CCMC Scoreboards

Three real-time forecast validation projects facilitated by the CCMC via forecast collection "scoreboards":

(1) **CME Scoreboard:** CME arrival time and geomagnetic storm strength

(2) **Flare Scoreboard:** flare occurence probability

(3) **SEP Scoreboard:** SEP onset, duration, peak flux, and probability

The CME, Flare, and SEP scoreboards enable world-wide community involvement in real-time predictions, foster community validation projects, and ultimately help researchers improve their CME, flare, and SEP forecasts. All CME, Flare, SEP forecast modelers and experts worldwide are invited to advise or participate in this effort.

SWRC Tools

http://kauai.ccmc.gsfc.nasa.gov/

https://kauai.ccmc.gsfc.nasa.gov/SWRC_Tools.html

NASA GSFC Community Coordinated Modeling Center (CCMC) Tools

CME Scoreboard

Space Weather DONKI

WSA-ENLIL Cone Fast Track

Stereo CAT

Space Weather Web Tools from CCMC/SWRC

CCMC
CME Arrival Time Scoreboard

The CME scoreboard is a research-based forecasting methods validation activity which provides a central location for the community to:

- submit their forecast in real-time
- quickly view all forecasts at once in real-time
- compare forecasting methods when the event has arrived
- view the average of all forecasts for each event (ensemble).

http://kauai.ccmc.gsfc.nasa.gov/CMEscoreboard

All prediction methods are welcome and all are encouraged to participate.

Participation from the community:

- All prediction models and methods are welcome from the world-wide research
- community (currently 19 methods are registered)
- Users submit their predictions for ongoing CME events, listing their method
- assumptions and input parameters
- Researchers can then view all of the predictions, modeling details, and the
- ensemble average of all predicted arrival times submitted by participants

Community predictions for the January 7, 2014 CME (X1.2 flare):

15 submissions
Average of all submissions: **12 hours early, Kp geomagnetic index 6 to 7.6**

CME: 2014-01-07T18:24:00-CME-001
Actual Shock Arrival Time: 2014-01-09T19:32Z
Observed Geomagnetic Storm Parameters:
Max Kp: 3.0

