

CME-learn: Benchmarking CME databases



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CME databases

The ISEST Master CME List

We encourage all users of the web to add to this list to create a list compiled from everybody for community use. For information on how to add an event, go to [filling the ISEST Master List](#).

ICME EVENT START	ICME EVENT END	CME in LASCO	ICME TYPE	AR	SURFACE LOCATION	FLARE MAGNITUDE	FLARE ONSET TIME	ICME VEL C2	SEEDS VEL A	SEEDS VEL B	AVG. VEL.	VELOCITY	TRANSIT TIME	DST PEAK	DST PEAK TIME	EJECTA START TIME	QUALITY	IN- SITU DATA	
05/02/2007 21:00:00	05/02/2007 22:00:00		ICME LK1	-				-	-	-	443.3 km/s			-43	05/03/2007 24:00:00	05/02/2007 21:00:00	3	Unsp	
11/01/2007 17:00:00	11/01/2007 19:27:00	EJ	-	N12 E40			125 km/s		442.41		450.7 km/s	93:33:00	-43	11/02/2007 21:00:00	11/01/2007 17:00:00	2	Unsp		
12/01/2009 03:30:00	12/01/2009 15:00:00	EJ	-	N08 W09			303 km/s	359 km/s	396 km/s	361.78	321.8 km/s	114:24:00	-		12/01/2009 03:30:00	12/01/2009 03:30:00	2	Unsp	
01/26/2009 05:00:00	01/26/2009 15:00:00	ICME LK1	-	N07 E04			220 km/s	134 km/s	303 km/s	299.89	347.7 km/s	103:29:57	-		01/26/2009 05:00:00	01/26/2009 05:00:00	3	Unsp	
02/03/2009 19:00:00	02/03/2009 15:00:00	ICME LK1	-	N08 E12			268 km/s	229 km/s	211 km/s	298	439.82 km/s	89:00:00	-48	02/04/2009 18:00:00	02/04/2009 00:00:00	3	Unsp		
09/30/2009 01:00:00	09/30/2009 18:00:00	ICME LK1	11027	N24 W09			586 km/s				345.38 km/s	112:54:00	-		09/30/2009 08:00:00	09/30/2009 08:00:00	2	Unsp	
10/29/2009 02:00:00	10/29/2009 15:54:00	ICME LK1	-	N09 E15			197 km/s				358.12 km/s	130:06:00	-		10/29/2009 02:00:00	10/29/2009 02:00:00	2	Unsp	
11/04/2009 09:00:00	11/04/2009 20:06:00	ICME LK1	11030	N23 W02			118 km/s	271 km/s	414.29	311.0 km/s	99:54:00	-			11/04/2009 08:00:00	11/04/2009 08:00:00	2	Unsp	
01/01/2010 03:00:00	01/01/2010 13:30:00	ICME LK1	11039	S28 E31	B8		12/07/2009 13:39:00	90 km/s	134 km/s	1010 km/s	2771	343.66 km/s	281.4 km/s	129:30:00	-	01/01/2010 12:00:00	01/01/2010 12:00:00	2	Unsp



Space Weather ScoreBoard

Past CMEs From 2013:

Predicted Shock Arrival Time	Difference (hrs)	Confidence (%)	Submitted On	Lead Time (hrs)	Predicted Geomagnetic Storm Parameters	
2013-12-19T03:38Z (+7.0h, +7.0h)	13.63	--	2013-12-12T17:09Z	44.85	Max Kp Range: 3.0 - 4.0	WSA-ENLIL +1
2013-12-19T06:00Z	10.00	--	2013-12-13T00:30Z	37.50	Max Kp Range: --, 4.0	WSA-ENLIL +2
2013-12-17T11:11Z (+14.1h, +13.8h)	4.18	--	2013-12-17T15:13Z	22.75	Max Kp Range: 2.0 - 6.0	Ensemble WSA-SWRC
2013-12-14T23:16Z	9.27	--	--	--	Max Kp Range: 2.5 - 4.66667	Average of all 3

