

# **On-Demand Analysis Tools for Space Science (Hands-On Activities)**

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**“Particle Detection: From Ground to Space and Space Weather Impact”  
Workshop, Chiang Mai, Thailand, 18 Feb 2024**

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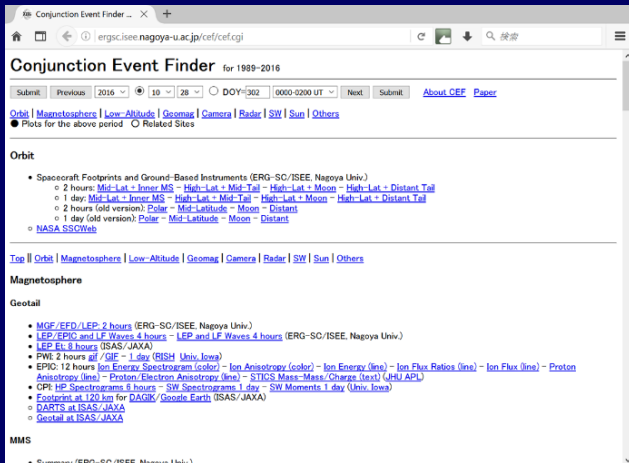
- **Introduction**
- **Comprehensive On-Demand Analysis Tools**
  - **Conjunction Event Finder (CEF)**
  - **NASA CDAWeb**
  - **NASA SSCWeb (introduction only)**
  - **IUGONET Type-A**
- **Comprehensive Analysis Tool (advanced)**
  - **SPEDAS (introduction only)**

# ■ Introduction

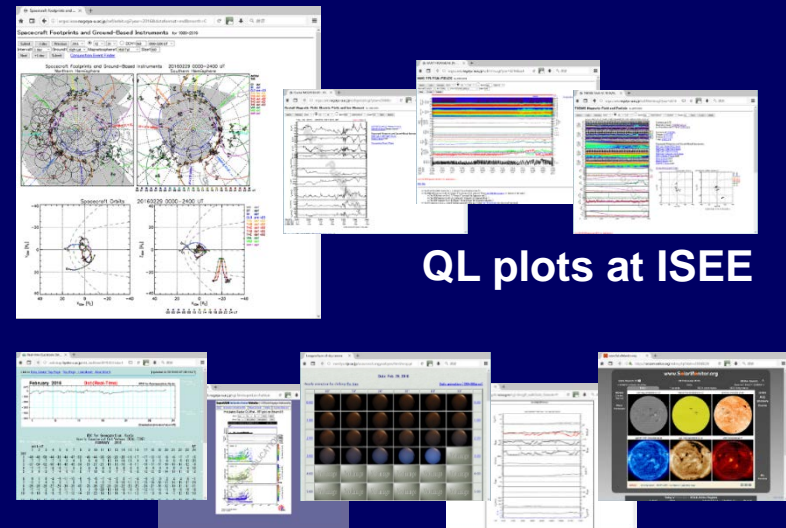
- In space science, we often need to check various kinds of data from various spacecraft-borne and ground-based instruments.
- To check and analyze data, we use:
  - Quick-look (QL) or ready-made plots
    - the easiest, quickest way to check data
    - **CEF, IUGONET Type-A**
  - On-demand plot-making tools
    - an easy way to check data and make plots
    - **NASA CDAWeb, NASA SSCWeb, IUGONET Type-A**
  - Analysis software
    - not so easy, for advanced serious analysis
    - **SPEDAS**

# ■ Conjunction Event Finder (CEF)

- <https://ergsc.isee.nagoya-u.ac.jp/cef/cef.cgi>
- Miyashita et al. (2011, doi:10.5047/eps.2011.01.003)
- Links to QL plots for various kinds of spacecraft and ground-based observations for a selected period.
- **Browse QL plots** one after another simply by clicking.
- Useful for **finding conjunction events** and planning future collaborations between spacecraft and ground-based observations.



>100 links to QL plots available  
at ISEE and other institute



QL plots at ISEE

QL plots at other institutes

## ■ How to Use CEF (1-1)

- If you already have an event or a time interval of interest
  - (1) Open the CEF (<https://ergsc.isee.nagoya-u.ac.jp/cef/cef.cgi>).
  - (2) Select the date and time period of interest at the top and click the “Submit” button, and the links to QL plots for the selected period will be generated.
  - (3) Scroll down in the CEF and click links to spacecraft and instruments of interest.
- Note that some links are dead, because the selected projects do not cover the selected period, the data are unavailable for some reason, and/or the CEF has not been updated yet. Even so, the CEF is still useful.

# ■ How to Use CEF (1-2)

- Example events: The ~0357 UT and ~0450 UT substorms on 26 February 2008

(Miyashita et al., 2018, doi:10.1029/2018GL078589;

Angelopoulos et al, 2008, doi:10.1126/science.1160495)

- (1) Open the CEF (<https://ergsc.isee.nagoya-u.ac.jp/cef/cef.cgi>).
- (2) Select “2008”, “02”, “26”, and “0400-0600 UT” at the top and click the “Submit” button, and the links to QL plots for the selected period will be generated.

## Conjunction Event Finder for 1989-2022

DOY=    [About CEF](#) [Paper](#)

[Orbit](#) | [Magnetosphere](#) | [Low-Altitude](#) | [Geomag](#) | [Camera](#) | [Radar](#) | [SW](#) | [Sun](#) | [Others](#)

Plots for the above period  Related Sites

### Orbit

- Spacecraft Footprints and Ground-Based Instruments (ERG-SC/ISEE, Nagoya Univ.)

# How to Use CEF (1-3)

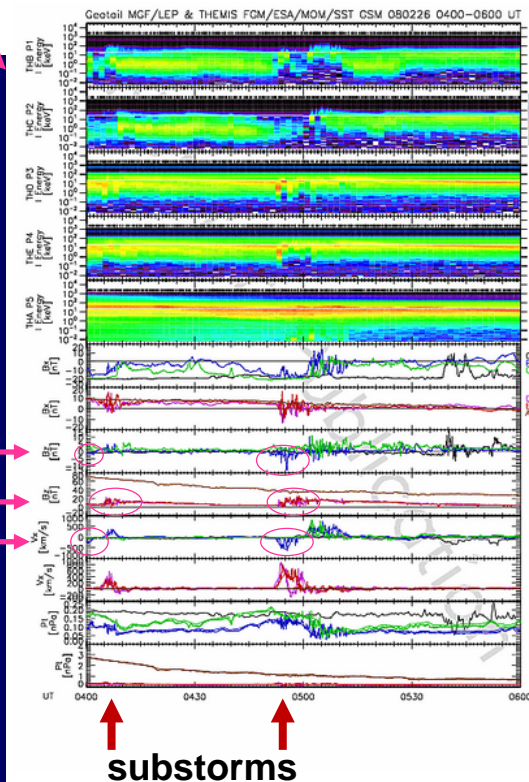
(3-1) Scroll down the CEF page and click the link to “Multi-SC+Geotail” at “THEMIS” “L2 FGM/ESA/SST: 2 hours”.

## THEMIS

- L2 FGM/ESA/SST: 2 hours [Multi-SC+Geotail](#) [A](#) [B](#) [C](#) [D](#) [E](#) (ERG-SC/ISEE, Nagoya Univ.)
- Summary: 2 hours [A](#) [B](#) [C](#) [D](#) [E](#) — 6 hours [A](#) [B](#) [C](#) [D](#) [E](#) — 1 day [A](#) [B](#) [C](#) [D](#) [E](#) (UCB SSL)
- [THEMIS Mission Site at UCB SSL](#)
- [THEMIS Mission Site at NASA](#)
- [Taiwan AIDA for THEMIS at NCU](#)
- [ARTEMIS Mission Site at UCB SSL](#)

## THEMIS Magnetic Field and Particle for 2007-2022

Submit -1 day Previous 2008 02 26 DOY=057 0400-0600 UT Multi-SC Size=100 Next +1 day Submit



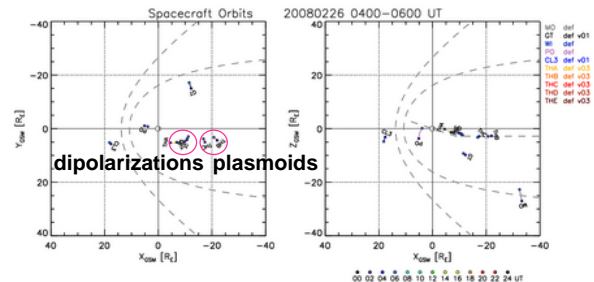
plasmoids  
dipolarizations  
plasmoids

Summary at ISEE  
Multi-SC 2 hours: [THEMIS+Geotail](#)  
L2 FGM/ESA/SST 2 hours: [A](#) [B](#) [C](#) [D](#) [E](#)

Summary at UCB SSL  
2 hours: [A](#) [B](#) [C](#) [D](#) [E](#)  
6 hours: [A](#) [B](#) [C](#) [D](#) [E](#)  
1 day: [A](#) [B](#) [C](#) [D](#) [E](#)

Spacecraft Footprints and Ground-Based Instruments:  
[Mid-Lat + Inner MS 2 hours](#)  
[High-Lat + Mid-Tail 2 hours](#)  
[High-Lat + Moon 2 hours](#)  
[High-Lat + Distant Tail 2 hours](#)  
[Mid-Latitude 2 hours](#) (old)  
[Polar 2 hours](#) (old)  
[Moon 2 hours](#) (old)  
[Distant 2 hours](#) (old)

### Conjunction Event Finder



# How to Use CEF (1-4)

(3-2) Scroll down the CEF page or click the link “Camera”, and click the link to “Keograms” at “THEMIS GBO ASI”.