http://kauai.ccmc.gsfc.nasa.gov/CMEscoreboard

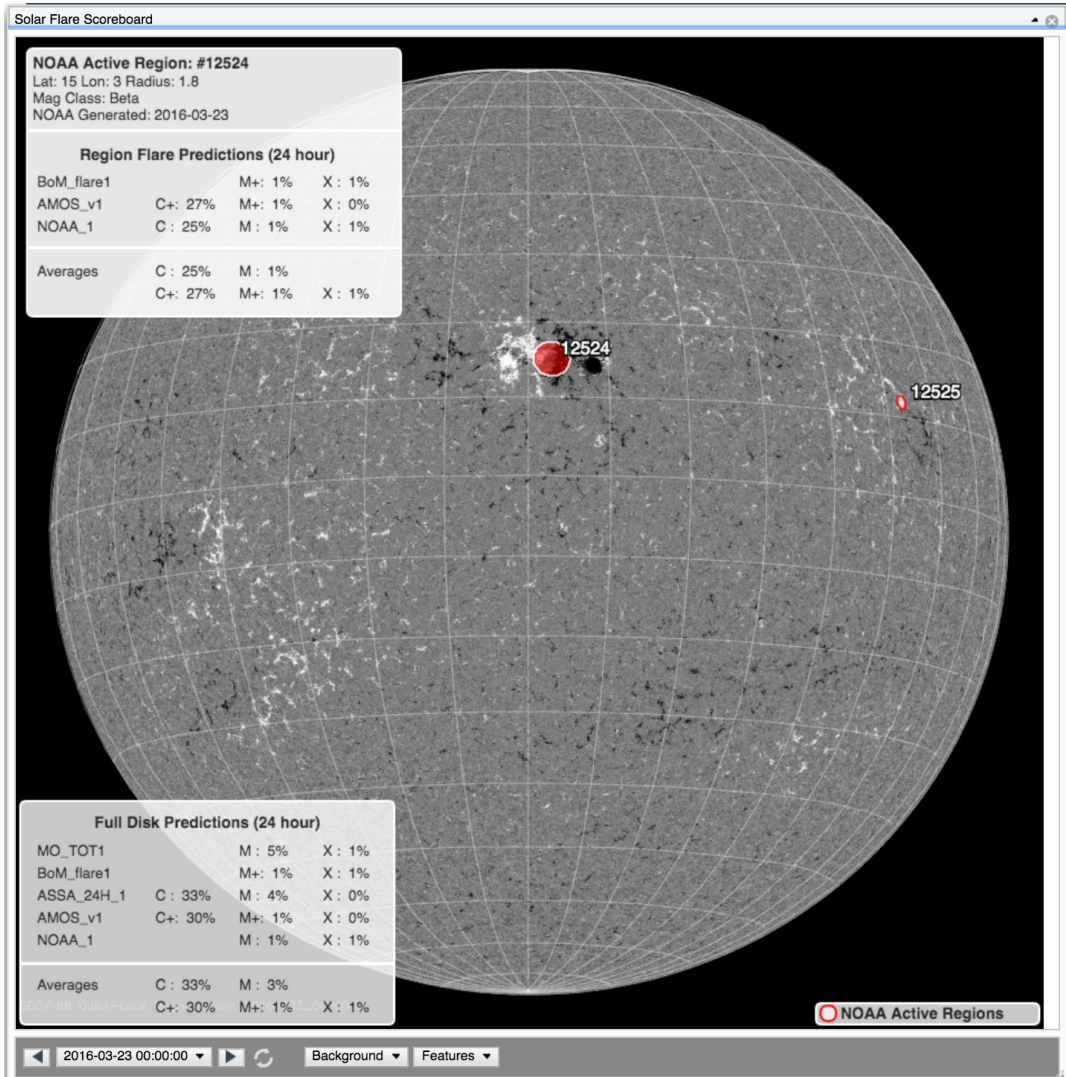
Predicted Shock Arrival Time	Difference (hrs)	Submitted On	Lead Time (hrs)	Predicted Geomagnetic Storm Parameter(s)	Method
2014-01-10T04:04Z (-16.0h, +36.0h)	8.53	2014-01-08T14:56Z	28.60	Max Kp Range: 8.0 - 8.0 Dst min. in nT: -300	COMESEP
2014-01-09T19:26Z (-10.0h, +10.0h)	-0.10	2014-01-07T21:00Z	46.53	----	STOA
2014-01-09T13:00Z (-7.0h, +7.0h)	-6.53	2014-01-08T23:17Z	20.25	Max Kp Range: 6.0 - 8.0	WSA-ENLIL + Cone
2014-01-09T12:00Z (-7.0h, +7.0h)	-7.53	2014-01-08T06:32Z	37.00	----	WSA-ENLIL + Cone
2014-01-09T11:22Z (-11.7h, +9.1h)	-8.17	2014-01-09T18:57Z	0.58	Max Kp Range: 3.0 - 5.0	Ensemble WSA-ENLIL + Cone (GSFC SWRC)
2014-01-09T08:02Z	-11.50	2014-01-08T16:37Z	26.92	----	Expansion Speed Prediction Model
2014-01-09T08:00Z	-11.53	2014-01-08T01:31Z	42.02	Max Kp Range: 6.0 - 7.0	WSA-ENLIL + Cone (NOAA/SWPC)
2014-01-09T06:35Z	-12.95	---	---	Max Kp Range: 6.0 - 7.625	Average of all Methods
2014-01-09T04:30Z (-2.5h, +2.5h)	-15.03	2014-01-08T05:02Z	38.50	Max Kp Range: 5.0 - 8.0	Other (SIDC)
2014-01-09T04:00Z (-6.0h, +6.0h)	-15.53	2014-01-08T09:42Z	33.83	----	DBM
2014-01-09T02:00Z	-17.53	2014-01-08T17:53Z	25.65	Max Kp Range: 8.0 - 9.0	BHV
2014-01-09T01:00Z	-18.53	2014-01-08T23:00Z	20.53	Dst min. in nT: -142 Dst min. time: 2014-01-09T12:00Z	Anemomilos
2014-01-09T00:38Z (-7.0h, +7.0h)	-18.90	2014-01-08T00:41Z	42.85	Max Kp Range: 6.0 - 8.0	WSA-ENLIL + Cone (GSFC SWRC)
2014-01-09T00:17Z (-6.9h, +9.2h)	-19.25	2014-01-08T04:11Z	39.35	Max Kp Range: 6.0 - 8.0	Ensemble WSA-ENLIL + Cone (GSFC SWRC)
2014-01-08T22:00Z	-21.53	2014-01-08T03:17Z	40.25	Dst min. in nT: -146 Dst min. time: 2014-01-09T11:00Z	Anemomilos
2014-01-08T12:30Z	-31.03	2014-01-08T05:58Z	37.57	----	ESA

Please join! All prediction methods are welcome and all are encouraged to participate. There are currently 19 registered models.

Flare Scoreboard

http://ccmc.gsfc.nasa.gov/challenges/flare.php

- Allows a consistent real-time comparison of various operational and research flare forecasts.
- Automated system; model developers can routinely upload their predictions to an anonymous ftp
- Forecast data is parsed and stored in a database which accessible to anyonevia an API
- This project is led by the UK Met Office and the planning group includes expert scientists as well as operational space weather prediction centers.