Predicted Shock Arrival Time	Difference (hrs)	Confidence (%)	Submitted On	Lead Time (hrs)	Predicted Geomagnetic Storm Parameters	
2013-12-07T18:00Z (+7.0h, +7.0h)	6.00	--	2013-12-08T01:09Z	46.85	Max Kp Range: 2.0 - 4.0	WSA-ENLIL +1
2013-12-07T18:43Z (+4.0h, +4.0h)	-10.25	--	2013-12-08T16:10Z	31.83	Max Kp Range: 3.0 - 6.0	Ensemble WSA-SWRC
2013-12-07T15:52Z	-8.13	--	--	--	Max Kp Range: 2.5 - 5.0	Average of all 3

GMU CME/ICME List

Provided by Phillip Hess (phess4@gmu.edu), Jie Zhang (jzhang7@gmu.edu) and Yidan Chi (lychi@mail.usc.edu.cn)

ICME EVENT START	ICME EVENT END	CME in LASCO	ICME TYPE	AR	SURFACE LOCATION	FLARE MAGNITUDE	FLARE ONSET TIME	SEEDS VEL C2	SEEDS VEL A	SEEDS VEL B	AVG. VEL.	VELOCITY	Transit Time	DST PEAK	DST PEAK TIME	EJECTA START TIME	Quality Rating	In-Situ Link
11/20/2007 00:00:00	11/20/2007 11:00:00	11/16/2007 06:50:00	EJ	-	N07 W04			160 km/s	-	253 km/s	474.80	462.8 km/s	87:10:00	-63	11/20/2007 21:00:00	11/20/2007 00:00:00	2	http://helio.gmu.edu/public/press4/jevents2/2007111900/2007111900.html#
12/17/2008 02:00:00	12/18/2008 15:00:00	12/12/2008 09:06:00	EJ	-	N36 W10			259 km/s	306 km/s	366.58	323.8 km/s	112:54:00	-	-	12/17/2008 02:00:00	12/17/2008 02:00:00	2	http://helio.gmu.edu/public/press4/jevents2/20090121600/20090121600.html#
01/26/2009 05:00:00	01/26/2009 15:00:00	01/21/2009 21:08:00	EJ	-	-			114 km/s	-	303 km/s	398.46	347.7 km/s	103:52:00	-	-	01/26/2009 05:00:00	3	http://helio.gmu.edu/public/press4/jevents2/2009012500/2009012500.html#
02/03/2009 19:00:00	02/04/2009 16:00:00	01/31/2009 01:54:00	EJ	-	N08 E12			229 km/s	211 km/s	238 km/s	449.37	355.9 km/s	89:06:00	-48	02/04/2009 18:00:00	02/03/2009 22:00:00	3	http://helio.gmu.edu/public/press4/jevents2/2009020200/2009020200.html#
09/30/2009 06:00:00	09/30/2009 18:00:00	09/25/2009 06:06:00	EJ	11027	N24 W09			-	-	-	351.04	348.5 km/s	117:54:00	-	-	09/30/2009 06:00:00	3	http://helio.gmu.edu/public/press4/jevents2/2009092900/2009092900.html#

SOHO LASCO CME CATALOG

YEAR	MONTH											
1996	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Goddard Space Flight Center
Sciences and Exploration Directorate