[Top](#) | [Orbit](#) | [Magnetosphere](#) | [Low-Altitude](#) | [Geomag](#) | [Camera](#) | [Radar](#) | [SW](#) | [Sun](#) | [Others](#)

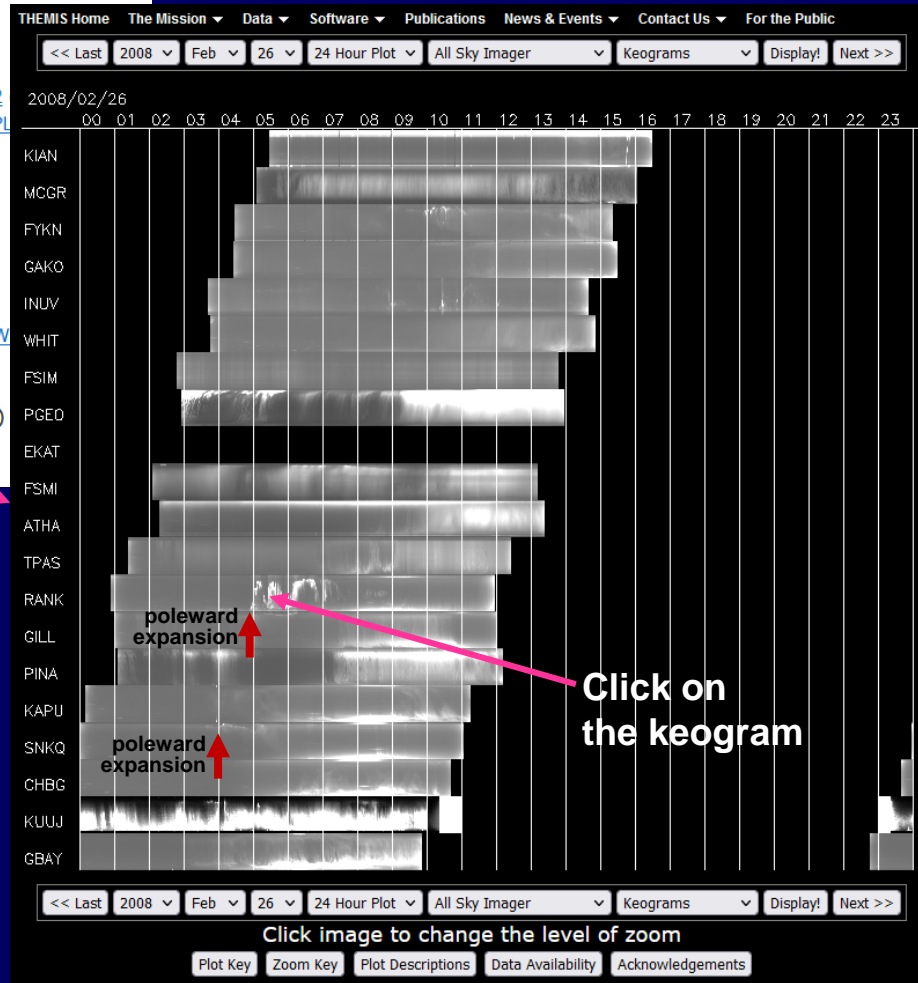
## Camera/Riometer/Ionosonde

### Spacecraft-Borne

- Polar: UVI ([NASA MSFC](#)) - [VIS 1 day \(Univ. Iowa\)](#) - PIXIE 1 day [Low High \(Lockheed Martin\)](#)
- IMAGE FUV Auroral Images: 1 hour WIC [1 2](#) - S13 [1 2](#) - S12 [1 2](#) (NASA CDAWeb) — 1 day [0 1 2](#)
- TIMED: [GUVI Maps of Auroral Electron Mean Energy and Energy Flux 1 day \(JHU APL\)](#) — [JHU APL](#)

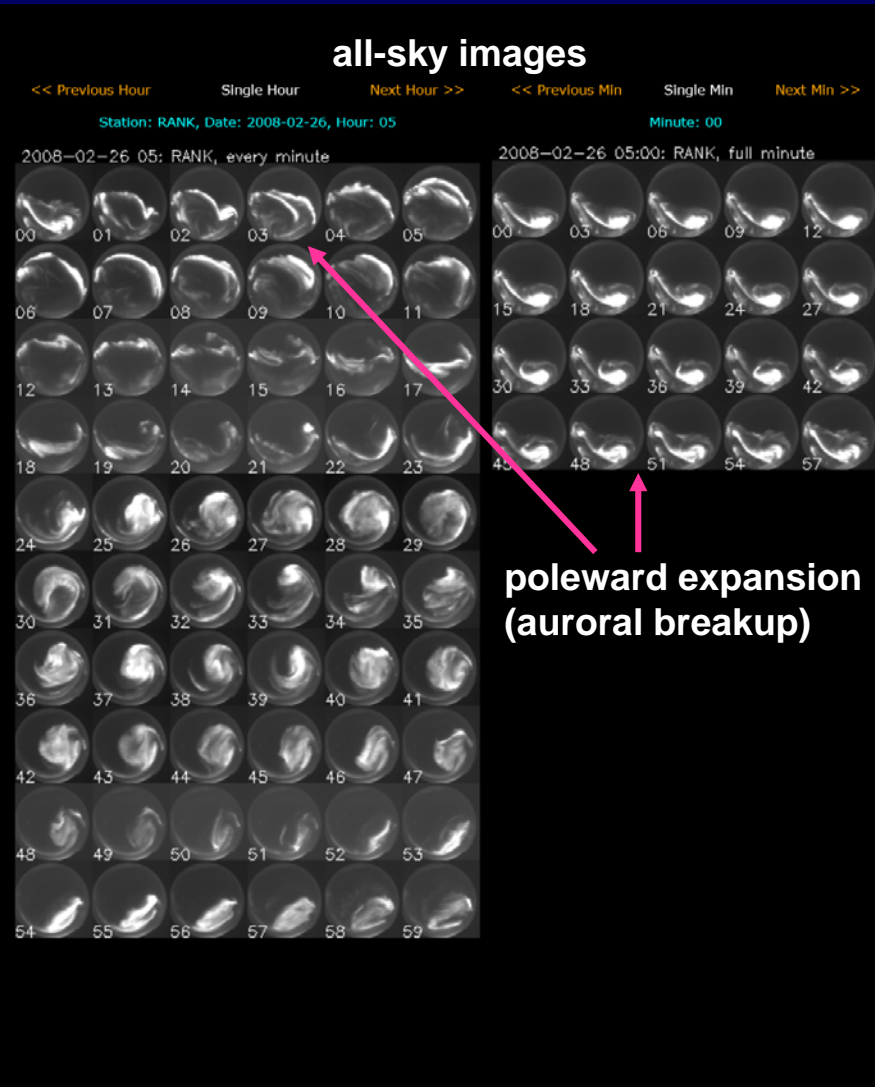
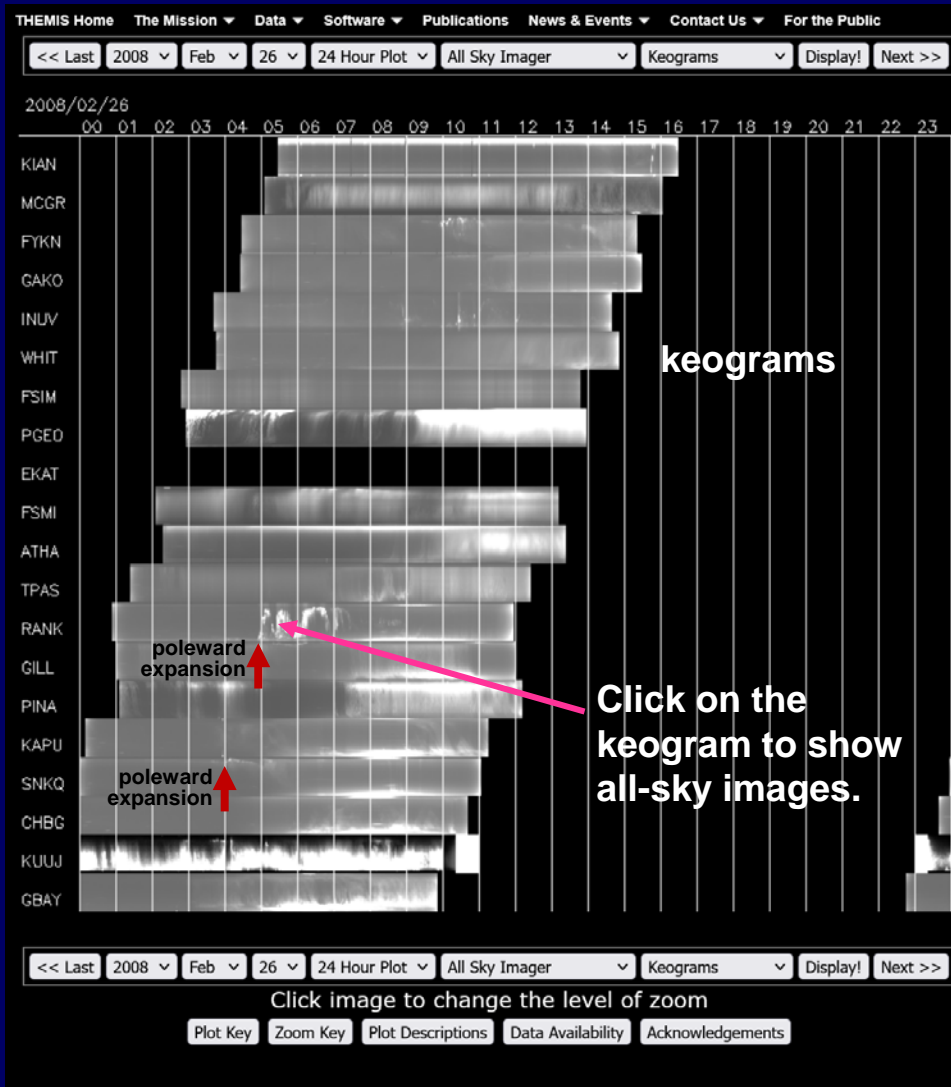
### Ground-Based

- OMTI Japanese Meridian and Canada: [Map \(ISEE, Nagoya Univ.\)](#)
- FMI ASC Northern Europe: Keogram 1 day [previous day selected day - Map \(FMI\)](#)
- NIPR ASC Norway Tromso: [1 Day \(NIPR\)](#)
- NIPR ASC Svalbard Longyearbyen: [1 Day - Map \(UNIS and NIPR\)](#)
- PsA + PWING EMCCD Northern Europe & Alaska: [1 Day \(ERG-SC/ISEE, Nagoya Univ.\)](#) — [PsA, PW](#)
- THEMIS GBO ASI Canada-Alaska: 1 day [Mosaic Summary](#) [Keograms](#) [REGO Keograms \(UCB SSL\)](#)
- UofC Space Physics Data Portal Canada-Alaska: [all instruments 1 day \(Univ. Calgary\)](#)
- NORSTAR Canada: MSP 12 hours [Churchill Line 486 nm all 557 nm all 630 nm all \(Univ. Calgary\)](#)
- [Univ. Calgary MSI Summary 1 hour \(Univ. Calgary\)](#)
- [GAIA Canada and Northern Europe](#)





# How to Use CEF (1-5)



# ■ How to Use CEF (2-1)

- If you want to find an interesting event from a specific spacecraft or ground-based instrument

- Open the website of QL plots (via the CEF).
- Browse them one after another.

## • Example:

To find an interesting spacecraft conjunction

- Open the CEF.
- Click the link to

“**High-Lat + Mid-Tail**”  
at “**Orbit**”

- “**Spacecraft footprints...**”
- “**2 hours**”.

