

Multipoint Interplanetary Coronal Mass Ejections Observed with Solar Orbiter, BepiColombo, Parker Solar Probe, Wind, and STEREO-A

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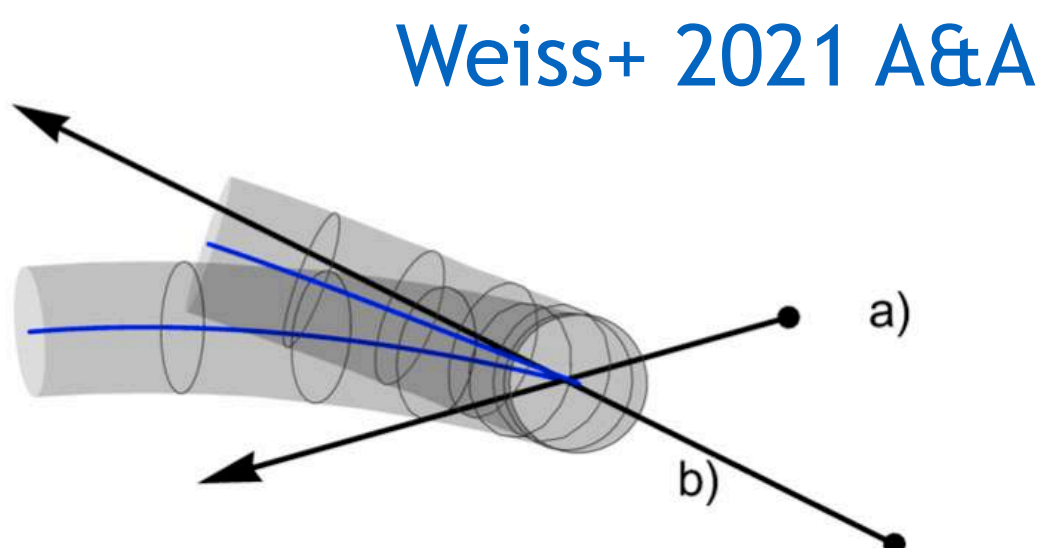
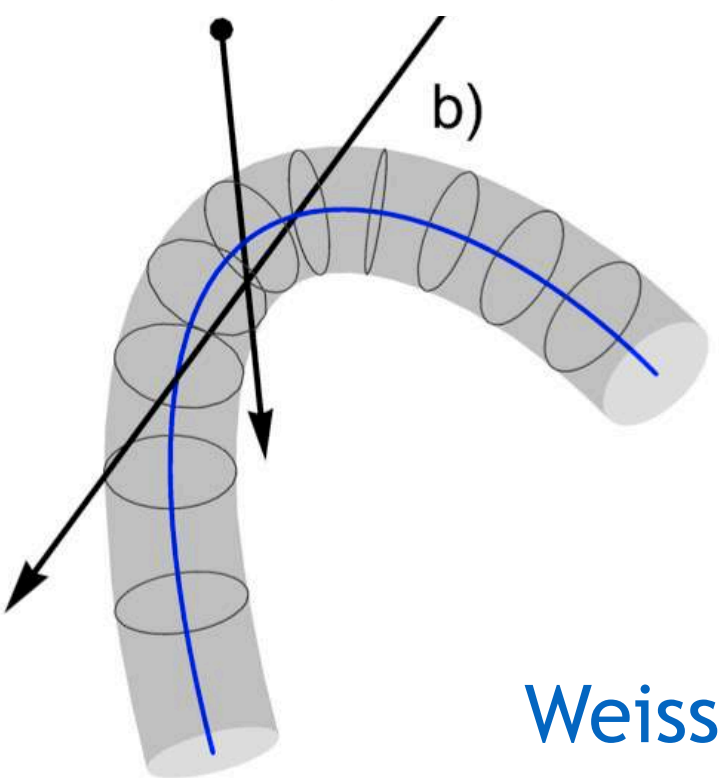
