CME Arrival Time & Impact Working Team

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Team Goals

- Evaluate where we stand with **CME arrival time and impact prediction**
- Establish **community-agreed metrics** and **events** regarding CME arrival time and impact.
- Provide a **benchmark** against which future models can be assessed against
- Complementary to the CME Scoreboard
- Complementary to CCMC and NOAA SWPC validation project
    - → https://ccmc.gsfc.nasa.gov/annex

Team Deliverables

- Catalog of **metrics** and how they relate to **user needs and science needs.**
- Model **assessments** with selected metrics for selected time intervals.
- **Online database** of model inputs, outputs, and observations.
- **Publication** describing model assessment results summarizing where we stand with CME arrival time and impact prediction.

Work with Information Architecture for Interactive Archives (IAIA) working team for online database.
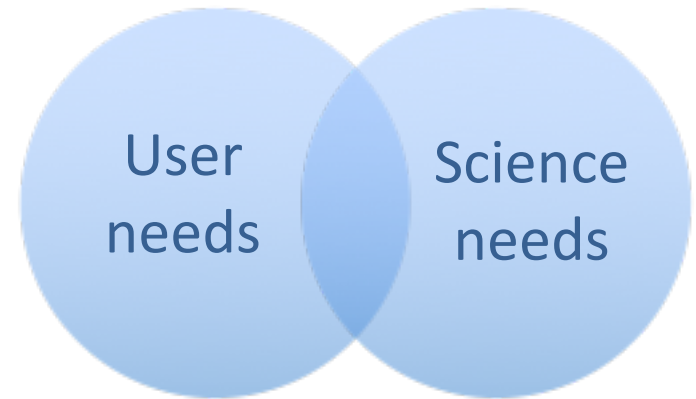
Participating models

- AWSoM_R + CME + EEGGL (University of Michigan)
- DBM (Vrsnak)
- DBEM (Dumbović)
- ElEvo (Ellipse Evolution) (Moestl)
- ElEvoHI (Ellipse Evolution based on HI) (Amerstorfer)
- Enhanced drag-based model (Hess & Zhang)
- EUHFORIA (Pomoell)
- SARM (Núñez)
- SUSANOO-CME
- WSA-ENLIL+Cone (Arge, Odstrcil)

contact us to add your model

CME Arrival and Impact Team: Summary

- All types of CME events
  - Keep track of the different types
- Validation set : 100 events
- Arrival time from catalogues
- 1h averaged OMNI data
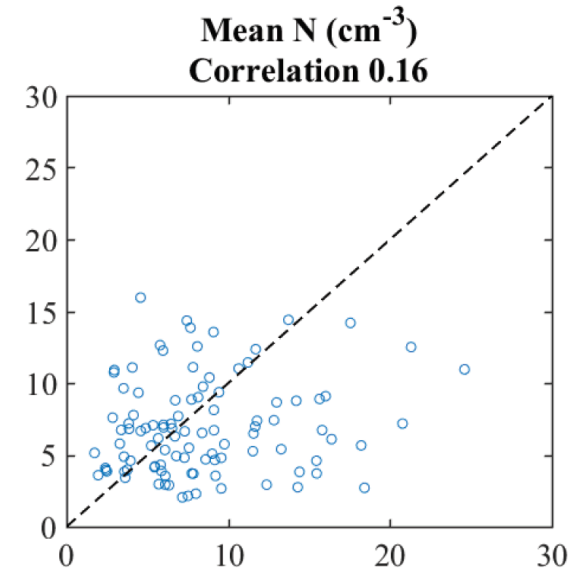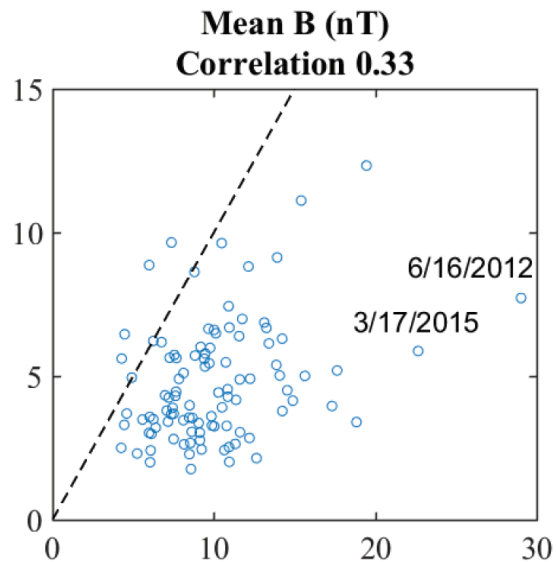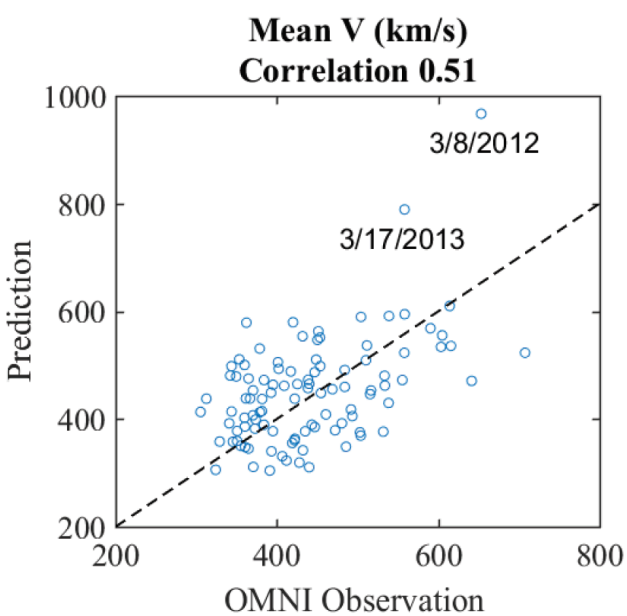- Skill scores and correlation coefficients

