Software developers: Chiu Wiegand (lead), Rick Mullinix

https://ccmc.gsfc.nasa.gov/donki/

Feedback and suggestions are welcome!

Email: chiu.wiegand@nasa.gov, m.leila.mays@nasa.gov
CCMC Tools and Services

Run-On-Request System
Usage Statistics [charts | tables]

integrated Space Weather Analysis (iSWA) system

Space Weather Database Of Notifications, Knowledge, Information (DONKI)

Comprehensive Assessment of Models and Events using Library Tools (CAMEL) Framework

SWPC CME Analysis Tool Web Version (SWPC_CAT_Web)

Stereo CME Analysis Tool (StereoCat)

Flare Scoreboard

CME Arrival Time Scoreboard

SEP Scoreboard

Kamodo (Open Source Project)

Kameleon Software Suite

EEGGL tool: Eruptive Event Generator (Gibson and Low)
DONKI

Database of Notifications, Knowledge, and Information

• Catalog of space weather phenomena.
• Chronicles the daily interpretations of space weather observations, simulation results, forecasting analysis, and notifications.
• Key component of the forecaster tool suite, developed to address space weather needs of NASA missions.
• Online tool for dissemination of forecasts, notifications, and archiving event-focused information
• Intelligent linkages, relationships, cause-and-effects between space weather activities
• Comprehensive search functionality to support anomaly resolution and space science research:
  • Space weather activity archive (flares, CME parameters and simulation results, SEPs, geomagnetic storms, radiation belt enhancements) with links between activities
  • GSFC space weather notification and weekly report archive
• Enables remote participation by students, world-wide partners, model and forecasting technique developers

https://ccmc.gsfc.nasa.gov/donki/
Click here to get started searching the database by space weather activity type and date.

Choose event type:
- Solar Energetic Particle
- Coronal Mass Ejection
- Interplanetary Shock
- Magnetopause Crossing
- Geomagnetic Storm
- Radiation Belt Enhancement
- High Speed Stream
- WSA-ENLIL+Cone Model

Select start and end date for search.

For example, Solar Energetic Particle (SEP), to see all SEP events above threshold values.
For example, Solar Energetic Particle (SEP), lists all SEP events above threshold values at various locations.

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Activity ID</th>
<th>SEP Event Time</th>
<th>Associated Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Energetic Particle</td>
<td>2013-05-13T04:12:00-SEP-001</td>
<td>2013-05-13T04:12Z</td>
<td>STEREO B: IMPACT 13-100 MeV</td>
</tr>
<tr>
<td>Solar Energetic Particle</td>
<td>2013-05-13T18:02:00-SEP-001</td>
<td>2013-05-13T18:02Z</td>
<td>STEREO B: IMPACT 13-100 MeV</td>
</tr>
</tbody>
</table>

All columns are sortable! (click column headings)
Search Space Weather Activity Archive

Space Weather Event Type:
Optional start date in format (e.g. 2013-01-31):
Optional end date in format (e.g. 2013-06-30):

For another example, select “WSA-ENLIL+Cone Model” to see all CME simulations in a certain date range.
Selecting “WSA-ENLIL+Cone Model” lists all CME simulations in a certain date range.

All columns are sortable! (click column headings)

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Model Completion Time</th>
<th>CME Input(s)</th>
<th>Predicted Earth Impact</th>
<th>Predicted Other Location(s) Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-03T09:33Z</td>
<td>• CME: 2013-05-02T14:36:00-CME-001(CME Analysis)</td>
<td>No or little impact to Earth.</td>
<td></td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-03T18:07Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001(CME Analysis)</td>
<td>No or little impact to Earth.</td>
<td>Spitzer: 2013-05-06T14:32Z</td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-04T13:52Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001(CME Analysis) • CME: 2013-05-03T22:36:00-CME-001(CME Analysis)</td>
<td>No or little impact to Earth.</td>
<td></td>
</tr>
</tbody>
</table>
### Shows impact prediction summary for each simulation