COMPREHENSIVE SOLAR WIND LABORATORY
FOR LONG-TERM SOLAR WIND MEASUREMENTS

Select year ▼

Choose date range:
dd / mm / yyyy to dd / mm / yyyy Go

Wind ICME Catalogue
1995 - 2021

ICME ¹ start time	(Shock)	MO ² start time	MO ³ type	MO/ICME end time	B ⁴	V _{sw} ⁵	V _{sw} ⁶	Plots	HO ⁷
1995 02/07 19:11	-	1995 02/08 03:21	Cx	1995 02/10 21:36	8.32	377	53	P	-
1995 03/04 00:36	Y	1995 03/04 11:23	Fr	1995 03/05 03:06	10.81	444	11	P	F
1995 03/06 02:11	-	1995 03/06 07:11	F-	1995 03/07 02:23	8.24	458	0	P	F
1995 04/03 06:43	-	1995 04/03 12:45	F+	1995 04/04 13:25	8.92	295	4	P	F
1995 04/05 07:11	-	1995 04/05 17:59	Fr	1995 04/06 17:15	7.30	332	-2	P	F
1995 05/13 10:19	-	1995 05/13 10:19	E	1995 05/13 15:59	10.87	329	8	P	-
1995 06/30 09:21	-	1995 06/30 14:23	Fr	1995 07/02 16:47	8.56	398	83	P	F
1995 08/22 12:56	Y	1995 08/22 22:19	Fr	1995 08/23 18:43	9.71	359	16	P	F
1995 09/26 15:57	-	1995 09/27 03:36	Fr	1995 09/27 21:21	9.78	375	-34	P	F
1995 10/18 10:40	Y	1995 10/18 19:11	Fr	1995 10/20 02:23	21.15	408	5	P	F
-	-	1995 12/16 07:11	F-	1995 12/16 18:11	11.03	396	5	P	F
-	-	1996 02/15 15:07	F+	1996 02/16 08:59	6.89	387	24	P	F
-	-	1996 04/04 11:59	Fr	1996 04/04 21:36	7.29	389	6	P	F
-	-	1996 05/17 01:36	F+	1996 05/17 11:58	7.06	420	8	P	F
-	-	1996 05/27 14:45	Fr	1996 05/29 02:22	9.71	368	29	P	F
-	-	1996 07/01 17:16	Fr	1996 07/02 10:17	10.98	354	13	P	F

CME databases

- CME heights (with respect to the disk center) are measured at the fastest segment of the leading edge.
- PA= Position Angle measured from Solar North in degrees (counter-clockwise)
- Halo CMEs are indicated in the "Central PA" column. The letters ("S", "BA", "OA") in the brackets show type of halo CMEs. [See examples.](#)
- Click on date to view Java script movie of the CME.
- Click on time to see height-time measurements as a text file.
- Click on speed to view height-time plots of the CME.
- Beware of data gaps. Check for LASCO/C2 data gaps [here](#).
- [A complete description of the catalog](#)
- Click [here](#) to search the entire catalog.

First C2 Appearance Date Time [UT]	Central PA [deg]	Angular Width [deg]	Linear Speed [km/s]	2nd-order Speed at final height [km/s]	2nd-order Speed at 20 Rs [km/s]	Accel [m/s ²]	Mass [gram]	Kine Ener
2021/01/01 09:12:05	252	28	128	114	0	-4.7 ¹	----	
2021/01/01 02:48:06	81	20	233	228	203	-0.7 ¹	----	
2021/01/01 22:00:05	238	127	190	227	380	5.1 ¹	----	
2021/01/02 11:36:05	249	155	395	361	321	-3.3 ¹	----	
2021/01/02 13:36:21	131	79	126	134	335	4.1 ¹	----	
2021/01/02 17:36:05	256	13	130	210	463	9.3 ¹	----	
2021/01/02 23:24:05	268	67	246	248	254	0.2 ¹	----	
2021/01/03 18:12:05	314	10	216	184	0	-12.3 ¹	----	
2021/01/03 22:12:05	293	10	252	165	0	-7.9 ¹	----	
2021/01/04 07:48:05	104	32	252	233	0	-10.5 ¹	----	
2021/01/04 13:25:41	283	41	182	184	215	0.6 ¹	----	

GMU CME/ICME List

Provided by Philip Ness (phn@gsu.edu), Yi Zhang (yhzhang12@gsu.edu) and Tsidan Chi (ychi3@gmail.com.edu.cn)

ICME EVENT START	ICME EVENT END	CME IN LASCO	ICME TYPE	AR	SURFACE LOCATION	FLARE MAGNITUDE	FLARE ONSET TIME	SEEDS VEL C2	SEEDS VEL V4	AVG. VEL.	VELOCITY	Throw time
11/20/2007 00:00:00	11/20/2007 09:30:00		E1	-	N67 W64	-	-	140 km/s	253 km/s	476.8 km/s	462.8 km/s	87.10.00
12/17/2008 02:00:00	12/18/2008 03:06:00		E1	-	N39 W50	-	-	259 km/s	306 km/s	366.58 km/s	323.8 km/s	112.24.00
01/26/2009 03:00:00	01/26/2009 12:08:00		E1	-	-	-	-	114 km/s	303 km/s	386.46 km/s	347.7 km/s	103.52.00
02/03/2009 13:00:00	02/04/2009 01:34:00		E1	-	N68 E12	-	-	229 km/s	211 km/s	298 km/s	449.37 km/s	89.06.00
09/30/2009 06:00:00	09/30/2009 09:06:00		E1	11027	N24 W69	-	-	-	-	351.94 km/s	348.5 km/s	117.54.00
10/26/2009 07:00:00	10/26/2009 13:54:00		E1	-	N69 E15	-	-	-	-	306.54 km/s	371.3 km/s	135.06.00