<https://ergsc.isee.nagoya-u.ac.jp/cef/cef.cgi>

## Conjunction Event Finder for 1989-2022

Submit Previous 2022 07 30 DOY=211 0000-0200 UT Next Submit [About CEF](#) [Paper](#)

[Orbit](#) | [Magnetosphere](#) | [Low-Altitude](#) | [Geomag](#) | [Camera](#) | [Radar](#) | [SW](#) | [Sun](#) | [Others](#)

Plots for the above period  Related Sites

### Orbit

- Spacecraft Footprints and Ground-Based Instruments (ERG-SC/ISEE, Nagoya Univ.)
  - 2 hours: [Mid-Lat + Inner MS](#) - [High-Lat + Mid-Tail](#) - [High-Lat + Moon](#) - [High-Lat + Distant Tail](#)
  - 1 day: [Mid-Lat + Inner MS](#) - [High-Lat + Mid-Tail](#) - [High-Lat + Moon](#) - [High-Lat + Distant Tail](#)
  - 2 hours (old version): [Polar](#) - [Mid-Latitude](#) - [Moon](#) - [Distant](#)
  - 1 day (old version): [Polar](#) - [Mid-Latitude](#) - [Moon](#) - [Distant](#)
- [NASA SSCWeb](#)
- [Space-Track.Org](#)

[Top](#) | [Orbit](#) | [Magnetosphere](#) | [Low-Altitude](#) | [Geomag](#) | [Camera](#) | [Radar](#) | [SW](#) | [Sun](#) | [Others](#)

### Magnetosphere

#### ERG (Arase)

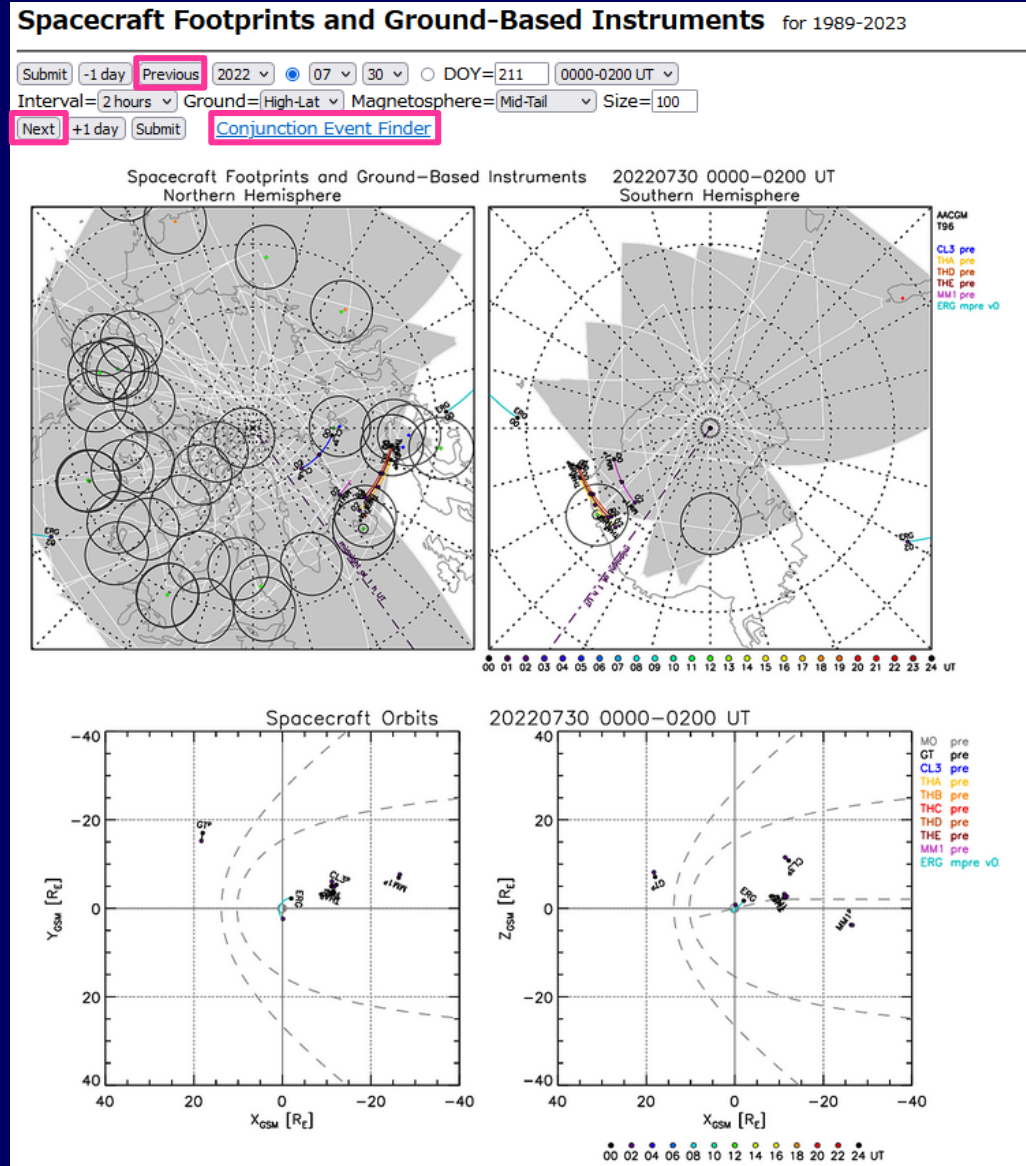
- Summary (ERG-SC/ISEE, Nagoya Univ.)
  - All: [2 hours - 8 hours - 1 day](#)
  - PWE/WFC (Chorus-burst, SWPIA-burst) 1 hour: [1](#) [2](#)
  - PWE: [8 hours - 1 day](#)
  - HEP: [8 hours - 1 day](#)
  - LEP-i: [8 hours - 1 day](#)
- [Near-Real Time 1 day](#) (SEES/JAXA)
- [Orbit](#) (SEES/JAXA)
- [ERG-GBO Conjunction Interval Finder](#)
- [ERG-SC at ISEE, Nagoya Univ.](#)

Geotail

# How to Use CEF (2-2)

- Click the “**Next**” button to show plots for the next interval.
- Click the “**Previous**” button to show plots for the previous interval.
- If you find an interesting event
  - Click the link to “**Conjunction Event Finder**” to browse QL plots of various kinds of data.

<https://ergsc.isee.nagoya-u.ac.jp/cef/orbit.cgi>



# ■ NASA CDAWeb

- Coordinated Data Analysis Web
- <https://cdaweb.gsfc.nasa.gov>
- Mainly for spacecraft data.
- Can make plots on demand and also download data.
- Can combine different data sets and specify a period flexibly.

- (1) Select spacecraft and instrument types.
- (2) Select data set.
- (3) Input a period and select plot options and data parameters.



The screenshot displays the NASA CDAWeb interface. At the top, it features the NASA logo and the text "GODDARD SPACE FLIGHT CENTER Space Physics Data Facility". Navigation links include "+ Goddard Home" and "+ NASA Home". A secondary navigation bar contains "+ SPDF HOME", "+ MISSION DATA", "+ MODELS at CCMC", "+ SCIENCE ENABLED", and "+ AND MORE".

The main content area is divided into several sections:

- CDWeb**: Includes links for "+ CDWEB HOME", "+ FEEDBACK", and "+ ABOUT CDWEB".
- Guides and Tutorials**: Includes "+ CDWeb help" and "+ Internet browser help".
- Direct Access to Data**: Includes "+ Direct HTTP(S) to Data" and "+ Direct FTP(S) to Data (FTPS required)".
- Additional Services**: Includes "+ CDWeb Inside IDL", "+ Overview of Alternative Data Access Methods", "+ Autoplot.org (non-NASA) interface to public CDWeb database", and "+ Pre-generated Data and Orbit plots via SPDFs GIFWALK".
- Additional Resources**: Includes "+ Usage Statistics", "+ Space Physics Use of CDF", "+ Data Inventory Graph", and "+ SPDF Home Page".

On the right side, there is a large image showing various data plots and the text "Coordinated Data Analysis Web". Below this, there is a section titled "Coordinated Data Analysis Web (CDAWeb)" with a paragraph explaining that CDAWeb contains selected public non-solar heliophysics data from current and past missions. It also includes two notices: one from June 2022 regarding SOHO CDF datasets and another from May 2022 regarding Parker Solar Probe (PSP) SWEAP and FIELDS data.

At the bottom, there is a section titled "PREVIOUS DATA & SOFTWARE UPDATES ..." which contains two columns of checkboxes for selecting sources and instrument types. The "Select zero OR more Sources" column includes ACE, AMPTE, ARTEMIS, Alouette, Apollo, Arase (ERG), and BepiColombo. The "Select zero OR more Instrument Types" column includes Activity Indices, Electric Fields (space), Electron Precipitation Bremsstrahlung, Energetic Particle Detector, Engineering, and Ephemeris/Attitude/Ancillary.

# How to Use CDAWeb (1)

- Example events: The ~0357 UT and ~0450 UT substorms on 26 February 2008

- (1) Select spacecraft and instrument types.
- Select “**THEMIS**” from “**Sources**” (left), and “**Magnetic Fields (space)**” and “**Particles (space)**” from “**Instrument Types** (right).”
  - Click the “**Submit**” button.

ST5  
 STEREO  
 Sakigake  
 Solar Orbiter  
 **THEMIS**  
 TIMED  
 TSS-1R  
 TWINS  
 Ulysses  
 Van Allen Probes (RBSP)  
 Voyager  
 Wind  
 Balloons  
 Ground-Based Investigations  
 Helio ephemeris  
 OMNI (Combined 1AU IP Data; Magnetic and Solar Indices)  
 Smallsats/Cubesats  
 Sounding Rockets

NASA Official: Robert M. Candey  
(301)286-8707, Robert.M.Candey@nasa.gov  
Curator: Tami Kovalick  
Last Modified: 20 Jul 2022

Contact SPDF: NASA-SPDF-  
Support@nasa.omni.microsoft.com  
+ Privacy Policy and Important Notices

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Space Physics Data Facility

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CDAWeb  
+ CDAWEB HOME  
+ FEEDBACK  
+ ABOUT CDAWEB

Guides and Tutorials  
+ CDAWeb help  
+ Internet browser help

Direct Access to Data  
+ Direct HTTP(S) to Data  
+ Direct FTP(S) to Data (FTPS required)

Additional Services  
+ CDAWeb Inside IDL  
+ Overview of Alternative Data Access Methods  
+ Autoplot.org (non-NASA) interface to public CDAWeb database  
+ Pre-generated Data and Orbit plots via SPDFs GIFWALK

Additional Resources  
+ Usage Statistics  
+ Space Physics Use of CDF  
+ Data Inventory Graph  
+ SPDF Home Page

Coordinated Data Analysis Web (CDAWeb)

CDAWeb contains selected public non-solar heliophysics data from current and past heliophysics missions and projects. Many datasets from current missions are updated regularly (even daily), including reprocessing older time periods. To find all of the public data and documents archived by the SPDF, see the SPDF archive. To search for additional heliophysics data products, check the heliophysics data portal.