User needs

Science needs

CME Arrival and Impact Team:
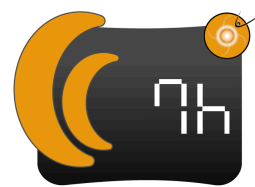## Skill scores

- What is a hit? – Different time intervals!
- Contingency table
- Mean Error, Mean Absolute Error, Mean Square Error, Root Mean Square Error

	Observed Arrival	No Observed Arrival
Predicted Arrival	Hit (H)	False Alarm (FA)
No Predicted Arrival	Miss (M)	Correct Rejection (CR)

CME Arrival and Impact Team:
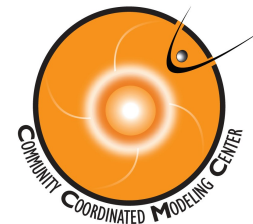## Correlation coefficients

See poster by L.K. Jian in session 10

CME Arrival Time Scoreboard
Community predictions for the 6 Sep 2017 CME

CME: 2017-09-06T12:24:00-CME-001

Actual Shock Arrival Time: 2017-09-07T22:30Z

Observed Geomagnetic Storm Parameters:
Max Kp: 8.0
Dst min. in nT: -142
Dst min. time: 2017-09-08T02:00Z
CME Note: Associated with X9.3 flare from AR 12673.

Predicted Shock Arrival Time	Difference (hrs)	Confidence (%)	Submitted On	Lead Time (hrs)	Predicted Geomagnetic Storm Parameter(s)	Method
2017-09-08T06:00Z (-3.0h, +3.0h)	7.50	80.0	2017-09-07T05:00Z	17.50	Max Kp Range: 5.0 - 8.0	WSA-ENLIL + Cone (Met Office)
2017-09-08T06:00Z (-2.0h, +2.0h)	7.50	----	2017-09-07T16:30Z	6.00	----	Ooty IPS
2017-09-08T07:32Z (-5.0h, +6.0h)	9.03	----	2017-09-07T08:33Z	13.95	----	DBM
2017-09-08T08:00Z (-3.0h, +3.0h)	9.50	70.0	2017-09-07T05:40Z	16.83	----	DBM + ESWF
2017-09-08T10:16Z (-4.0h, +4.0h)	11.77	----	2017-09-07T09:00Z	13.50	----	EAM (Effective Acceleration Model)
2017-09-08T10:25Z	11.92	----	2017-09-07T02:13Z	20.28	----	SARM
2017-09-08T10:42Z	12.20	----	2017-09-07T15:55Z	6.58	----	SPM
2017-09-08T12:46Z	14.27	84.0	---	---	Max Kp Range: 4.33333 - 6.5	Average of all Methods
2017-09-08T13:00Z (-7.0h, +7.0h)	14.50	90.0	2017-09-07T08:25Z	14.08	Max Kp Range: 5.0 - 7.0	Other
2017-09-08T13:52Z	15.37	----	2017-09-07T15:46Z	6.73	----	SPM2
2017-09-08T15:48Z (-9.0h, +10.0h)	17.30	100.0	2017-09-07T14:53Z	7.62	Max Kp Range: 4.0 - 6.0	Ensemble WSA-ENLIL + Cone (GSFC SWRC)
2017-09-08T16:00Z	17.50	----	2017-09-09T12:59Z	-38.48	----	WSA-ENLIL + Cone (BoM)
2017-09-08T16:30Z (+14.0h)	18.00	----	2017-09-07T12:32Z	9.97	----	ElEvo
2017-09-08T17:00Z (-12.0h, +12.0h)	18.50	80.0	2017-09-06T22:40Z	23.83	Max Kp Range: 4.0 - 6.0	Other (SIDC)
2017-09-08T18:27Z (-7.0h, +7.0h)	19.95	----	2017-09-06T17:23Z	29.12	Max Kp Range: 3.0 - 5.0	WSA-ENLIL + Cone (GSFC SWRC)
2017-09-08T22:00Z	23.50	----	2017-09-06T23:24Z	23.10	Max Kp Range: 5.0 - 7.0	WSA-ENLIL + Cone (NOAA/SWPC)

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

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