Near-Earth Interplanetary Coronal Mass Ejections Since January 1996

Compiled by Ian Richardson (1, 2) and Hilary Cane (3),

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(2) **Partnership for HelioPhysics and Space Environment Research (PHASER) and The Department of Astronomy, University of Maryland, College Park;**

(3) **University of Tasmania, Australia.**

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Note added May 18, 2016: The dates in the table have been reformatted so that the year is now included for every time. Previously, the year was indicated only at the start of the list of events in that year, and only month and day were indicated in the event times. This change should make it easier to convert the list into another format, such as text or a spreadsheet. Currently, we don't maintain text or spreadsheet versions of the list, but these can be made by, for example, downloading and opening the file in a spreadsheet program such as Excel. Each box in the list should appear as a spreadsheet cell. Note that the contents of each box in the list are not necessarily uniform, so some editing (e.g., removing letters from some times in the first column) may be required. The list can then be saved in the desired format. A text version can also be made by converting the file to pdf and extracting the text from the pdf version.

Disturbance Y/M/D (UT) (a)	ICME Plasma/Field Start, End Y/M/D (UT) (b)	Comp. Start, End (Hrs wrt. Plasma/Field) (c)	MC Start, End (Hrs wrt. Plasma/Field) (d)	BDE? (e)	BIF? (f)	Qual. (g)	dV (km/s) (h)	V_ICME (km/s) (i)	V_max (km/s) (j)	B (nT) (k)	MC? (l)	Dst (nT) (m)	V_transit (km/s) (n)	LASCO CME Y/M/D (UT) (o)		
1996/05/27 1500	1996/05/27 1500	1996/05/29 0300	...	...	0	+4	N	...	2	0	370	400	9	2	-33	...
1996/07/01 1320	1996/07/01 1800	1996/07/02 1100	...	...	0	0	N	...	3	40	360	370	11	2	-20	...
1996/08/07 0600	1996/08/07 1200	1996/08/08 1000	...	...	0	0	N	...	2	10	350	380	7	2	-23	...
1996/12/23 1600	1996/12/23 1700	1996/12/25 1100	...	...	+10	0	N	...	2	20	360	420	10	2	-18	435
																1996/12/19 1630 H
Disturbance Y/M/D (UT) (a)	ICME Plasma/Field Start, End Y/M/D (UT) (b)	Comp. Start, End (Hrs wrt. Plasma/Field) (c)	MC Start, End (Hrs wrt. Plasma/Field) (d)	BDE? (e)	BU (f)	Qual. (g)	dV (km/s) (h)	V_ICME (km/s) (i)	V_max (km/s) (j)	B (nT) (k)	MC? (l)	Dst (nT) (m)	V_transit (km/s) (n)	LASCO CME Y/M/D (UT) (o)		
List of Full Halo CMEs From the View Angle of SOHO Since 1996																
Publications:																
• Shen, Chenglong, Yuming Yang, Zonghao Pan, Min Zhang, Pinzhong Ye, and Shui Wang, Full halo coronal mass ejections from the view angle of SOHO, <i>Journal of Space Weather and Space Climate</i> , 2013 (DOI:10.1002/2013JWPA.00019)																
• Chenglong Shen, Yuming Yang, Zonghao Pan, Bin Miao, Pinzhong Ye, and S. Wang, Full Halo Coronal Mass Ejections from the View Angle of SOHO, <i>Journal of Space Weather and Space Climate</i> , 2013 (DOI:10.1002/2013JWPA.00019)																
Frontside full halo CMEs, Backside full halo CMEs																
Table A: The numbers of the full halo CMEs in different groups																
								Group I	Group II	Group III					Total	