NOTICE: June 2022: The SOHO CDF datasets CELIAS-PM\_30S and CELIAS-PM\_5MIN have been completely reprocessed to version 2, based on a new version of the original ASCII datasets at <https://soho.nascom.nasa.gov/data/archive.html>, resulting in significant changes to the data. See CELIAS-PM\_30S and CELIAS-PM\_5MIN readme files for details.

NOTICE: May 2022: The Parker Solar Probe (PSP) SWEAP and FIELDS data have been extended to December 2021, including Encounter 10 in November 2021 and Venus Gravity Assist 5 in October 2021. The ISOIS data have been extended to January 2022, covering part of the inbound leg of Orbit 11 as an addition. EPI-HI data calibrations are updated and some variables are changed for ISOIS L2 summary data. Please check the PSP inventory plot and annual inventory plots for details.

PREVIOUS DATA & SOFTWARE UPDATES ...

• Select zero OR more Sources (default = All Sources if >=1 Instrument Type is selected)

• Select zero OR more Instrument Types (default = All Instrument Types if >=1 Source is selected)


ACE  
 AMPTE  
 ARTEMIS  
 Alouette  
 Apollo  
 Arase (ERG)  
 BepiColombo  
 CNOFS  
 CRRES  
 Cassini  
 Cluster  
 DMSP  
 DSCOVR  
 Dawn  
 Dynamics Explorer  
 Equator-S  
 FAST  
 Formosat

Activity Indices  
 Electric Fields (space)  
 Electron Precipitation Bremsstrahlung  
 Energetic Particle Detector  
 Engineering  
 Ephemeris/Attitude/Ancillary  
 Gamma and X-Rays  
 Housekeeping  
 Imaging and Remote Sensing (ITM/Earth)  
 Imaging and Remote Sensing (Magnetosphere/Earth)  
 Imaging and Remote Sensing (Sun)  
 Magnetic Fields (Balloon)  
 **Magnetic Fields (space)**  
 **Particles (space)**  
 Plasma and Solar Wind  
 Pressure gauge (space)

# How to Use CDAWeb (2)


## (2) Select data set.

- Click “**Click here to CLEAR All checkboxes**”.
- Select “**THD\_L2\_ESA**” and “**THD\_L2\_FGM**”.
- Click the “**Submit**” button.

**GODDARD SPACE FLIGHT CENTER**  
Space Physics Data Facility

[+ Goddard Home](#)  
[+ NASA Home](#)

+ SPDF HOME+ MISSION DATA+ MODELS at CMC+ SCIENCE ENABLED+ AND MORE

+ CDAWeb HomeCoordinated Data Analysis Web

+ FEEDBACK

### CDAWeb Data Selector

• To go forward to plot, list and retrieve your selected data, press the “submit” button directly below or at the bottom of this page.

• For any special notes on usage of a given data set, please click on that data set name below.

• As needed to select the datasets of actual interest to you:

- manually check/uncheck one or more data sets from the list below OR**  
 [Click here to CLEAR All checkboxes, OR](#)  
 [Click here to SELECT All checkboxes](#)

Submit


- THEMIS\_R0\_GIFWALK:** Links to THEMIS pre-generated MP Crossing Survey plots - David Sibeck (NASA GSFC)  
[Available Time Range: Select dataset for details] [Info](#) [Metadata](#)
- THA\_L2\_ESA:** THEMIS-A (P5): Electrostatic Analyzer (ESA): Electron/Ion Ground-Calculated Energy Fluxes (ions: 5 eV to 25 keV) electrons: 6 eV to 30 keV) and Moments (density, velocity, pressure, and temperature). Includes FULL, REDUCED and BURST modes. FULL: high angular resolution, low (few min) time resolution. REDUCED: degraded angular resolution, high (approx. 3 sec) time resolution. BURST: high angular resolution, high time resolution; only short bursts of data. Note that angular resolution affects moments since they are obtained integrating over the mode-specific angular distribution. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/03/07 00:00:00 - 2022/07/19 00:00:00] [Info](#) [Metadata](#)
- THB\_L2\_ESA:** THEMIS-B (P1/ARTEMIS-P1): Electrostatic Analyzer (ESA): Electron/Ion Ground-Calculated Energy Fluxes (ions: 5 eV to 25 keV) electrons: 6 eV to 30 keV) and Moments (density, velocity, pressure, and temperature). Includes FULL, REDUCED and BURST modes. FULL: high angular resolution, low (few min) time resolution. REDUCED: degraded angular resolution, high (approx. 3 sec) time resolution. BURST: high angular resolution, high time resolution; only short bursts of data. Note that angular resolution affects moments since they are obtained integrating over the mode-specific angular distribution. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/03/07 00:00:00 - 2022/07/18 00:00:00] [Info](#) [Metadata](#)
- THC\_L2\_ESA:** THEMIS-C (P2/ARTEMIS-P2): Electrostatic Analyzer (ESA): Electron/Ion Ground-Calculated Energy Fluxes (ions: 5 eV to 25 keV) electrons: 6 eV to 30 keV) and Moments (density, velocity, pressure, and temperature). Includes FULL, REDUCED and BURST modes. FULL: high angular resolution, low (few min) time resolution. REDUCED: degraded angular resolution, high (approx. 3 sec) time resolution. BURST: high angular resolution, high time resolution; only short bursts of data. Note that angular resolution affects moments since they are obtained integrating over the mode-specific angular distribution. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/03/07 00:00:00 - 2022/07/18 00:00:00] [Info](#) [Metadata](#)
- THD\_L2\_ESA:** THEMIS-D (P3): Electrostatic Analyzer (ESA): Electron/Ion Ground-Calculated Energy Fluxes (ions: 5 eV to 25 keV) electrons: 6 eV to 30 keV) and Moments (density, velocity, pressure, and temperature). Includes FULL, REDUCED and BURST modes. FULL: high angular resolution, low (few min) time resolution. REDUCED: degraded angular resolution, high (approx. 3 sec) time resolution. BURST: high angular resolution, high time resolution; only short bursts of data. Note that angular resolution affects moments since they are obtained integrating over the mode-specific angular distribution. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/03/07 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THE\_L2\_ESA:** THEMIS-E (P4): Electrostatic Analyzer (ESA): Electron/Ion Ground-Calculated Energy Fluxes (ions: 5 eV to 25 keV) electrons: 6 eV to 30 keV) and Moments (density, velocity, pressure, and temperature). Includes FULL, REDUCED and BURST modes. FULL: high angular resolution, low (few min) time resolution. REDUCED: degraded angular resolution, high (approx. 3 sec) time resolution. BURST: high angular resolution, high time resolution; only short bursts of data. Note that angular resolution affects moments since they are obtained integrating over the mode-specific angular distribution. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/03/07 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)

- THD\_L2\_FFT:** THEMIS-D: On Board Fast Fourier Transform (FFT) power spectra of Electric (EFI) and Magnetic (SCM) field, for particle and wave burst survey modes. - V. Angelopoulos (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/02/24 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THE\_L2\_FFT:** THEMIS-E: On Board Fast Fourier Transform (FFT) power spectra of Electric (EFI) and Magnetic (SCM) field, for particle and wave burst survey modes. - V. Angelopoulos (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/02/24 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THA\_L2\_FGM:** Spacecraft-collected fluxgate magnetometer, Decimated TeleMetry High, DSL, GSE and GSM coordinates - V. Angelopoulos, U. Auster & K.H. Glassmeier and W. Baumjohann (UCB, TUBS and IWF respectively, NASA NAS5-02099)  
[Available Time Range: 2007/02/23 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THB\_L2\_FGM:** Spacecraft-collected fluxgate magnetometer, Decimated TeleMetry High, DSL, GSE and GSM coordinates - V. Angelopoulos, U. Auster & K.H. Glassmeier and W. Baumjohann (UCB, TUBS and IWF respectively, NASA NAS5-02099)  
[Available Time Range: 2007/02/24 00:00:00 - 2022/07/19 00:00:00] [Info](#) [Metadata](#)
- THC\_L2\_FGM:** Spacecraft-collected fluxgate magnetometer, Decimated TeleMetry High, DSL, GSE and GSM coordinates - V. Angelopoulos, U. Auster & K.H. Glassmeier and W. Baumjohann (UCB, TUBS and IWF respectively, NASA NAS5-02099)  
[Available Time Range: 2007/02/23 00:00:00 - 2022/07/18 00:00:00] [Info](#) [Metadata](#)
- THD\_L2\_FGM:** Spacecraft-collected fluxgate magnetometer, Decimated TeleMetry High, DSL, GSE and GSM coordinates - V. Angelopoulos, U. Auster & K.H. Glassmeier and W. Baumjohann (UCB, TUBS and IWF respectively, NASA NAS5-02099)  
[Available Time Range: 2007/02/23 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THE\_L2\_FGM:** Spacecraft-collected fluxgate magnetometer, Decimated TeleMetry High, DSL, GSE and GSM coordinates - V. Angelopoulos, U. Auster & K.H. Glassmeier and W. Baumjohann (UCB, TUBS and IWF respectively, NASA NAS5-02099)  
[Available Time Range: 2007/02/23 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THA\_L2\_FIT:** THEMIS-A: On Board spin fits of Electric (EFI) and Magnetic (FGM) field. - V. Angelopoulos (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/02/26 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THB\_L2\_FIT:** THEMIS-B (P1/ARTEMIS-P1): On Board spin fits of Electric (EFI) and Magnetic (FGM) field. - V. Angelopoulos (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/02/26 00:00:00 - 2022/07/19 00:00:00] [Info](#) [Metadata](#)

- THD\_L2\_MOM:** THEMIS-D (P3): On Board moments: Electron/Ion moments density, flux, velocity, pressure and temperature. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/08/10 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)
- THE\_L2\_MOM:** THEMIS-E (P4): On Board moments: Electron/Ion moments density, flux, velocity, pressure and temperature. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)  
[Available Time Range: 2007/08/10 00:00:00 - 2022/07/20 00:00:00] [Info](#) [Metadata](#)

Submit

Reset



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Last Modified: 21 Jul 2022

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+ Privacy Policy and Important Notices

# ■ How to Use CDAWeb (3-1)

## (3) Input a period and select plot options and data parameters.

- Input a period.
  - Start time:  
**2008/02/26 03:30:00.000**
  - Stop time:  
**2008/02/26 05:30:00.000**
- Select plot options.
  - Check “**Combine all time-series ... into one plot file**”.
  - Check “**Plot overlay options**” and then select “**Overlay vector components of selected variables**”.
- Note that there are several other options, including downloading the data.