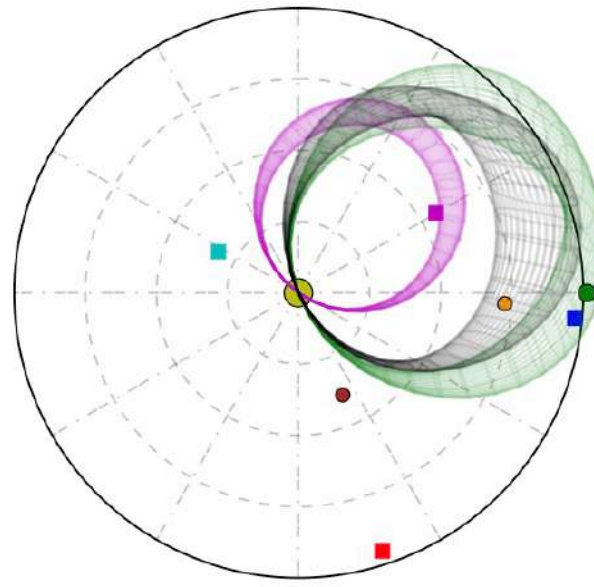
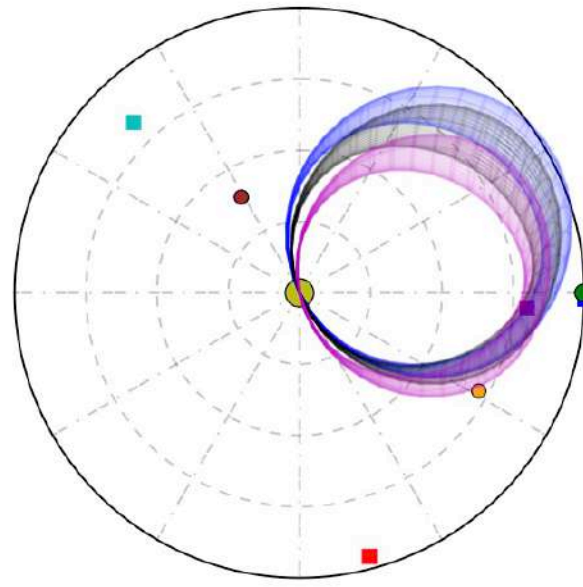
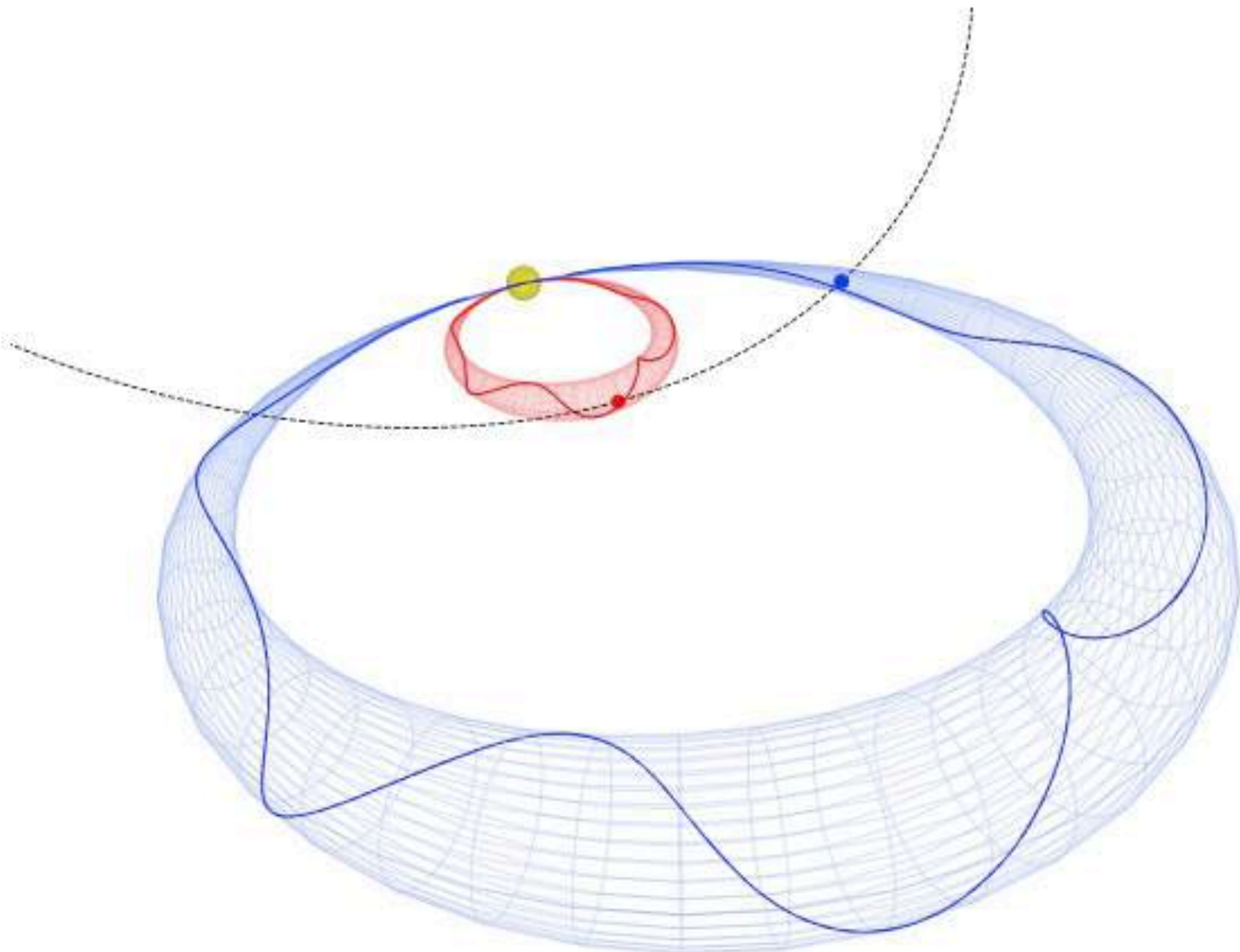
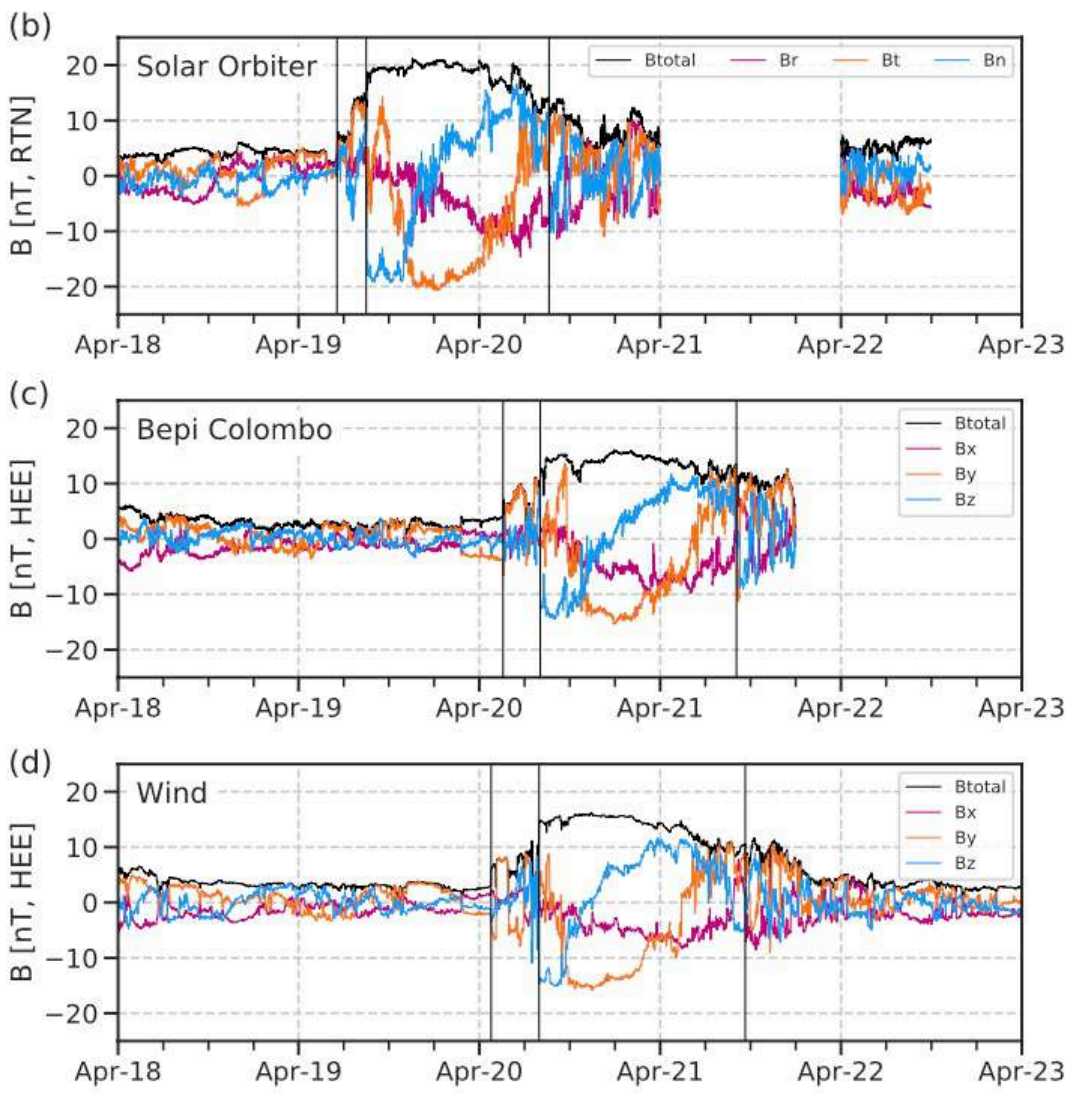
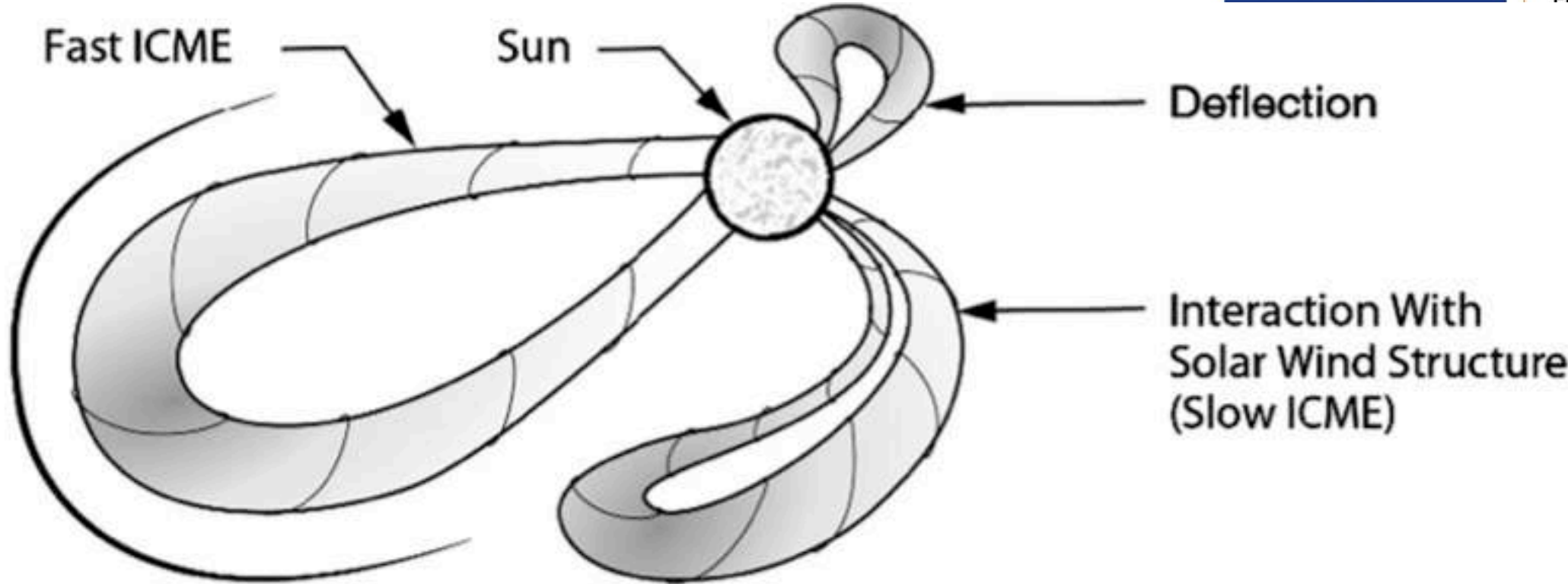
MULTIPOINT ICME EVENTS