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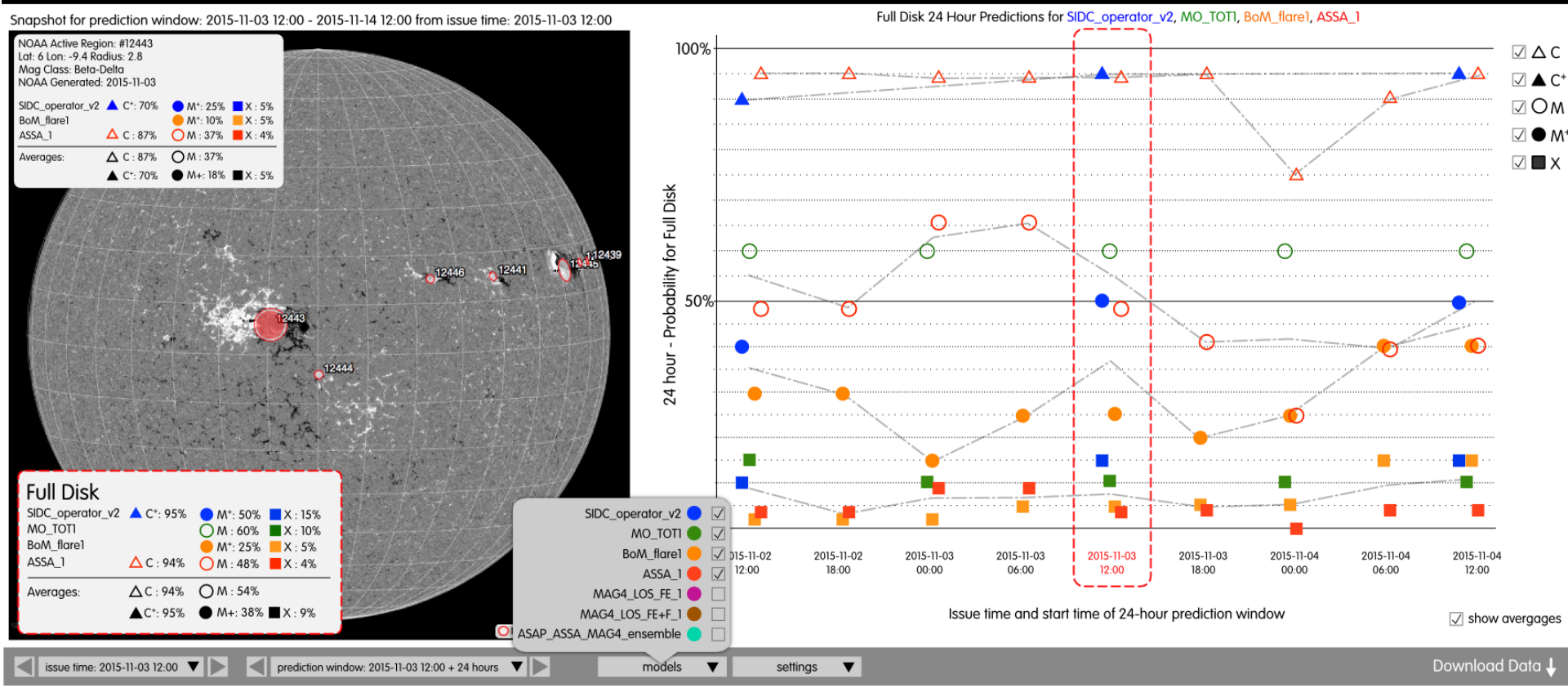


The full disk and active region flare forecasts can currently be viewed on an interactive display overlaid on an SDO/AIA or HMI image of then Sun and will be dynamically paired with a graph of flare probability vs. time (coming soon)

SEP Scoreboard

http://ccmc.gsfc.nasa.gov/challenges/sep.php

- Planning for the SEP Scoreboard has started (led by BIRA-IASB and the UK Met Office)
- Builds upon the flare scoreboard and CME arrival time scoreboard
- Automated system; model developers can routinely upload their predictions to an anonymous ftp. Forecast data will be parsed and stored in a database which accessible to anyone via an API
- SEP forecasts can be roughly divided into three categories:

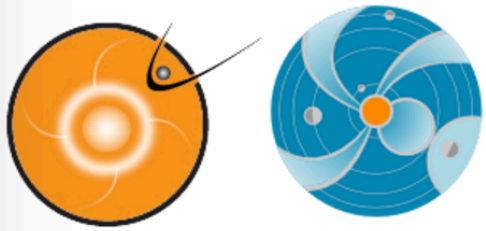
The SEP scoreboard will focus on real-time forecasts (first and second categories).
The SEP scoreboard team can also coordinate a set of historical events for a "SEP challenge" with different models, particularly those physics-based models in the third category that are not ready or relevant for real-time modeling.