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Model Completion Time</th>
<th>CME Input(s)</th>
<th>Predicted Earth Impact</th>
<th>Predicted Other Location(s) Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-03T09:33Z</td>
<td>• CME: 2013-05-02T14:36:00-CME-001( CME Analysis )</td>
<td>No or little impact to Earth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-03T18:07Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001( CME Analysis )</td>
<td>No or little impact to Earth.</td>
<td>Spitzer: 2013-05-06T14:32Z</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>STEREO B: 2013-05-06T16:39Z</td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-04T12:48Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001( CME Analysis )</td>
<td>No or little impact to Earth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CME: 2013-05-03T22:36:00-CME-001( CME Analysis )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-04T13:52Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001( CME Analysis )</td>
<td>No or little impact to Earth.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CME: 2013-05-03T22:36:00-CME-001( CME Analysis )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Earth Shock Arrival Time = 2011-06-01T02:38Z
Duration of disturbance (hr) =
Minimum magnetopause standoff distance: $R_{min(Re)} = 6.6$
Possible Kp index:
$Kp90=1$
$Kp135=5$
Search Space Weather Activity Archive

Space Weather Event Type: WSA-ENLIL+Cone Model
Optional start date in format (e.g. 2013-01-31): 2013-05-03
Optional end date in format (e.g. 2013-06-30): 2013-05-31

Generate Report for WSA-ENLIL+Cone Inputs

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Model Completion Time</th>
<th>CME Input(s)</th>
<th>Predicted Earth Impact</th>
<th>Predicted Other Location(s) Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-03T09:33Z</td>
<td>• CME: 2013-05-02T14:56:00-CME-001( CME Analysis  )</td>
<td>No or little impact to Earth.</td>
<td></td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-03T18:00:07Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001( CME Analysis  )</td>
<td>No or little impact to Earth.</td>
<td>Spitzer: 2013-05-06T14:32Z</td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-04T12:48Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001( CME Analysis  )</td>
<td>No or little impact to Earth.</td>
<td>Spitzer: 2013-05-06T06:39Z</td>
</tr>
<tr>
<td>WSA-ENLIL+Cone</td>
<td>2013-05-04T13:52Z</td>
<td>• CME: 2013-05-03T18:00:00-CME-001( CME Analysis  )</td>
<td>No or little impact to Earth.</td>
<td>Spitzer: 2013-05-06T16:39Z</td>
</tr>
</tbody>
</table>

Earth Shock Arrival Time = 2011-06-01T02:38Z
Duration of disturbance (hr) =
Minimum magnetopause standoff distance:
Rmin(Re) = 6.6
Possible Kp index:
(kp)90=1
(kp)135=5
(kp)180=5
Full simulation results for the selected run:

WSA-ENLIL+Cone Model with Completion Time: 2013-05-04T12:48Z

Model Inputs:
2013-05-03T18:00:00-CME-001 with CME Analysis: Lon.=89.0, Lat.=18.0, Speed=760.0, HalfAngle=60.0, Time21.5=2013-05-03T22:30Z
2013-05-03T22:36:00-CME-001 with CME Analysis: Lon.=86.0, Lat.=18.0, Speed=520.0, HalfAngle=22.0, Time21.5=2013-05-04T05:37Z

Model Outputs:
Earth Impact:
No or little impact to Earth.

Other Location(s) Impact:
Spitzer with estimated shock arrival time 2013-05-06T06:39Z
STEREO B with estimated shock arrival time 2013-05-06T16:39Z

Timelines Link = http://iswa.gsfc.nasa.gov/downloads/20130503_223000_ENLIL_CONE_timeline.gif
DONKI also shows intelligent linkages, relationships, cause-and-effects between space weather activities.

For example, search for solar flares during May 2013, and click here for more information on the M5.0 flare.