Luhmann et al. 2020 Sol. Phys.



Key observations for the improved understanding of ...

- global CME magnetic structure and shape
- origin of CME magnetic fields
- interplanetary evolution of CME magnetic fields
- interactions with other CMEs, CIRs and the solar wind
- evolution of shocks and their standoff distances
- energetic particle propagation
- real time Bz prediction



Weiss+ 2021 A&A

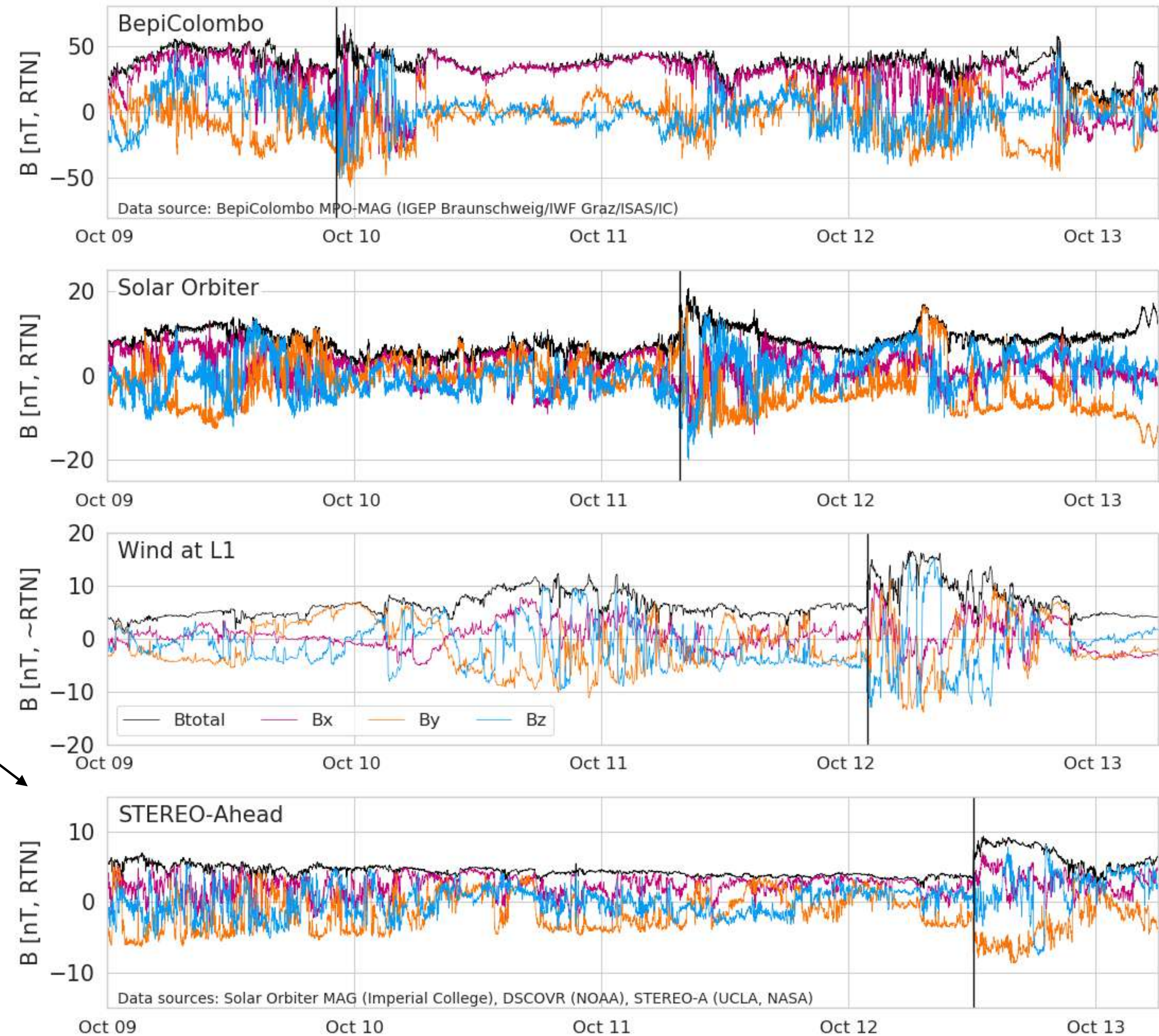
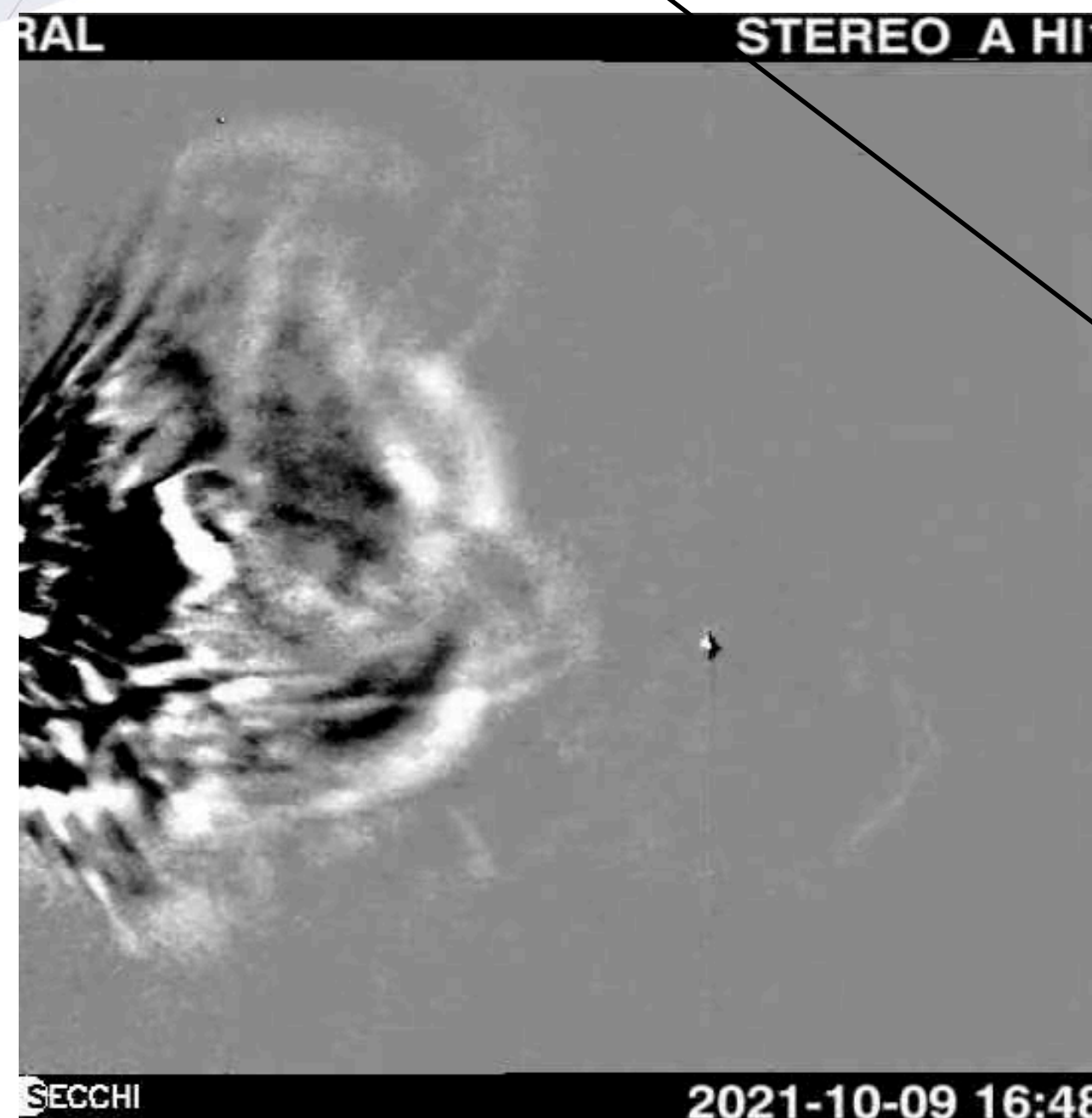
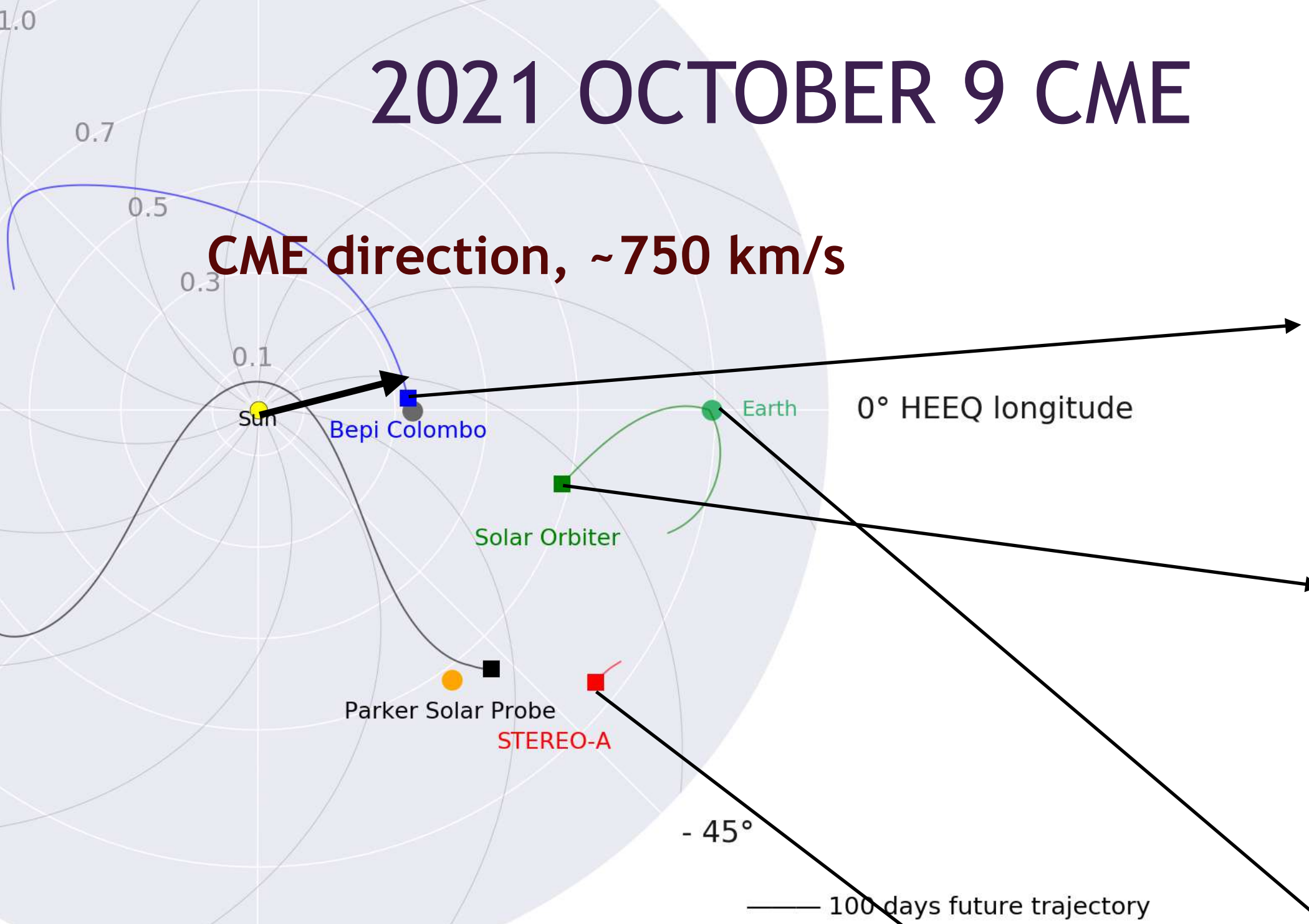
Weiss+ 2022, ApJS, revised