The screenshot shows the CDAWeb Data Explorer interface. At the top, there is a header for the Goddard Space Flight Center Space Physics Data Facility. Below the header, there are navigation links for SPDF HOME, MISSION DATA, MODELS at CCMC, SCIENCE ENABLED, and AND MORE. The main content area is titled "CDAWeb Data Explorer" and contains several sections for configuring data retrieval and plotting. The "Select start and stop times" section has two input fields for start and stop times, both containing the values "2008/02/26 03:30:00.000" and "2008/02/26 05:30:00.000" respectively. Below this, there are two unchecked checkboxes for "Compute uniformly spaced binned data" and "Use spike removal". The "Select an activity" section has a radio button selected for "Plot Data". Under "Plot Data", there are several options, including "Combine all time-series and spectrogram plots" and "Plot overlay options", both of which are checked. The "Plot overlay options" section has a radio button selected for "Overlay vector components of selected variables". At the bottom, there are "Submit" and "Reset" buttons.

GODDARD SPACE FLIGHT CENTER  
Space Physics Data Facility

+ Goddard Home  
+ NASA Home

+ SPDF HOME + MISSION DATA + MODELS at CCMC + SCIENCE ENABLED + AND MORE

+ CDAWeb Home  
CDAWeb  
+ FEEDBACK

Coordinated Data Analysis Web

### CDAWeb Data Explorer

Select start and stop times from which to GET or PLOT data:

Start time (YYYY/MM/DD HH:MM:SS.mmm): 2008/02/26 03:30:00.000

Stop time (YYYY/MM/DD HH:MM:SS.mmm): 2008/02/26 05:30:00.000

Compute uniformly spaced binned data for scalar/vector/spectrogram data (not available with noise filtering)

Use spike removal to filter data without binning (not available with noise filtering)(Warning: Experimental !!)

Select an activity:

Data Availability Chart : Generate a chart showing when data is available for the selected data set(s) and time range (Select > 1day).

Plot Data : select one or more variables from list below and press submit.

Also create PS and PDF best quality outputs (all plot types except images and plasmagrams).  
Many panels per dataset are allowed but <=4 panels optimal for standard Y-axis height and single page display.

Use coarse noise filtering to remove values outside 3 deviations from mean of all values in the plotted time interval.

Change the X-axis width for time-series and spectrogram PNG plots (NEW default=3). **NEW**

Change the Y-axis height for time-series and spectrogram plots (NEW default=2). **NEW**

Autoscale time axis (useful for finding discrete bursts/events). **NEW**

Combine all time-series and spectrogram plots, for all requested datasets, into one plot file.

Plot overlay options.

Overlay vector components of selected variables.

Overlay selected variables or variable components that are identical among the datasets chosen  
(Supported constellations: MMS, Van Allen Probes (RBSP), THEMIS, Cluster, and GOES).

List Data (ASCII/CSV): select one or more variables from list below and press submit. (Works best for < 31 days)

Download original files : press submit button to retrieve list of files. (Max. 200 days - use [HTTPS site](#) for larger requests)

Create V3.9 CDFs for download: select one or more variables from the list below and press submit. **NEW**

Create audio files based on data from selected variables. [More information about audification.](#)

Note: CDF patch required for reading Version 3.9 CDFs in IDL or MATLAB.  
Get CDFX - IDL GUI plotting/listing toolkit software. To be used with either the daily or "created" CDF files available above.

Pressing the "Submit" button will spawn a new window/tab in order to support the new "Previous" and "Next" functions.

Submit Reset

# How to Use CDAWeb (3-2)

- Select data parameters.
  - For **THD\_L2\_ESA**:  
Select “**Ion Velocity Vector in GSM**” under “**ESA Reduced Mode, Ion Moment**”.
  - For **THD\_L2\_FGM**:  
Select “**FGS (spin-resolution/~3 sec) magnetic field B in XYZ GSM coordinates**” under “**FGM-FGS Data**”.
- Click the “**Submit**” button at the top or the bottom.

**THD\_L2\_FGM: Info Metadata**

Spacecraft-collected fluxgate magnetometer, Decimated TeleMetry High, DSL, GSE and GSM coordinates - V. Angelopoulos, U. Auster & K.H. Glassmeier and W. Baumjohann (UCB, TUBS and IWF respectively, NASA NAS5-02099)

Available dates: 2007/02/23 00:00:00 - 2022/07/20 00:00:00  
(Continuous coverage not guaranteed - check the [inventory\\_graph](#) for coverage)

- FGM-FGS Data Quality (0: Good data, 1:boom not deployed, 2:in shadow, 3:uncorrected shadow, 4:noisy waveforms)
- (Good data only) FGS magnetic field B magnitude
- FGS (spin-resolution/~3 sec) magnetic field B in XYZ GSE Coordinates
- FGS (spin-resolution/~3 sec) magnetic field B in XYZ GSM Coordinates
- FGS magnetic field B in DSL (Despun Spacecraft) Coordinates
- (All Qualities data) FGS magnetic field B magnitude
- FGS (spin-resolution/~3 sec) magnetic field B in XYZ GSE Coordinates
- FGS magnetic field B in XYZ GSM Coordinates
- FGS magnetic field B in XYZ DSL (Despun Spacecraft) Coordinates
- FGM-FGL Data Quality (0: Good data, 1:boom not deployed, 2:in shadow, 3:uncorrected shadow, 4:noisy waveforms)
- (Good data only) FGL magnetic field B magnitude
- FGL (low-resolution/~0.25 sec) magnetic field B in XYZ GSE Coordinates
- FGL (low-resolution/~0.25 sec) magnetic field B in XYZ GSM Coordinates

**THD\_L2\_ESA: Info Metadata**

THEMIS-D (P3): Electrostatic Analyzer (ESA): Electron/Ion Ground-Calculated Energy Fluxes (ions: 5 eV to 25 keV) electrons: 6 eV to 30 keV) and Moments (density, velocity, pressure, and temperature). Includes FULL, REDUCED and BURST modes. FULL: high angular resolution, low (few min) time resolution. REDUCED: degraded angular resolution, high (approx. 3 sec) time resolution. BURST: high angular resolution, high time resolution; only short bursts of data. Note that angular resolution affects moments since they are obtained integrating over the mode-specific angular distribution. - V. Angelopoulos, C.W. Carlson & J. McFadden (UCB, NASA NAS5-02099)


Available dates: 2007/03/07 00:00:00 - 2022/07/20 00:00:00  
(Continuous coverage not guaranteed - check the [inventory\\_graph](#) for coverage)

- ESA Full Mode Ion Moment Data Quality (0: Good data, non-zero: Data may not be suitable, see: [http://themis.ssl.berkeley.edu/esa\\_flag.shtml](http://themis.ssl.berkeley.edu/esa_flag.shtml).)
- (Good data only) ESA Full (High Angular Resolution, few minute time res.) Mode, Ion Density
- Ion Average Temperature
- Ion Thermal Velocity
- SC Potential (Same time array as Full Ion ESA data)
- Ion Energy Flux spectrogram w/
- Ion Diagonalized Temperature (Tprp1, Tprp2, Tpar)
- Temperature, Field Aligned (TprpFA1, TprpFA2, TparFA)
- Ion Pressure Tensor
- Ion Momentum Flux Tensor
- Ion Particle Flux Vector *lv* Quality
- Ion Symmetry Vector (direction of pressure tensor symmetry (DSL))
- Ion Symmetry Angle (between symmetry direction and B)
- Magnetic Field Vector in DSL (Same time array as Full Ion ESA data)
- Ion Velocity Vector in DSL
- Ion Velocity Vector in GSE
- Ion Velocity Vector in GSM
- ESA Full Mode, Electron Moment Data Quality (0: Good data, non-zero: Data may not be suitable, see: [http://themis.ssl.berkeley.edu/esa\\_flag.shtml](http://themis.ssl.berkeley.edu/esa_flag.shtml).)
- (Good data only) ESA Full (High Angular Resolution, few minute time res.) Mode, Electron Density
- Electron Average Temperature
- Electron Thermal Velocity
- SC Potential (Same time array as Full Electron ESA data)
- Electron Energy Flux spectrogram
- Electron Diagonalized Temperature (Tprp1, Tprp2, Tpar)
- Electron Temperature, Field Aligned (Tprp1FA, Tprp2FA, TparFA)
- Electron Pressure Tensor
- Electron Momentum Flux Tensor
- Electron Particle Flux Vector
- Electron Symmetry Vector (direction of pressure tensor symmetry (DSL))
- Electron Symmetry Angle (between symmetry direction and B)
- Magnetic Field Vector in DSL (Same time array as Full Electron ESA data)
- Electron Velocity Vector in DSL
- Electron Velocity Vector in GSE
- Electron Velocity Vector in GSM
- ESA Reduced Mode, Ion Moment Data Quality (0: Good data, non-zero: Data may not be suitable, see: [http://themis.ssl.berkeley.edu/esa\\_flag.shtml](http://themis.ssl.berkeley.edu/esa_flag.shtml).)
- (Good data only) ESA Reduced (Low Angular Res., 3-s Time Res.) Mode, Ion Density
- Ion Average Temperature
- Ion Thermal Velocity
- SC Potential (Same time array as Reduced Ion ESA data)
- Ion Energy Flux spectrogram
- Ion Diagonalized Temperature (Tprp1, Tprp2, Tpar)
- Temperature, Field Aligned (Tprp1FA, Tprp2FA, TparFA)
- Ion Pressure Tensor
- Ion Momentum Flux Tensor
- Ion Particle Flux Vector
- Ion Symmetry Vector (direction of pressure tensor symmetry (DSL))
- Ion Symmetry Angle (between symmetry direction and B)
- Magnetic Field Vector in DSL (Same time array as Reduced Ion ESA data)
- Ion Velocity Vector in DSL
- Ion Velocity Vector in GSE
- Ion Velocity Vector in GSM
- ESA Reduced Mode, Electron Moment Data Quality (0: Good data, non-zero: Data may not be suitable, see: [http://themis.ssl.berkeley.edu/esa\\_flag.shtml](http://themis.ssl.berkeley.edu/esa_flag.shtml).)
- (Good data only) ESA Reduced (Low Angular Res., 3-s Time Res.) Mode, Electron Density
- Electron Average Temperature
- Electron Thermal Velocity