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Activity ID</th>
<th>FLR Start Time</th>
<th>Associated Instrument</th>
<th>FLR Peak Time</th>
<th>FLR End Time</th>
<th>Class</th>
<th>Source Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Flare</td>
<td>2013-05-14T01:00:00-FLR-001</td>
<td>2013-05-14T01:00Z</td>
<td>GOES15: SEM/XRS 1.0-8.0</td>
<td>2013-05-14T01:11Z</td>
<td></td>
<td>X3.2</td>
<td>N10E89</td>
</tr>
</tbody>
</table>
More details and relationships for the M5.0 flare:

**Solar Flare**
End Time:
Intensity: M5.0 class
Source region N13W75
Activity ID: 2013-05-22T12:30:00-FLR-001 (version 2)
Note:
Submitted on 2014-02-03T19:49Z by Leila Mays

A Notification with ID [20130522-AL-001](#) was sent on 2013-05-22T15:30Z

**All directly linked activities:**
- [2013-05-22T13:24:00-CME-001](#)
- [2013-05-22T15:05:00-SEP-001](#)
  GOES13: SEM/EPS >10 MeV
- [2013-05-22T15:05:00-SEP-002](#)
  GOES13: SEM/EPS >100 MeV
- [2013-05-22T15:30:00-SEP-001](#)
  SOHO: COSTEP 15.8-39.8 MeV

---

Click the notification ID to see a copy of the flare notification.

Related events are listed at the bottom. This flare was associated with a CME and also an SEP event near Earth

Click on the activity IDs for information on the CME or SEPs.
Alternatively, search the notification database by space weather activity type and date

Choose event type, or weekly report

Select start and end date for search

For example, select ALL to list all notification types and weekly reports.
### Search Space Weather Notification Archive

Notification for Space Weather Event Type:

(Optional) Search start date from (e.g. 2013-01-31):

(Optional) Search end date to (e.g. 2013-06-30):

Selecting **ALL** lists all notification types and weekly reports in a certain date range.

<table>
<thead>
<tr>
<th>Message ID</th>
<th>Sent Date</th>
<th>For SW Event(s)</th>
<th>Sent By</th>
</tr>
</thead>
<tbody>
<tr>
<td>20130514-AL-003</td>
<td>2013-05-14T04:55Z</td>
<td>CMEAnalysis CME</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130514-AL-002</td>
<td>2013-05-14T03:50Z</td>
<td>CMEAnalysis CME</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130514-AL-001</td>
<td>2013-05-14T01:45Z</td>
<td>FLR</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130513-AL-008</td>
<td>2013-05-13T19:15Z</td>
<td>CMEAnalysis CME</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130513-AL-007</td>
<td>2013-05-13T18:35Z</td>
<td>SEP</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130513-AL-004</td>
<td>2013-05-13T06:00Z</td>
<td>CMEAnalysis CME</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130513-AL-003</td>
<td>2013-05-13T05:20Z</td>
<td>CMEAnalysis CME</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130513-AL-001</td>
<td>2013-05-13T02:52Z</td>
<td>FLR</td>
<td>Dan Comberiate</td>
</tr>
<tr>
<td>20130508-7D-001</td>
<td>2013-05-08T16:06Z</td>
<td>Report</td>
<td>chiu wiegand</td>
</tr>
<tr>
<td>20130503-AL-001</td>
<td>2013-05-03T18:20Z</td>
<td>FLR</td>
<td>Dan Comberiate</td>
</tr>
</tbody>
</table>

Click on the message ID to see a copy the notification.

All columns are sortable! (click column headings)
DONKI - Caveats

• Data entry for past events (using logs and alert archives) was performed by students:
  • Could be errors, mostly due to typos, or duplicate entries
  • We are adding data quality flags to indicate whether entries have been “checked”
  • Entries from Aug 2013 onwards is mostly verified.
• Search filters combinations will be added
• More data export options coming (suggestions?)

• CME measurements are made in real-time, with limited data.
Demo:

DONKI

Database of Notifications, Knowledge, and Information

https://ccmc.gsfc.nasa.gov/donki/