Davies+ 2021 A&A

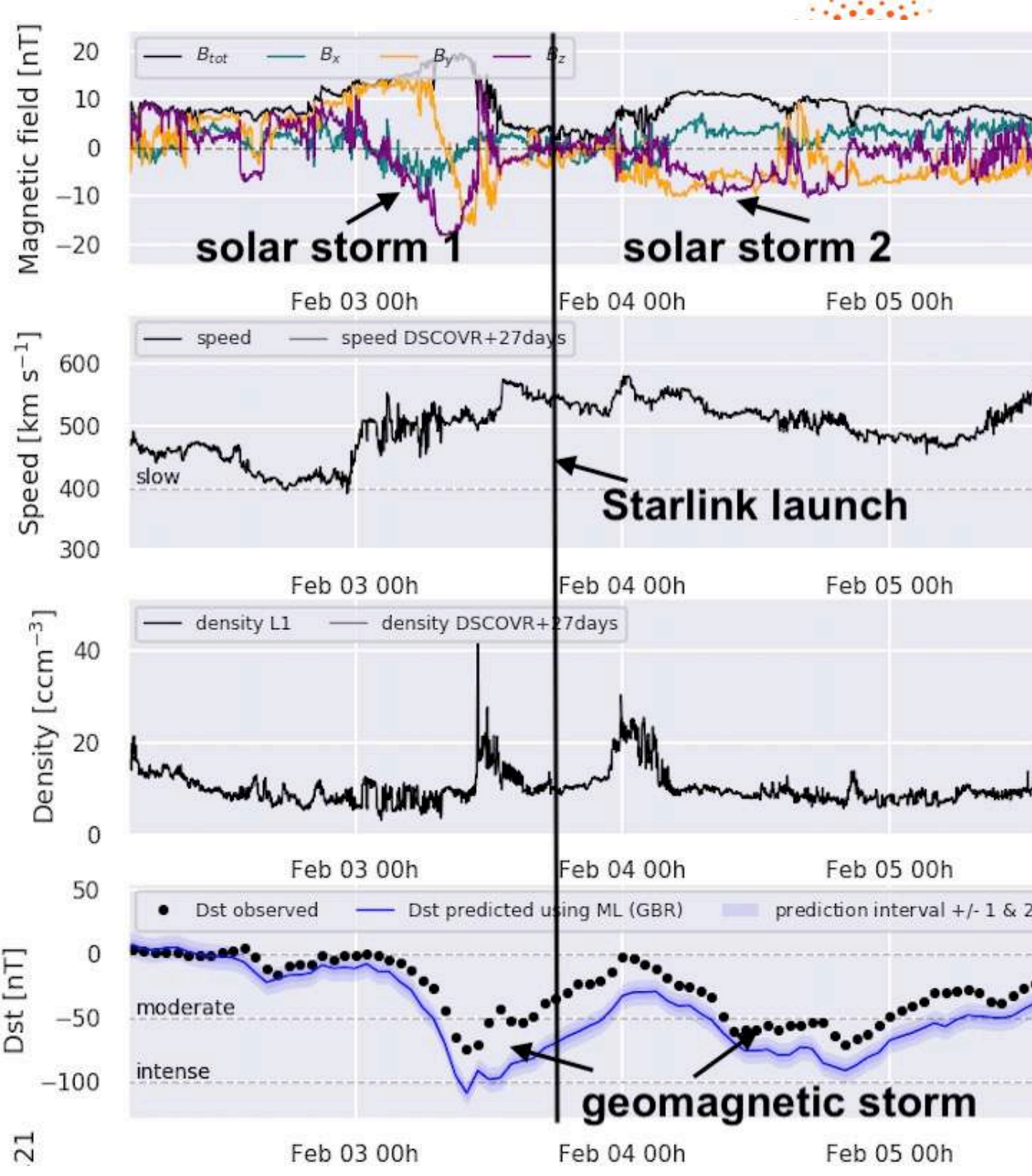
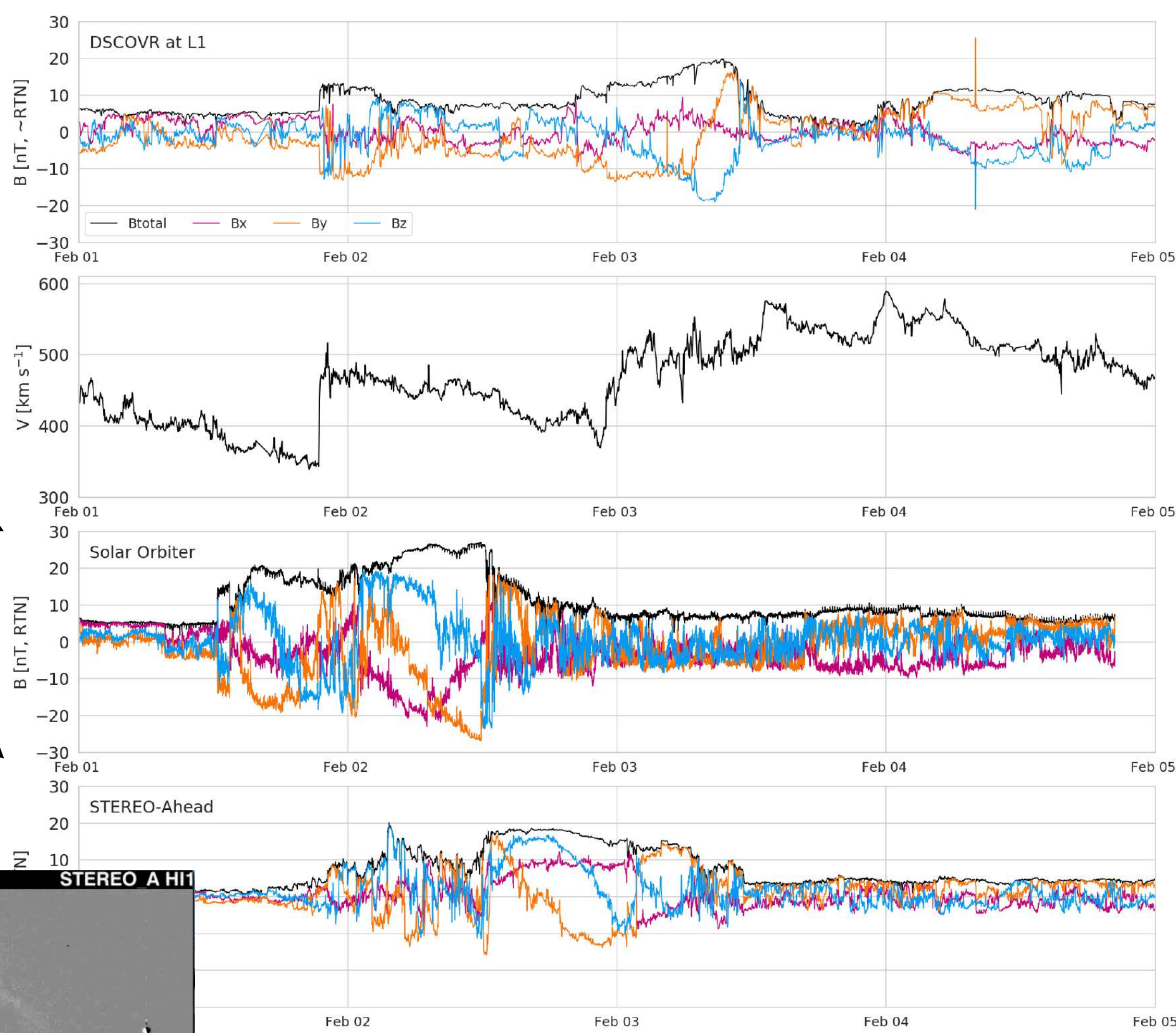
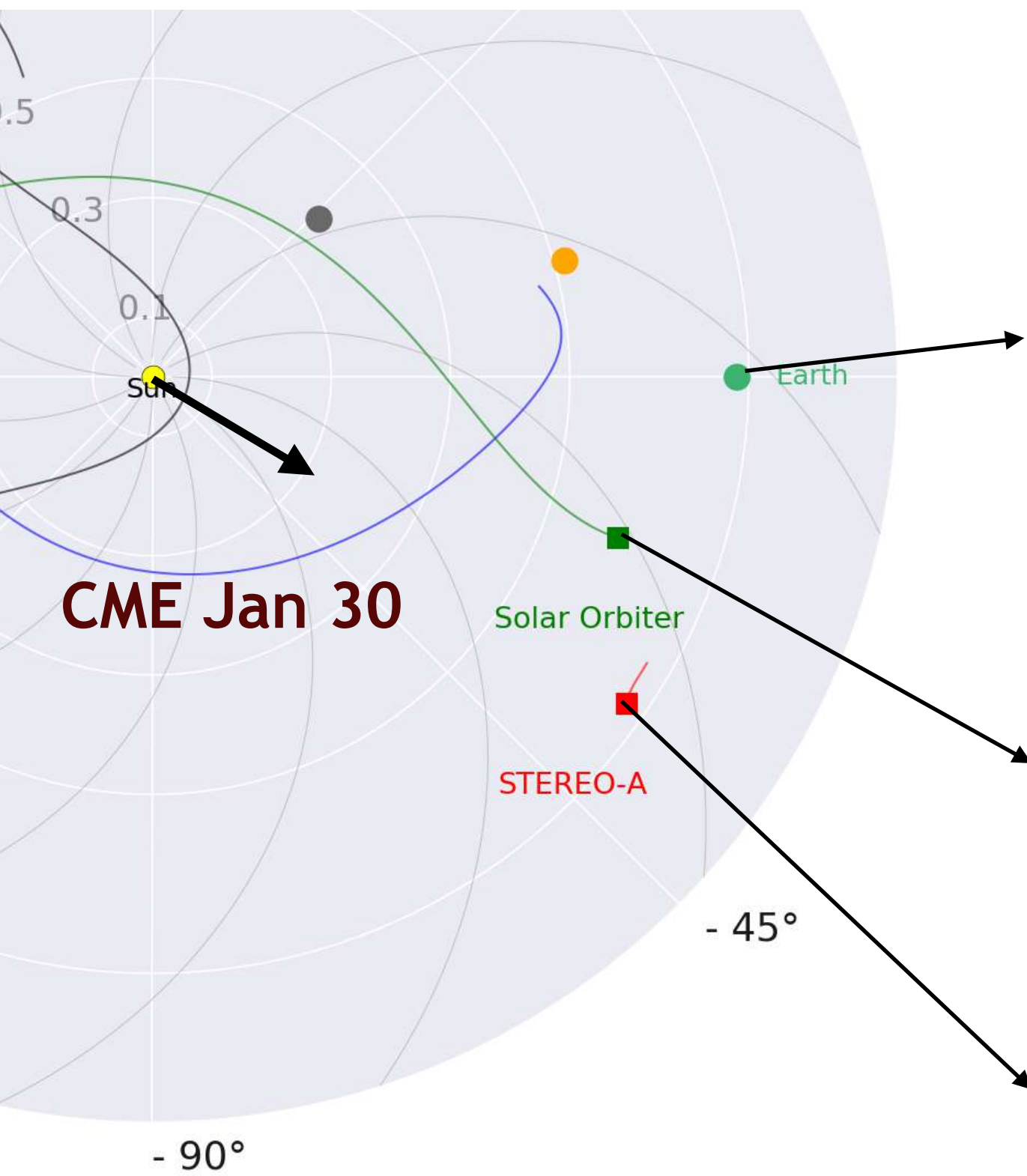
Möstl+ 2020 ApJ

