halted at: CSA_LOGIN
```

To quickly solve this issue:

- in the login script ([csa_login.pro](#)), please add `csa_login_obj->SetProperty, ssl_verify_peer = 0`
- in the product script ([csa_product.pro](#)), please add `csa_product_obj->SetProperty, ssl_verify_peer = 0`

Alternatively, please have a look here [here](#).

```
function csa_login,user,pass  
  
;Function that logs in to the CSA AIO system.  
;Parameters:  
;  
;    USER: String containing your RSSD LDAP user identifier  
;  
;    PASS: String containing your RSSD LDAP password  
;  
;  
;Return Value:  
;  
;    If login is successful, returns a string containing a JSESSIONID cookie  
;  
;    If login is unsuccessful, returns 0  
;  
;  
;Example:
```

PYTHON

This section of code, in Python 3, will allow you to do the same as the previous scripts: download a selection of data and uncompress the package.

```
from requests import get # to make GET request  
import tarfile  
  
def download(url, params, file_name):  
    # open in binary mode  
    with open(file_name, "wb") as file:  
        # get request  
        response = get(url, params=params)  
        # write to file  
        file.write(response.content)  
  
myurl = 'https://csa.esac.esa.int/csa/aio/product-action'  
query_specs = {'DATASET_ID': 'C1_CP_FGM_SPIN',  
              'START_DATE': '2003-03-03T12:00:00Z',  
              'END_DATE': '2003-03-04T12:00:00Z',  
              'DELIVERY_FORMAT': 'CEF',  
              'NON_BROWSER': '1',  
              'DELIVERY_INTERVAL': 'hourly',  
              'CSACOOKIE': ''}  
  
download(myurl, query_specs, '20160616test.tar.gz')  
  
with tarfile.open("20160616test.tar.gz") as tar:  
    tarname = tar.getnames()  
    tar.extractall()
```

5. Rest API: <https://csa.esac.esa.int/csa/aio/>



cluster
Archive Inter-Operability subsystem (AIO)
developed by ESAC Science Data Centre (ESDC)

[HOME](#) [HOW-TO](#) [METADATA](#) [INVENTORY](#) [DATA](#) [ASYNC DATA](#) [STREAMING](#) [WGET](#) [MATLAB, IDL, +](#) [MANUAL](#)

Cluster Resources

- Cluster Science Archive
- Mission Home
- Mission Overview
- Space Science - Cluster
- Multimedia Gallery
- For Kids

STREAMING DATA REQUESTS

Data streaming allows a faster delivery of the data. It enables immediate streaming of one dataset to (instead of a file package being created on the CSA server and then sent). However, the following constraints apply:

- Only CEF products can be downloaded using these requests
- Only one dataset can be requested
- Only one file is delivered for the time period requested, i.e. delivery interval option is not available
- Header only cannot be requested
- If the internet connection is broken before file download has completed, the request must be made again for the whole file

PRODUCT REQUESTS

Table 8: Streamed product requests

PARAMETER NAME(S)	DESCRIPTION	MANDATORY
DATASET_ID	Unique identifier of the dataset whose data we want to retrieve. Please note that wild cards ('*') are NOT allowed	YES

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Matlab routines to work with space data, particularly with MMS and Cluster/CAA data. Also some general plasma routines.

8,115 commits 13 branches 63 releases 21 contributors

Branch: master New pull request Find file Clone or download

thomas-nilsson-irfu	New irfu-matlab v1.15.0	Latest commit f98b8a6 9 days ago
+local	Some more minor checkcode() corrections..	2 years ago
+lp	Some more minor checkcode() corrections..	2 years ago
+maarble	Some more minor checkcode() corrections..	2 years ago
+model	Some more moves to HTTPS	2 years ago