# How to Use CDAWeb (4)

## (4) Plot.




**GODDARD SPACE FLIGHT CENTER**  
Space Physics Data Facility

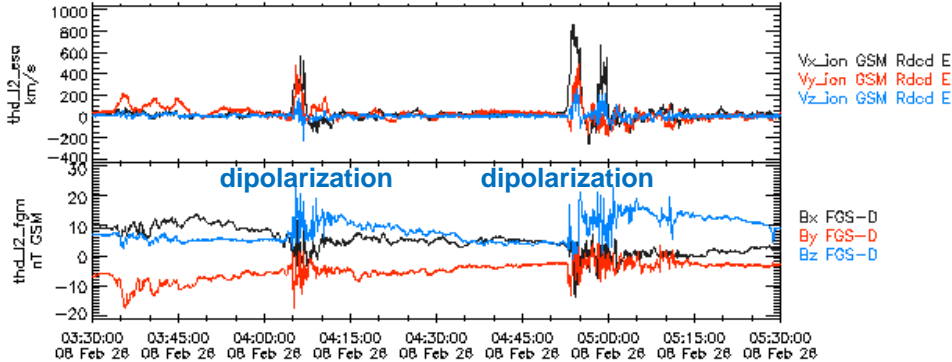
+ Goddard Home  
+ NASA Home

+ SPDF HOME   + MISSION DATA   + MODELS at CCMC   + SCIENCE ENABLED   + AND MORE

+ CDAWeb Home  
**CDAWeb**  
+ FEEDBACK



Multiple datasets being plotted; refer to labels on either side of plot.



thd\_L12\_esa  
km/s

Vx\_Ion GSM Rded E  
Vy\_Ion GSM Rded E  
Vz\_Ion GSM Rded E

thd\_L12\_fgm  
nT GSM

Bx\_FGS-D  
By\_FGS-D  
Bz\_FGS-D

03:30:00 03:45:00 04:00:00 04:15:00 04:30:00 04:45:00 05:00:00 05:15:00 05:30:00  
08 Feb 28 08 Feb 28 08 Feb 28 08 Feb 28 08 Feb 28 08 Feb 28 08 Feb 28 08 Feb 28 08 Feb 28

TIME RANGE=2008/2/26 (57) to 2008/2/26 (57)

Please acknowledge PI(s), V. Angelopoulos, C.W. Carlson & J. McFadden at UCB, NASA NASS-02099 and V. Angelopoulos, U. Auster & K.H. Glassmeier and W. Baumjohann at UCB, TUBS and IWF respectively, NASA NASS-02099 and CDAWeb when using these data.  
Generated by CDAWeb on Wed Jul 20 13:33:40 2022


<< Previous time range   Next time range >> **NEW**

>> Zoom IN time range <<   << Zoom OUT time range >> **NEW**

< Pan left   Pan right > **NEW**

Return to: CDAWeb Data Explorer **NEW**

[notes and caveats](#)



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# ■ NASA SSCWeb

- Satellite Situation Center
- <https://sscweb.gsfc.nasa.gov>
- Orbit data of many spacecraft (definitive and predictive)
- Can make plots on demand and also download data.
- Can combine different spacecraft and specify a period flexibly.
- More options than CDAWeb

**SSCWeb**

- + SSCWEB HOME
- + FEEDBACK
- + LOCATOR GRAPHICS
- + 4-D ORBIT VIEWER
- + LOCATOR TABULAR
- + QUERY
- + COORD. CALCULATOR
- + ABOUT SSCWEB

Important Cluster Ephemeris Changes  
+ Download pdf

Guides and Tutorials  
+ Users Guide  
+ Navigation Tips  
+ Models and Regions of Geospace  
+ Query Tutorial  
+ Locator Tutorial

Additional Services  
+ Web Service Access to SSCWeb  
+ Heliospheric spacecraft, planet and comet trajectories  
+ Space Physics models at CCMC  
+ IGRF/DGRF and CGM coordinate transformations  
+ Products and information  
+ Data Format Translations

Additional Resources  
+ Usage Statistics  
+ Key parameter and orbit plots produced by the THEMIS & PWG projects  
+ JPL NAIF provided observation geometry computations: WebGeoCalc

**SATELLITE SITUATION CENTER (SSCWeb) SYSTEM AND SERVICES**

SPDF News & Announcements

**NOTICE: September 30 2021: The SPDF websites use Let's Encrypt for our web site HTTPS certification. One of the Let's Encrypt root certificates (DST Root CA X3) expired on Sept. 30, 2021. You may find that some web tools report that our SSL certificates cannot be verified. If so, please update those tools to support the latest root certificates, and to use OpenSSL 1.1.0 or later. This includes updating the root certificates used by curl and wget, and IDL (IDL 8.7.1 and 8.8's ca-bundle.crt work). Compatible software package versions are listed at <https://letsencrypt.org/docs/certificate-compatibility/>.**

**NOTICE: February, 2021: To reach SPDF support services staff please use our new email address: [NASA-SPDF-Support@nasa.onmicrosoft.com](mailto:NASA-SPDF-Support@nasa.onmicrosoft.com) (for help with CDAWeb, SSCWeb, SPDF Web Services and OMNIWeb). To reach CDF support staff please use our new email address: [NASA-CDF-Support@nasa.onmicrosoft.com](mailto:NASA-CDF-Support@nasa.onmicrosoft.com).**

**Database Contents**

- + Spacecraft Availability & Time Ranges

**Graphics**

- + Locator Graphics  
The Locator graphics component provides the ability to plot the orbits of multiple spacecraft. In addition to orbit plots, mapped and time series plots can also be generated. (THEMIS Saved Examples)
- + 4-D Orbit Viewer  
This application provides the user with the capability to select spacecraft(s) and time ranges of interest, and see their orbits represented as an interactive 4-D animation.

**Listings**

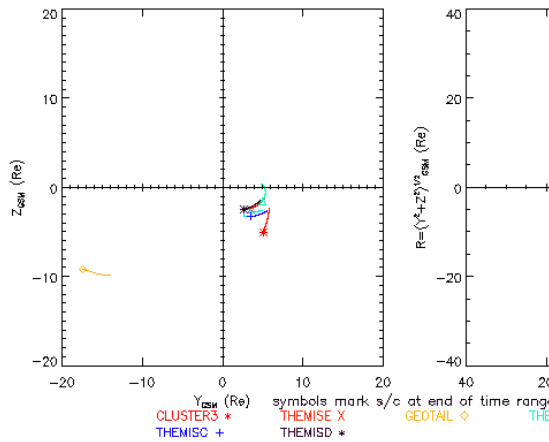
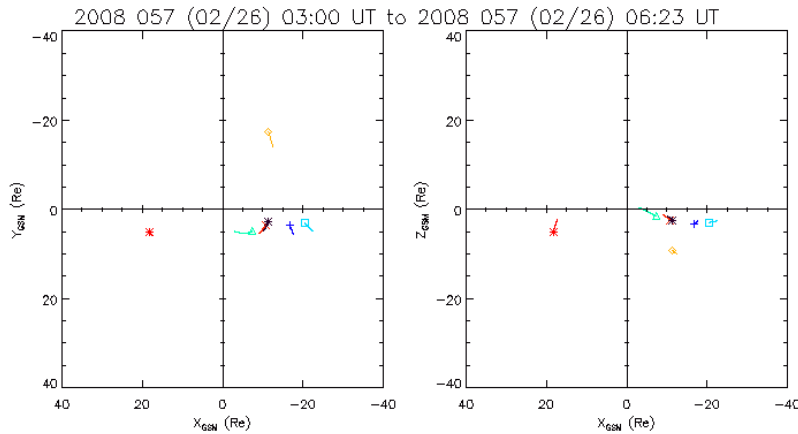
- + Locator Tabular  
The Locator component provides tabular information. As tabular output, the spacecraft's coordinate location can be listed in a variety of coordinate systems, as well as other location related items. (THEMIS Saved Examples)
- + Query  
The Query component provides two query matching options: magnetospheric region occupancy and magnetic field line tracing. The region query lists the entry and exit times during which specified satellite(s) were in particular magnetospheric regions. The trace query identifies periods when one or more spacecraft are on the same magnetic flux tube of force, or periods when one or more spacecraft occupy a field line which traces down to a specified ground station. (THEMIS Saved Examples)
- + Coordinate Calculator

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Locator Graphics  
(on demand on browsers)

SSC 4D Orbit Viewer  
(Java-based software)



Generated by SSCweb on: Thu Jul 21 01:01:26 2022

**Satellite Chooser**

central bodies: EARTH  
 coordinates: GSM

fr: 2008-02-26 03:00  
 to: 2008-02-26 06:00

Field-Line Tracing:  
 Enabled to (km)  
 Not Enabled

Position: 2008-02-26 04:00:00

coordinate system: GSM

coordinates (RE/...):  
 Cartesian  
 Spherical

distance to (RE):  
 Magnetopause  
 Bowshock  
 Neutral Sheet

footpoints (°):  
 North  
 South  
 Closest

Satellite	Color	X	Y	Z
Cluster-3 (FM7/Samba)	Green	17.622	5.69	-3.131
Geotail	Brown	-12.238	-15.008	-9.807
THEMIS-A (P5)	Purple	-4.475	5.27	-0.159
THEMIS-B (P1)	Pink	-21.924	4.344	-2.718
THEMIS-C (P2)	Red	-17.352	5.023	-2.876
THEMIS-D (P3)	Blue	-10.606	4.204	-1.837
THEMIS-E (P4)	Cyan	-9.756	4.676	-1.604

Capture Positions (R...)

Color: Neu...  
 Opacity: [Slider]  
 B Field Model Parameters  
 SWP (nP): 2.04  
 Display Model Parameters

File Options Tools Help

time: 2008-02-26 04:00:00 speed: 10

Projection:  parallel  perspective Views:  xyView  yzView  xzView

Thickness: Symbol [Dropdown] 100 [Slider]

Axis Span (RE): 10 [Slider] 1000 [Slider] 100 [Slider] 10 [Slider] 1 [Slider]

Major Ticks: 2 [Slider] 100 [Slider] 10 [Slider] 1 [Slider]

Key: --- X --- Y --- Z

Location Info:  
 Orbits  Earth  Axis  Labels  Planar Views  Animation Bar  
 Magnetopause  Bowshock  Neutral Sheet  xy Plane  zy Plane  xz Plane  
 Footpoints North  Footpoints South  Footpoints Closest  Geographic Grid  Ground Stations  Sunlight

# IUGONET Type-A

- Inter-university Upper atmosphere Global Observation NETwork (<http://search.iugonet.org>)
- Tanaka et al. (2022, doi:10.1002/gdj3.170)
- Various kinds of ground-based instrument all over the world related to Japanese projects
- Display QL plots, make plots on demand, and also download data.