this session ST1.10 18:17

2021 OCTOBER 9 CME

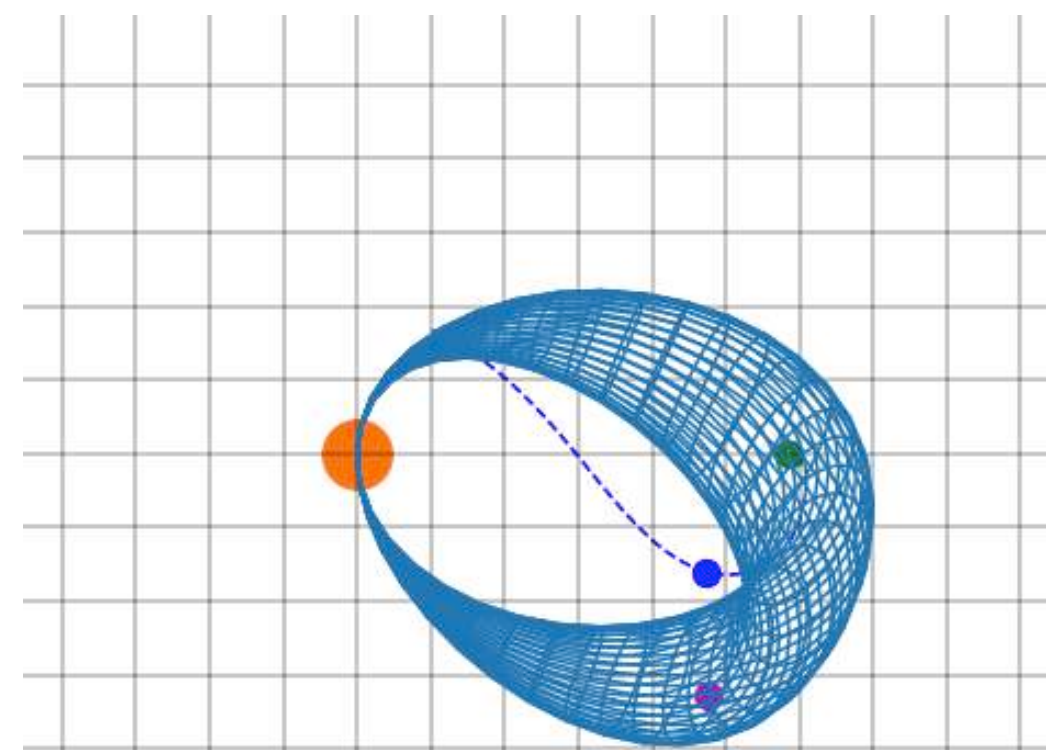
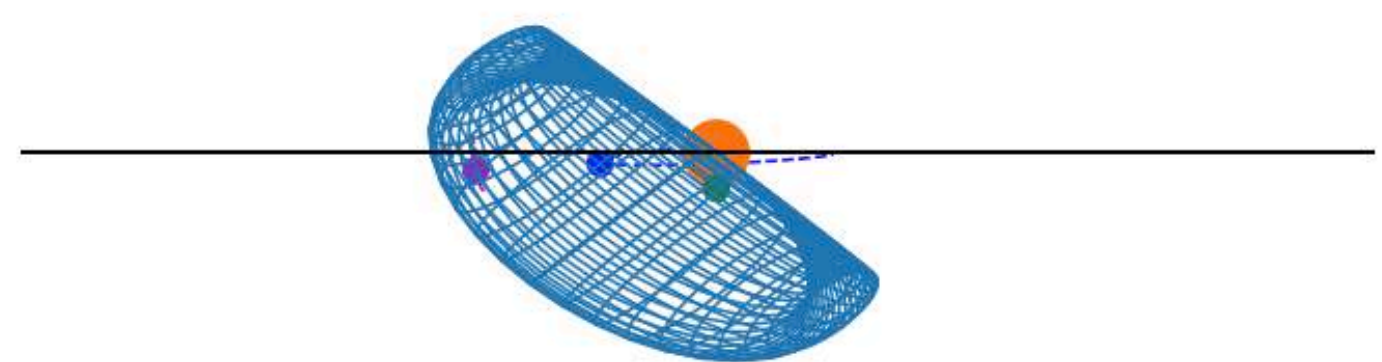
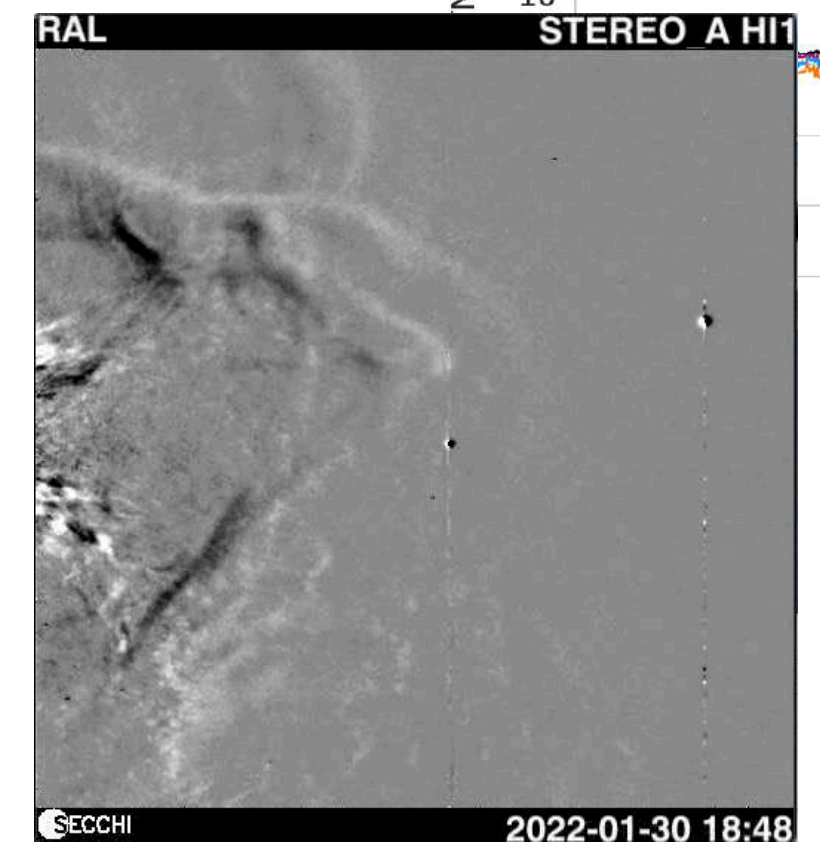