At this stage we are soliciting feedback from SEP forecasters on:

- What information should be contained in the forecast files (see website for proposed forecast submission file format)
- Ideas on displaying forecasts side by side, or combining forecasts.

live demo of CME scoreboard

the following slides show demo screenshots



CME ScoreBoard

Login

CME Scoreboard

CME arrival time predictions from the research community:
The CME Scoreboard (developed at the Community Coordinated Modeling Center, CCMC) is a research-based forecasting methods validation activity which provides a central location for the community to:

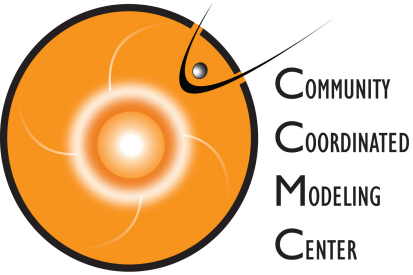
- submit their forecast in real-time
- quickly view all forecasts at once in real-time
- compare forecasting methods when the event has arrived

Using this system:

- Anyone can view prediction tables
- Users can enter in your CME shock arrival time forecast after logging in:
  - Registered Users: Begin by finding your CME under the "Active CMEs" section, then click "Add Prediction" and select your forecasting "Method Type" from the list. (Click here to register for an account.)
  - Power Users: If you do not see your CME listed under the "Active CMEs" section, click "Add CME" to get started (Click here to request power user privileges). To enter the actual CME shock arrival time, click "*Edit CME*" after you are done entering your prediction(s).
- Click here to see a list of registered methods. If you would like to register your prediction method, please send an email to M. Leila Mays or Yihua Zheng with your model/technique details.
- Click here for more detailed instructions.

http://kauai.ccmc.gsfc.nasa.gov/CMEscoreboard

Anyone can view predictions, please register to submit predictions.



Begin by clicking **Add Prediction** under the "Active CMEs" section and select your forecasting "Method Type" from the list.
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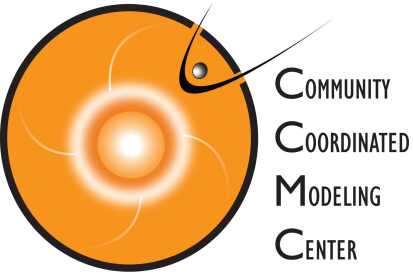
Active CMEs:

Note: If you can't find your CME below, please click "Add CME" to add your CME. To enter the actual CME shock arrival time, click "*Edit CME*" after you are done entering your prediction(s).

CME: 2015-01-01T00:00:00-CME-001
Edit CME
Delete CME
Add Prediction
No Prediction Entered for this CME yet!

http://kauai.ccmc.gsfc.nasa.gov/CMEscoreboard



http://kauai.ccmc.gsfc.nasa.gov/CMEscoreboard

Prediction Form for CME (2014-01-01T00:00:00-CME-001)

Enter submission time in format (yyyy-MM-dd'T'HH:mm'Z' i.e. 2012-07-12T16:52Z) :

Method Type (details):

Prediction notes: (Please include all initial conditions/parameters used in your prediction)

- ✓ --- Select ---
- Anemomilos
- Ballistic projection
- BHV
- DBM
- ECA
- ESA
- H3DMHD (HAFv.3+3DMHD)
- HAFv.3
- HAFv2w
- HI J-map
- Other
- Other (ips.gov.au)
- Other (SIDC)
- STOA
- TH
- WSA-Enlil + Cone
- WSA-Enlil + Cone (GSFC SWRC)
- WSA-Enlil + Cone (NOAA/SWPC)

Enter predicted CME shock arrival time in format (yyyy-MM-dd'T'HH:mm'Z' i.e. 2012-07-12T16:52Z) :

Positive Error Bar in hours (optional):

Negative Error Bar in hours (optional):

Kp Range Lower Limit (optional):

Kp Range Upper Limit (optional):

Dst min. in nT (optional):

Dst min. time in format (yyyy-MM-dd'T'HH:mm'Z' i.e. 2012-07-12T16:52Z) (optional):

Scoreboard – Future Improvements

- Automatically accepting and parsing predictions (less work for groups who can populate directories with their predictions)
    - Manually created predictions (e.g. from SIDC)
    - Automatically created predictions (e.g. from Anemomilos, SARM).
        - Challenges: filtering out non-CME related predictions, matching predictions with CME start time.
- Showing table data in dynamic plot form, e.g. Prediction Error vs. Time of Prediction, Prediction Error vs Input parameters.
- Suggestions: We can add an “analysis” field to provide a few sentences about the arrival and predictions. This can also be found in DONKI as notes/comments. We can add the ability for users to also submit their prediction “confidence”.
- Any interest in including STEREO A and B predictions?

- Your suggestions?