List of Full Halo CMEs From the View Angle of SOHO Since 2007 March 1

Publications:

- Shen, Chenglong, Yuming Wang, Zonghao Pan, Min Zhang, Pinzhong Ye, and Shui Wang, Full halo coronal mass ejections: Do we need to correct the projection effect in terms of velocity?, JGR, VOL. 118, 1-8, doi:10.1002/2013JA018272, 2013 ([arXiv:1303.4058; PDF from Wiley](#))
- Chenglong Shen, Yuming Wang, Zonghao Pan, Bin Miao, Pinzhong Ye, and S. Wang, Full Halo Coronal Mass Ejections: Arrival at the Earth, J. Geophys. Res., DOI:10.1002/2014JA020001, 2014 ([Arxiv:1406.4589; PDF from Wiley](#))

Frontside full halo CMEs, Backside full halo CMEs

Table A: The numbers of the full halo CMEs in different groups

	Group I	Group II	Group III	Total
Front Side	37	2	9	48
Back Side	29	1	8	38
Total	66	3	17	86

Group I: Can be fitted by the GCS model.

Group II: Can be fitted by the GCS model. But, No V_{CDA} is obtained due to points less than 3.

Group III: Cannot be fitted by the GCS model.

Table B: The list of all the frontside full halo CMEs([back to top](#))

No	CME date	Direction	€	Width	V _{C2}	V _{CDA}	T _{shock}	T _{ICME} Begin	T _{ICME} End	Comment
1	2009/12/16 04:30:03	E6.N9	10	45	411(14)	208	---	2009/12/19 09:49	2009/12/20 09:22	

Benchmarking databases

CME database 1: Probabilistic drag base model inversion, 250 events [2007-2015] with mass, acceleration and morphological features

CME database 2: Active region information along with CME morphological features

CME database 3: CACTUS cme databases (Morphological + Richardson information)

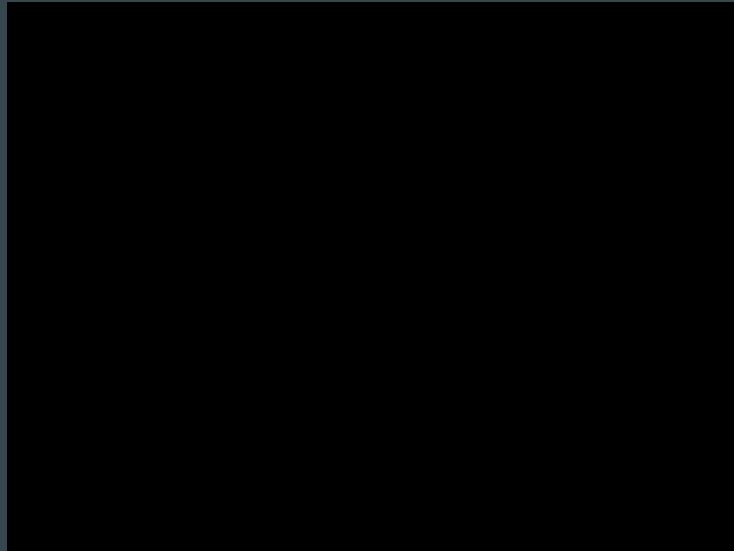
CME database 4: SOHO CME database

[Community is encouraged to send me other databases]

Interface

- Select CME database
- Explore the database using interactive plots
- Train your own ML algorithms from the selected list
 - Select split of dataset
 - Select input features for the model
 - Select target features for the model
- See the results of training, download high resolution plots

Interface



Future actions

- Deploy to a platform
- Make the more modular
- Uploading databases online

References

Arrival Time Estimates of Earth-Directed CME-Driven Shocks , K. Suresh, N. Gopalswamy & A. Shanmugaraju Solar Physics volume 297, Article number: 3 (2022)

Interplanetary Coronal Mass Ejections Resulting from Earth-Directed CMEs Using SOHO and ACE Combined Data During Solar Cycle 23 Evangelos Paouris & Helen Mavromichalaki Solar Physics volume 292, Article number: 30 (2017)

<https://cdaw.gsfc.nasa.gov/>

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

http://solar.gmu.edu/heliophysics/index.php/The_ISEST_Master_CME_List

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