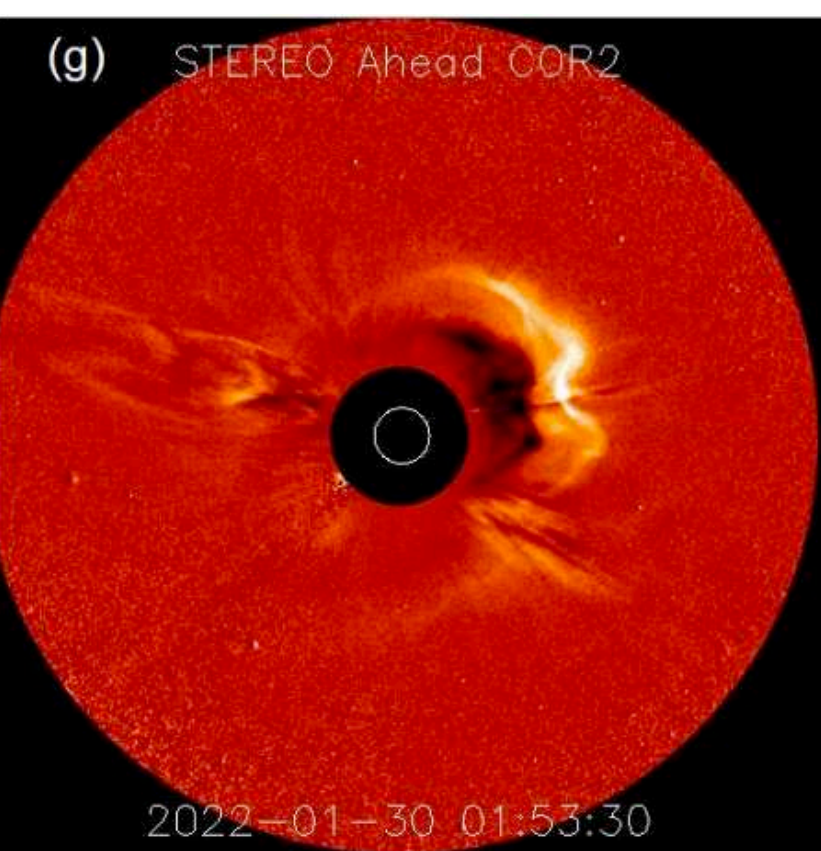


2022 FEB 3 STARLINK EVENT



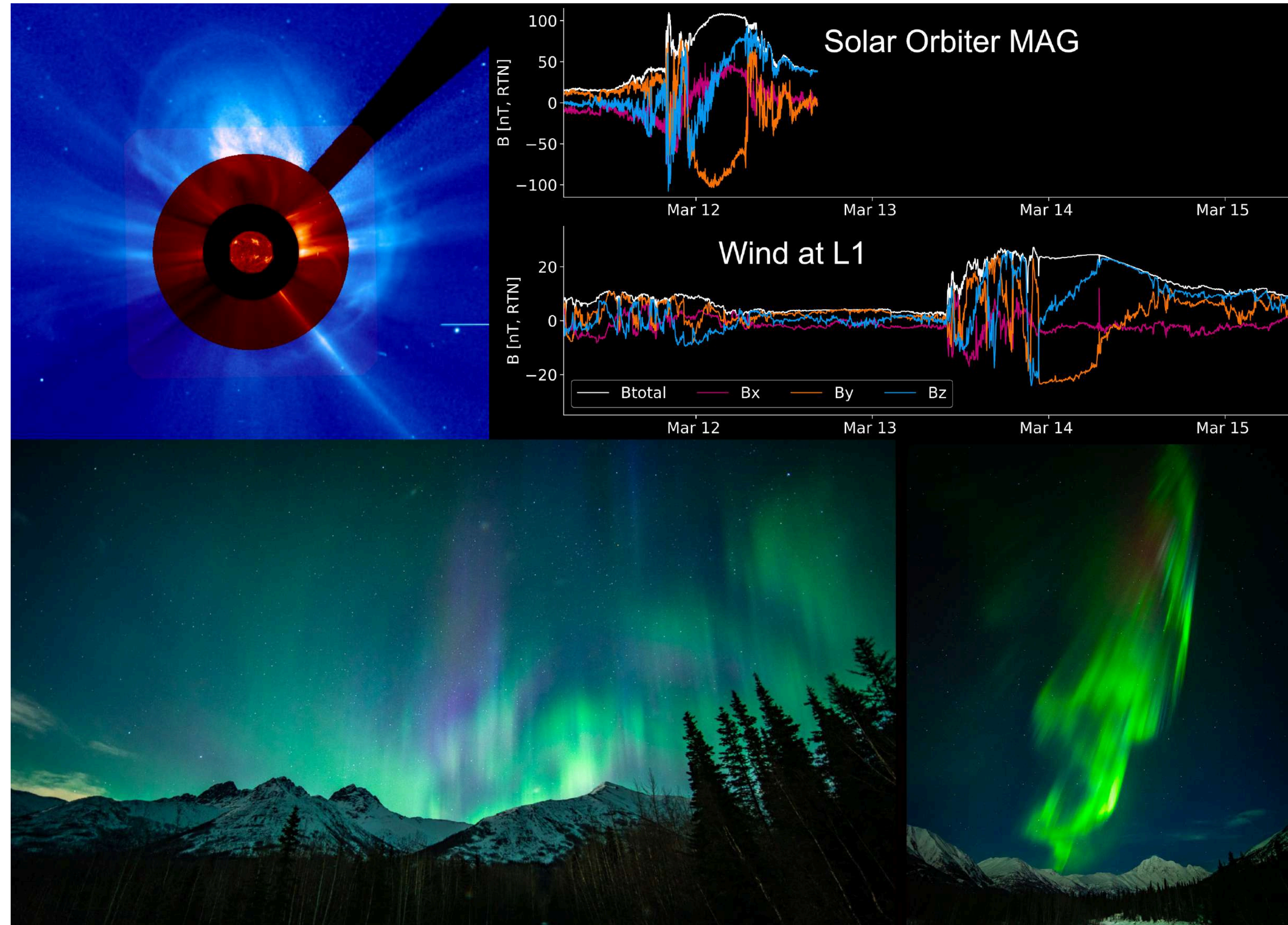
Pal+ 2022 in prep.