The screenshot displays the IUGONET Web Service interface. At the top, it features the logo 'IUGONET Web Service' and 'Type-A' with a stylized 'A' graphic. Below the logo, there is a navigation bar with 'UDAS web Available!' and links for 'Rules of the Road' and 'About Type-A'. The main content area is titled 'IUGONET DataSet' and includes a search form with a 'LIST' and 'MAP' button. The search form contains a table with columns for 'Instrument Type', 'Observed Region', and 'ERG Campaign'. Below the table, there are search criteria fields for 'Satellite', 'Ground-Based', 'Keyword', and 'Timespan'. The 'Ground-Based' section is expanded, showing a list of instrument types with checkboxes. The 'Search Results' section at the bottom indicates that the search was successful and provides options for displaying the results as a plot or movie.

**IUGONET Web Service**  
Upper Atmosphere xIDL x Web Technology  
**Type-A**

Inter-University Upper Atmosphere Global Observation NETWORK

UDAS web Available! | Rules of the Road | About Type-A

### IUGONET DataSet

[LIST](#) [MAP](#)

Instrument Type	Observed Region	ERG Campaign
<input type="checkbox"/> SMART (Telescope)	<input type="checkbox"/> DST (Telescope)	<input type="checkbox"/> FMT (Telescope)
<input checked="" type="checkbox"/> Geomagnetic Indices	<input type="checkbox"/> Magnetometer	<input type="checkbox"/> WDC Geomag., Kyoto
<input type="checkbox"/> Geomag., Kakioka	<input type="checkbox"/> MM210	<input type="checkbox"/> AWS
<input type="checkbox"/> EA Radar	<input type="checkbox"/> LT Radar	<input type="checkbox"/> MU Radar
<input type="checkbox"/> MW Radar	<input type="checkbox"/> WP Radar	<input type="checkbox"/> X-Band Radar
<input type="checkbox"/> GPS Receiver	<input type="checkbox"/> Na-Lidar	<input type="checkbox"/> EISCAT
<input type="checkbox"/> VHF Radar	<input type="checkbox"/> VLF/ELF	<input type="checkbox"/> Ionosonde
<input type="checkbox"/> Others		

Satellite:  
 AKEBONO  CHAMP  COSMIC

Ground-Based:  
 Refractor (Telescope)  Muon (Telescope)  
 Induction  MAGDAS  
 All Sky Imager  BL Radar  
 MF Radar  PWING/Psa  
 Ceilometer  Riometer  
 OMTI  SuperDARN  
 Radiosonde  BL/LT/WP Radar

Keyword:

Timespan: 2008/02/26 To 2008/02/26 [Set Detail](#)

Search Results:  Contains Summary Plot,  Create Plot (Select one or more variables from list below and press 'Plot')

[Text](#)  [Prev](#) Numerical: 2008/02/20 00:00:00 - 2008/02/27 00:00:00, Plot/Movie: 2008/02/26, Timespan: 1 3 7 [Next](#)>

**Ground-Based**

# How to Use IUGONET Type-A (1)

One instrument can be selected from the MAP.

The screenshot displays the IUGONET Web Service Type-A interface. At the top, it features the logo and text: "IUGONET Web Service Upper Atmosphere xIDL x Web Technology Type-A" and "Inter-University Upper Atmosphere Global Observation NETWORK". Below this, there are navigation links: "UDAS web Available!", "Rules of the Road", and "About Type-A".

The main content area is titled "Observatories" and contains a sidebar on the left with a list of instruments under the heading "INST./PROJECT". The list includes:

- All (Close Panel)
- Satellite
  - ✓ AKEBONO
  - ✓ CHAMP
  - ✓ COSMIC
- Ground-Based
  - ✓ SMART (Telescope)
  - ✓ DST (Telescope)
  - ✓ FMT (Telescope)
  - ✓ Refractor (Telescope)
  - ✓ Muon (Telescope)
  - ✓ Geomagnetic Indices
  - ✓ Magnetometer
  - ✓ WDC Geomag., Kyoto
  - ✓ Induction
  - ✓ MAGDAS
  - ✓ Geomag., Kakioka
  - ✓ MM210
  - ✓ AWS
  - ✓ All Sky Imager
  - ✓ BL Radar
  - ✓ EA Radar
  - ✓ LA Radar
  - ✓ MU Radar
  - ✓ MF Radar
  - ✓ PWING/PsA
  - ✓ MW Radar
  - ✓ WP Radar
  - ✓ X-Band Radar

The main map area shows a satellite view of Southeast Asia, including Myanmar (Burma), Laos, Thailand, Cambodia, and Vietnam. Various cities and regions are labeled, such as Chiang Mai, Vientiane, Bangkok, and Ho Chi Minh City. A pink flower icon is placed over Chiang Mai, and a purple flower icon is placed over Saraburi. A sidebar on the right of the map includes a "LIST" button, a "MAP" button (highlighted in red), and a "Map/Satellite" toggle. Below the toggle are zoom controls (+, -) and a person icon. At the bottom of the map, there is a scale bar (100 km) and a "Terms of Use" link.

At the bottom of the interface, it states: "All Rights Reserved. Copyright (c) 2009-2022 IUGONET".

OMTI Fabry-Perot interferometer wind data at Chiang Mai and AVON/VLF-B Tweek data at Saraburi are also registered.

# ■ How to Use IUGONET Type-A (2-1)

To search for data and show QL plots

- (1) Select instruments and specify a time span.
- (2) Click the “Search” button.
- (3) Click the “Plot” button to show QL plots.

The screenshot displays the IUGONET Web Service interface. At the top, there is a header with the IUGONET logo and the text "IUGONET Web Service Upper Atmosphere x/IDL x Web Technology" and "Inter-University Upper Atmosphere Global Observation NETWork". Below the header, there are navigation links: "UDAS web Available!" and "Rules of the Road | About Type-A |".

The main content area is titled "IUGONET DataSet" and features a "LIST" button and a "MAP" button. Below this, there is a table with three columns: "Instrument Type", "Observed Region", and "ERG Campaign".

The "Instrument Type" section is divided into "Satellite" and "Ground-Based". Under "Ground-Based", several instruments are listed with checkboxes. The following instruments are checked:

- Geomagnetic Indices
- Induction
- All Sky Imager
- SuperDARN

The "Observed Region" and "ERG Campaign" sections are currently empty.

Below the instrument list, there is a "Keyword:" field and a "Timespan:" field. The "Timespan:" field is set to "2008/02/26" to "2008/02/26". A "Search" button is located below the "Timespan:" field.

At the bottom of the interface, there is a "Search Results:" section. It includes a "Text" button and a "Plot" button. The "Plot" button is highlighted. Below the "Plot" button, there is a "Ground-Based" section.

Red boxes and numbers (1), (2), and (3) are overlaid on the screenshot to indicate the steps described in the text:

- (1) Points to the "Geomagnetic Indices" checkbox.
- (2) Points to the "Search" button.
- (3) Points to the "Plot" button.

# How to Use IUGONET Type-A (2-2)

IUGONET Web Service  
Upper Atmosphere Global Observation Network

UDAS web Available! | Rules of the Road | About Type-A

### IUGONET DataSet

**Instrument Type** | **Observed Region** | **ERG Campaign** | **LIST** | **MAP**

Satellite:  AKEBONO  CHAMP  COSMIC

Ground-Based:

SMART (Telescope)  DST (Telescope)  FMT (Telescope)  Refractor (Telescope)  Muon (Telescope)

Geomagnetic Indices  Magnetometer  WDC Geomag., Kyoto  Induction  MAGDAS

Geomag., Kakioka  MM210  AWS  All Sky Imager  BL Radar

EA Radar  LT Radar  MU Radar  MF Radar  PWiNG/PsA

MW Radar  WP Radar  X-Band Radar  Cellometer  Riometer

GPS Receiver  Na-Lidar  EISCAT  QMTI  SuperDARN

VHF Radar  VLF/ELF  Ionosonde  Radiosonde  BL/LT/WP Radar

Others

Keyword: \_\_\_\_\_

Timespan: 2008/02/26 To 2008/02/26 Set Detail

**(5)**

Search Results:  Contains Summary Plot,  Create Plot (Select one or more variables from list below and press 'Plot') **Plot**

Numerical: 2008/02/20 00:00:00 - 2008/02/27 00:00:00, Plot/Movie: 2008/02/26, Timespan: 1 3 7

#### Ground-Based

##### Geomagnetic Indices

**(4)**  Numerical Data Geomagnetic Auroral Electrojet Index Provisional AE

Numerical Data Geomagnetic Equatorial Dist Index

Numerical Data Mit-latitude Geomagnetic Indices ASY and SYM

##### Induction

Numerical Data CDF data of magnetic field measured at 0.5-sec intervals with the induction magnetometer at Aedeu, Iceland

Numerical Data CDF data of magnetic field measured at 0.5-sec intervals with the induction magnetometer at Husafell, Iceland

Numerical Data CDF data of magnetic field measured at 0.5-sec intervals with the induction magnetometer at Tjornes, Iceland

Numerical Data CDF data of magnetic field measured at 20Hz intervals with the induction magnetometer at Syowa Station, Antarctica

To make a plot for a specified period

**(4) Check data of interest under the QL plots.**

**(5) Click the “plot” button.**

#### All Sky Imager

#### SuperDARN

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# How to Use IUGONET Type-A (2-3)

To make a plot for a specified period

(6) Specify a time span.

(7) Select parameters.

(8) Click the “Plot” button to make a plot.

IUGONET Web Service  
Upper Atmosphere Research & Data, & Web Technology  
Type-A  
UDAS web Available!

**UDAS web**  
To create plot, choose variables and press "Plot" button. To download ASCII files, press "Download ASCII" button.

**Step.1: Set Time Span (less than 10 days)**  
(6) From: 2008 02 26 03 00 00  
To: 2008 02 26 06 00 00

**Step.2: Choose Variables to Plot**  
 Check/Clear All  
Numerical Data CDF data of magnetic field measured at 0.5-sec intervals with the induction magnetometer at Aedey, Iceland.  
Download ASCII  
 nipr\_imag\_aed\_02hz\_x (North-South magnetic variation at Aedey)  
 nipr\_imag\_aed\_02hz\_y (East-West magnetic variation at Aedey)  
 nipr\_imag\_aed\_02hz\_z (Vertical magnetic variation at Aedey)  
(7)  nipr\_imag\_aed\_02hz\_x\_dpwrspc (Dynamic power spectrum of North-South magnetic variation at Aedey)  
 nipr\_imag\_aed\_02hz\_y\_dpwrspc (Dynamic power spectrum of East-West magnetic variation at Aedey)  
 nipr\_imag\_aed\_02hz\_z\_dpwrspc (Dynamic power spectrum of Vertical magnetic variation at Aedey)  
Numerical Data Geomagnetic Auroral Electrojet Index Provisional AE  
 wdc\_mag\_ae\_prov\_1min\_0 (Geomagnetic Auroral Electrojet (AE) index ( $AE = |AU - AL|$ ))  
 wdc\_mag\_ae\_prov\_1min\_1 (Amplitude of Upper envelope (AU))  
 wdc\_mag\_ae\_prov\_1min\_2 (Amplitude of Lower envelope (AL))  
 wdc\_mag\_ae\_prov\_1min\_3 (Average value of the AU and AL induces ( $AO = (AU + AL)/2$ ))  
 wdc\_mag\_ae\_prov\_1min\_4 (AX index)

**Step.3: Set Options**  
 Plot as a Postscript File.  
\* At Least, one variable should be chosen.  
\* Each observation data has terms of use. Read it again before using it.