Weiss+ 2022 in prep.



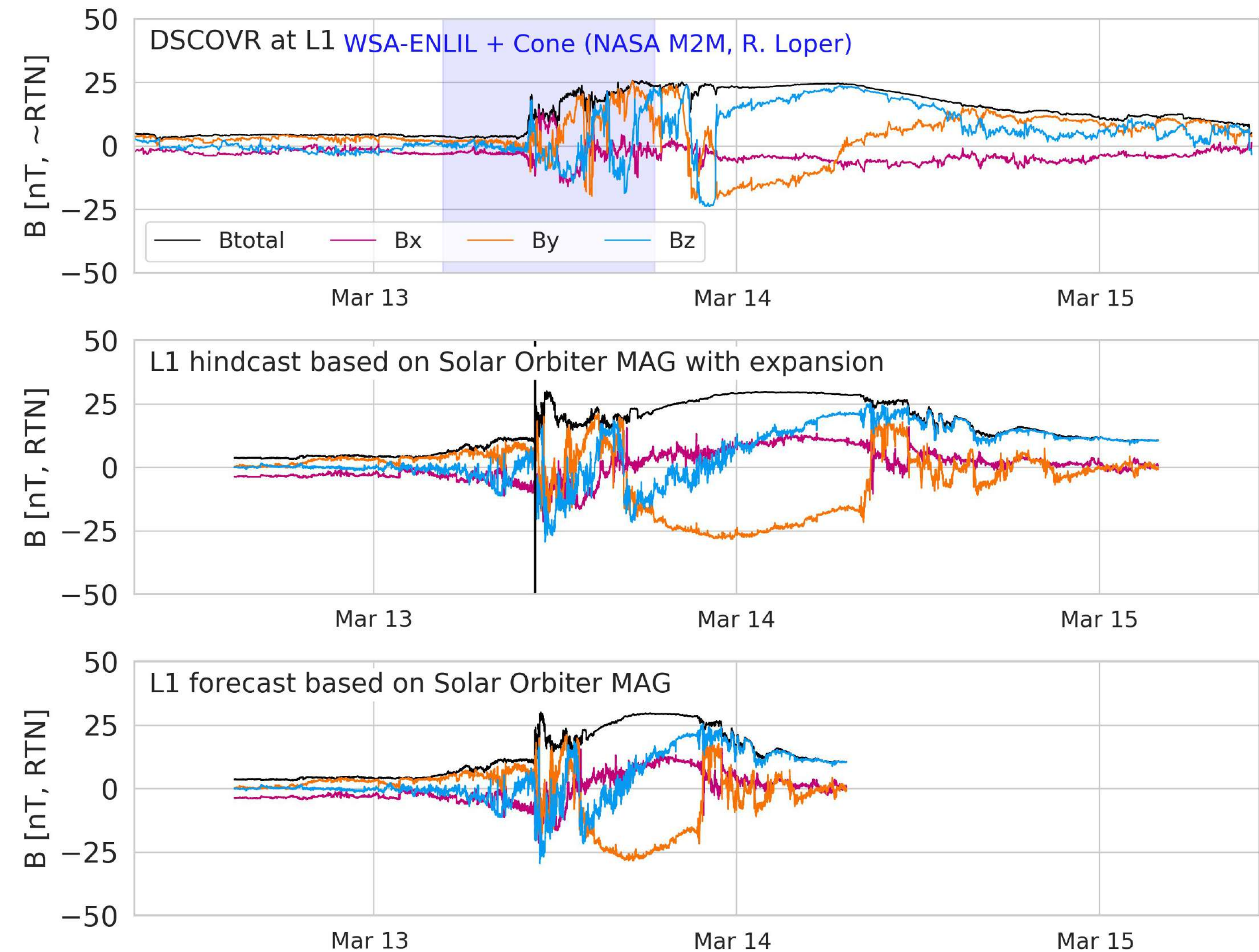
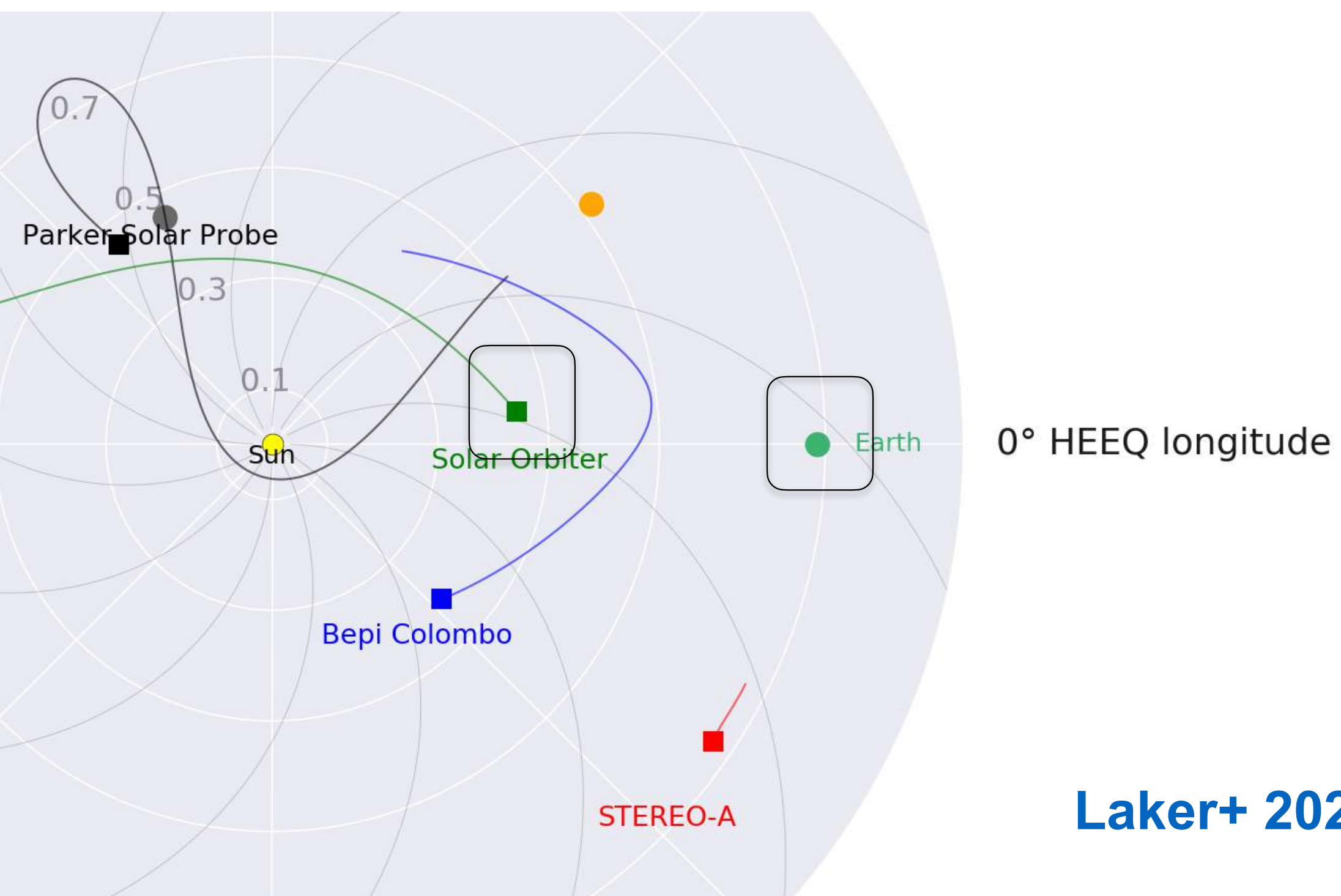
2022 MARCH 10 CME SOLAR ORBITER

- Direct Bz prediction from inner heliospheric observations
- Still unclear how much evolution effects distort Bz (erosion, deflection)
- what longitude difference is ok?
- proof of concepts
[Lindsay+ 1999](#), [Kubicka+ 2016](#)
- **CME 2022 March 10 22:06 UT**
- **Earth arrival on March 13**
- **Dst min -85 nT, moderate geomag. storm**
- 1 per year opportunity with SolO near the Sun-Earth line
- Solar Orbiter MAG team managed to get data in real time before CME arrival!



2022 MARCH 10 CME SOLAR ORBITER

- **Tim Horbury / Imperial College** [@SolarOrbiterMAG](#)
[@chrisoutofspace](#) [@RonanLaker](#)
- SolO at 0.43 AU, 10 deg west of Earth
- forecast tweeted on March 12 18:26 UT, CME arrived on March 13 10:11 UT
- Bz behavior largely correct
- Maximum CME field: pred 30.1, obs 25.7 nT
- Minimum CME Bz: pred. 25.6, obs. 23.7 nT



Laker+ 2022 in prep.

Möstl et al. 2022 (ApJL)

<https://arxiv.org/abs/2109.07200>

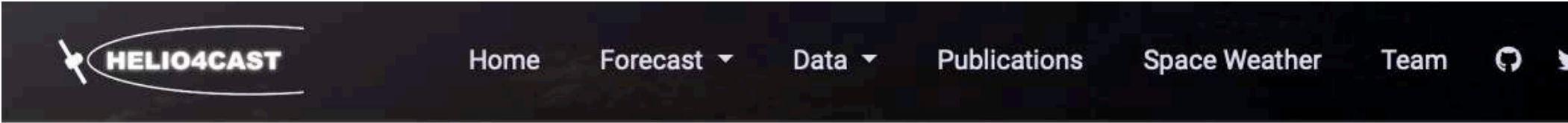
<https://helioforecast.space/lineups>

Based on

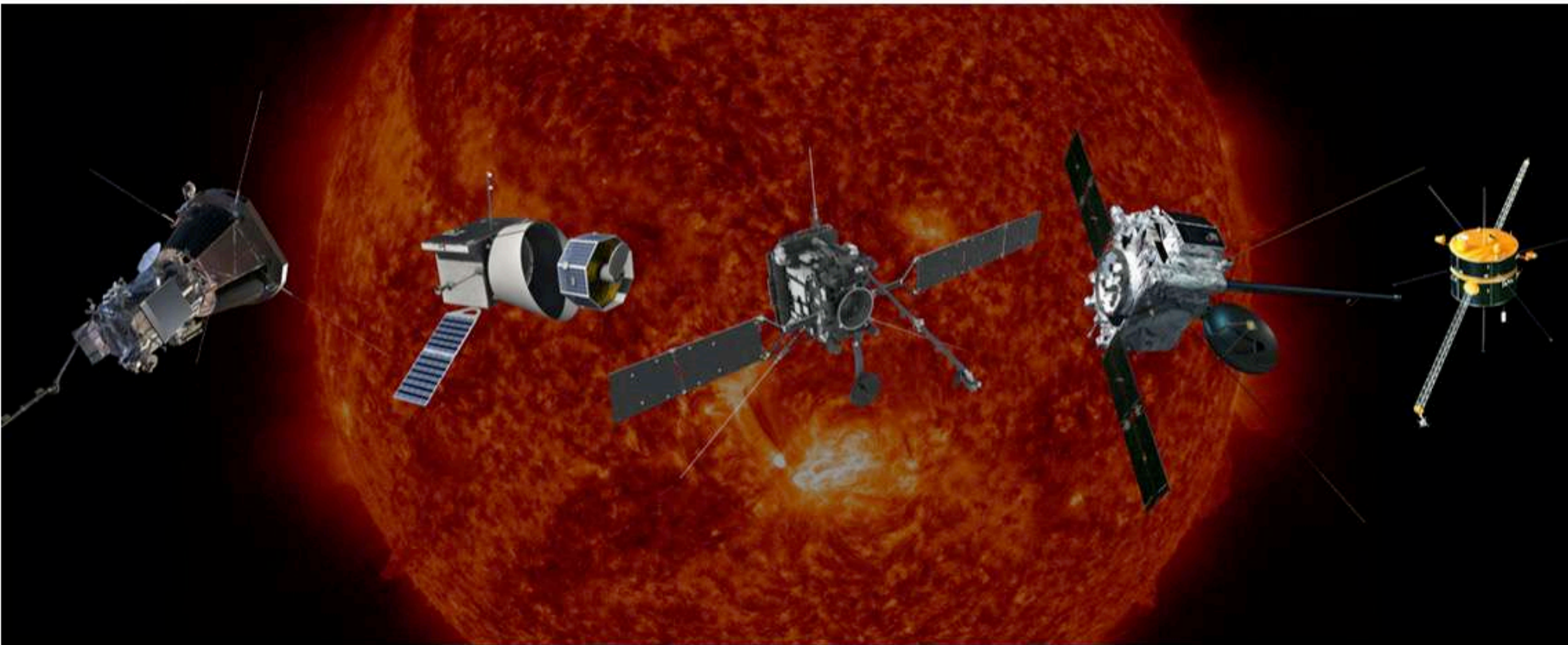
- HELCATS HIGeoCAT - direction, speeds of CMEs STEREO-A HIRAL: Barnes, Davies, Harrison
https://www.helcats-fp7.eu/catalogues/wp3_cat.html
- HELIO4CAST ICMECAT living catalog, 1073 events
<https://helioforecast.space/icmecat>

Each lineup event is at least observed by 2 spacecraft, but by at least 1 spacecraft in situ.

covers April 2020 - April 2021, living catalog



ICME lineups - a catalog of multipoint solar storm observations



This is the HELIO4CAST multipoint interplanetary coronal mass ejection (ICME) catalog. **This is version 1.0, released 2021-**

Show entries

Search:

#	event	event_start_time	spacecraft	sc_helioidistance	sc_heelon	cme_heelon	speed	mo_bmax	mo_bzmin	id
0	1	2020-04-15 20:49	HIA	0.967	-75.4	-6	339	-	-	HCME_A_20200415_01
1	1	2020-04-19 05:06	SolarOrbiter	0.808	-4.0	-	-	21.2	-19.2	ICME_SOLO_MOESTL_20200419_01
2	1	2020-04-20 01:34	Wind	0.996	0.2	-	346	16.2	-15.1	ICME_Wind_MOESTL_20200420_01
3	1	2020-04-20 03:09	BepiColombo	1.011	-1.3	-	-	16.1	-14.4	ICME_BEPI_MOESTL_20200420_01
4	2	2020-05-26 01:29	HIA	0.966	-72.3	36	497	-	-	HCME_A_20200526_01
5	2	2020-05-28 12:45	SolarOrbiter	0.564	28.2	-	-	28.2	-26.6	ICME_SOLO_MOESTL_20200528_01
6	2	2020-05-29 21:20	Wind	1.005	-0.2	-	350	14.5	-12.4	ICME_Wind_MOESTL_20200529_01
7	2	2020-05-29 15:27	BepiColombo	0.977	-5.2	-	-	13.1	-11.5	ICME_BEPI_MOESTL_20200529_01
8	3	2020-05-27 04:49	HIA	0.966	-72.2	-47	315	-	-	HCME_A_20200527_01
9	3	2020-06-03 07:54	STEREO-A	0.965	-71.5	-	373	9.9	-4.6	ICME_STEREO_A_MOESTL_20200603_01

Showing 1 to 10 of 44 entries

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