Plot (8)

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**Step.3: Set Options**  
 Plot as a Postscript File.  
\* At Least, one variable should be chosen.  
\* Each observation data has terms of use. Read it again before using it.

Plot

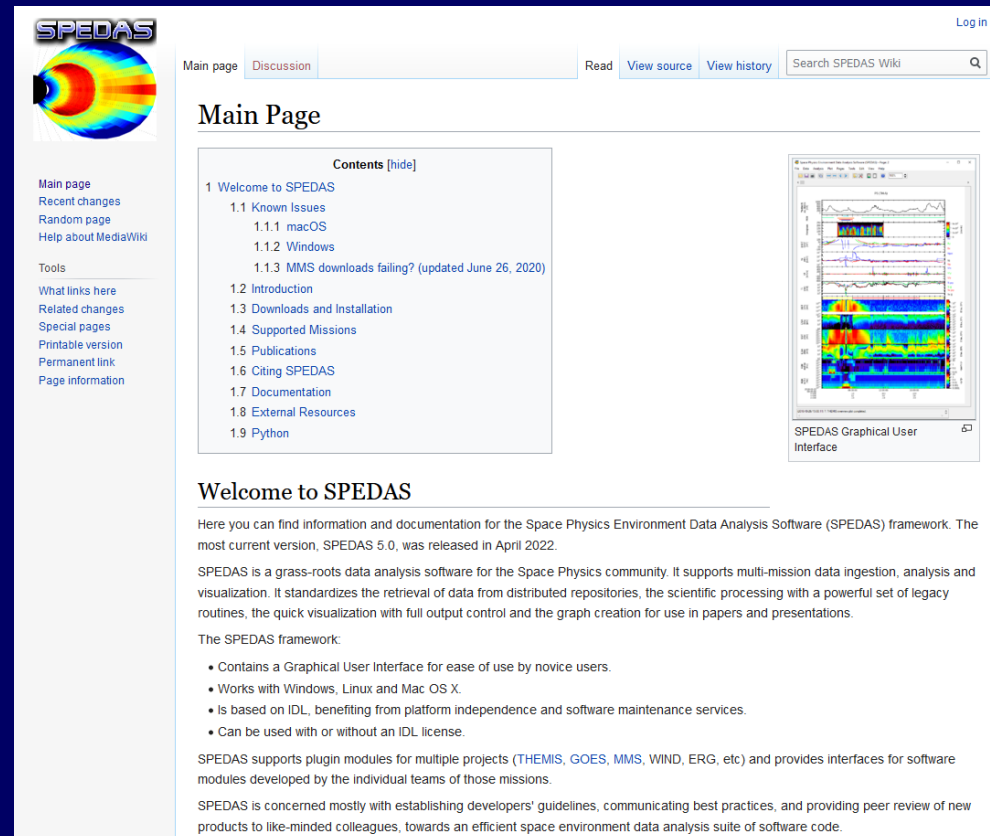
The plot displays four vertically stacked panels sharing a common x-axis representing time from 0300 to 0600 on February 26, 2008. The top panel is a spectrogram showing the power spectrum of the magnetic field, with a color scale on the right ranging from  $10^0$  to  $10^2$   $(\mu V^2/Hz)$ . The second panel shows the AE index (AE) in units of  $10^3$  nT, with a scale from 0 to 100. The third panel shows the amplitude of the upper envelope (AU) in units of  $10^3$  nT, with a scale from 0 to 45. The bottom panel shows the amplitude of the lower envelope (AL) in units of  $10^3$  nT, with a scale from -60 to 0. Two red arrows point to substorm events in the AE, AU, and AL panels, labeled "substorm".

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# ■ SPEDAS

- Space Physics Environment Data Analysis Software
- <http://spedas.org/wiki>
- Angelopoulos et al. (2019, doi:10.1007/s11214-018-0576-4)
- For advanced serious analysis of various spacecraft and ground-based data
- Works with Windows, Linux and Mac OS X.
- Written in **IDL** and **Python**
  - - Customized analysis and plot
  - Incorporate your own data into SPEDAS
- IDL executable is available without license.



The screenshot shows the SPEDAS Wiki Main Page. At the top left is the SPEDAS logo, a stylized sun or planet with a rainbow-like ring. Below the logo are navigation links: Main page, Recent changes, Random page, Help about MediaWiki, Tools, What links here, Related changes, Special pages, Printable version, Permanent link, and Page information. The main content area has a 'Main Page' heading and a 'Contents [hide]' section with a list of links: 1 Welcome to SPEDAS, 1.1 Known Issues (with sub-links for 1.1.1 macOS, 1.1.2 Windows, and 1.1.3 MMS downloads failing? (updated June 26, 2020)), 1.2 Introduction, 1.3 Downloads and Installation, 1.4 Supported Missions, 1.5 Publications, 1.6 Citing SPEDAS, 1.7 Documentation, 1.8 External Resources, and 1.9 Python. To the right of the contents is a thumbnail image of the SPEDAS Graphical User Interface, showing a complex data visualization with multiple panels and plots. Below the thumbnail is the caption 'SPEDAS Graphical User Interface'. At the bottom of the page is a 'Welcome to SPEDAS' section with introductory text and a list of features.

**SPEDAS**

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## Main Page

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    - 1.1.2 Windows
    - 1.1.3 MMS downloads failing? (updated June 26, 2020)
  - 1.2 Introduction
  - 1.3 Downloads and Installation
  - 1.4 Supported Missions
  - 1.5 Publications
  - 1.6 Citing SPEDAS
  - 1.7 Documentation
  - 1.8 External Resources
  - 1.9 Python

SPEDAS Graphical User Interface

### Welcome to SPEDAS

Here you can find information and documentation for the Space Physics Environment Data Analysis Software (SPEDAS) framework. The most current version, SPEDAS 5.0, was released in April 2022.

SPEDAS is a grass-roots data analysis software for the Space Physics community. It supports multi-mission data ingestion, analysis and visualization. It standardizes the retrieval of data from distributed repositories, the scientific processing with a powerful set of legacy routines, the quick visualization with full output control and the graph creation for use in papers and presentations.

The SPEDAS framework:

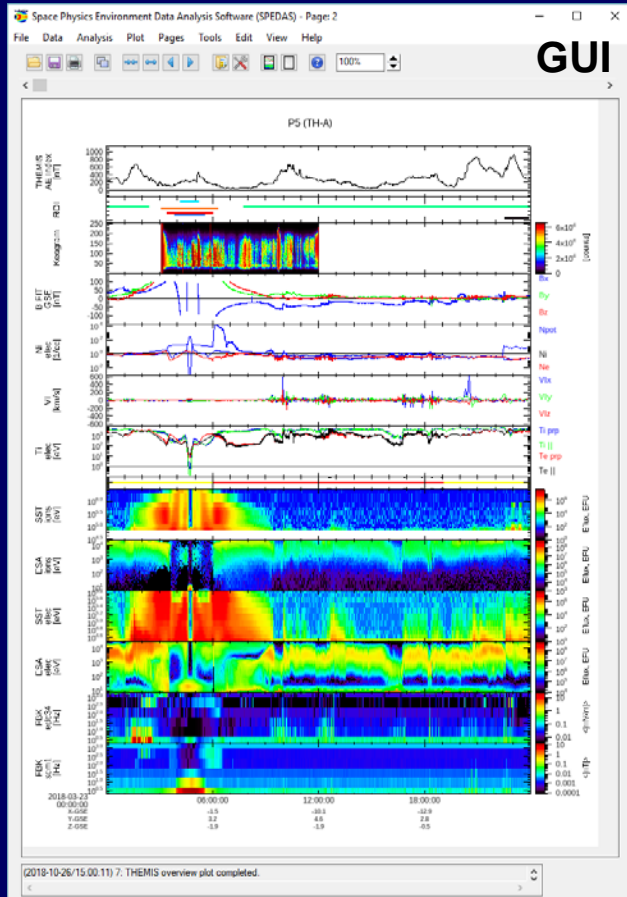
- Contains a Graphical User Interface for ease of use by novice users.
- Works with Windows, Linux and Mac OS X.
- Is based on IDL, benefiting from platform independence and software maintenance services.
- Can be used with or without an IDL license.

SPEDAS supports plugin modules for multiple projects (THEMIS, GOES, MMS, WIND, ERG, etc) and provides interfaces for software modules developed by the individual teams of those missions.

SPEDAS is concerned mostly with establishing developers' guidelines, communicating best practices, and providing peer review of new products to like-minded colleagues, towards an efficient space environment data analysis suite of software code.

# ■ How to Use SPEDAS

- Works in **graphical user interface** and **command line**.



**GUI**

## MMS data analysis using SPEDAS: an introduction

This video shows a step-by-step introduction on how to use SPEDAS to make a simple plot:

<http://www.youtube.com/watch?v=390FguKn7w4>

This is the script that can be run in IDL:

```
pro test_mms1

mms_init

; Select a time range
trange = ['2015-09-01/21:15', '2015-09-01/21:25']

; Select a probe
probe = 1

; Load FGM data
mms_load_fgm, probe=probe, trange=trange,
level='12'

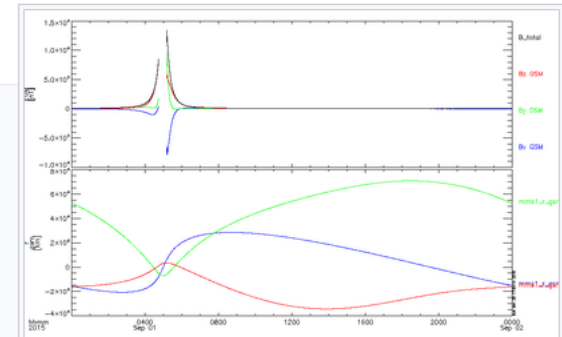
; Load position data
mms_load_mec, probe=probe, trange=trange, level='12'

; Select quantities to plot
vars = ['mms1_fgm_b_gsm_srvy_12', 'mms1_mec_r_gsm']

; Plot data
tplot, vars

end
```

**Command line**



Screenshot of example test\_mms1

**Download and plot data  
by only a few commands.**

- A lot of manuals can be found at the website and in the SPEDAS source code files.