Eruption and Interplanetary Evolution of a Stealthy Streamer-Blowout CME Observed by PSP at ~ 0.5 AU

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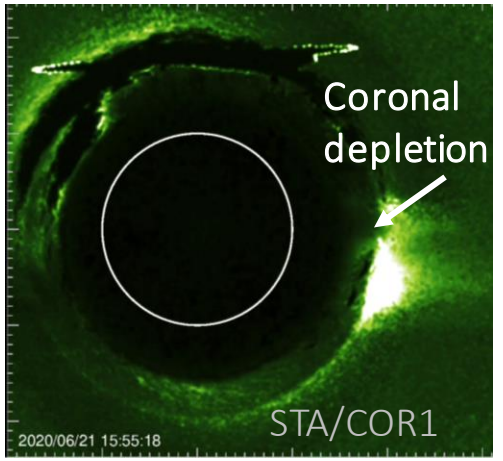
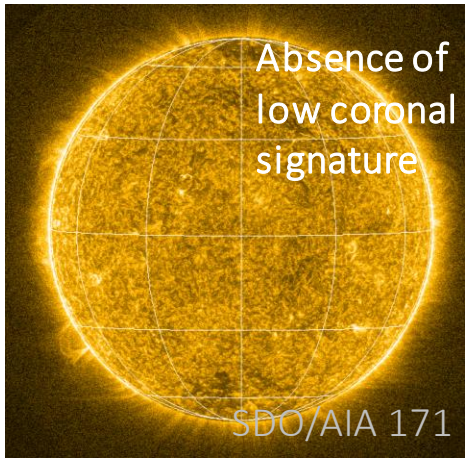
Solar observation of a stealthy Streamer blowout CME

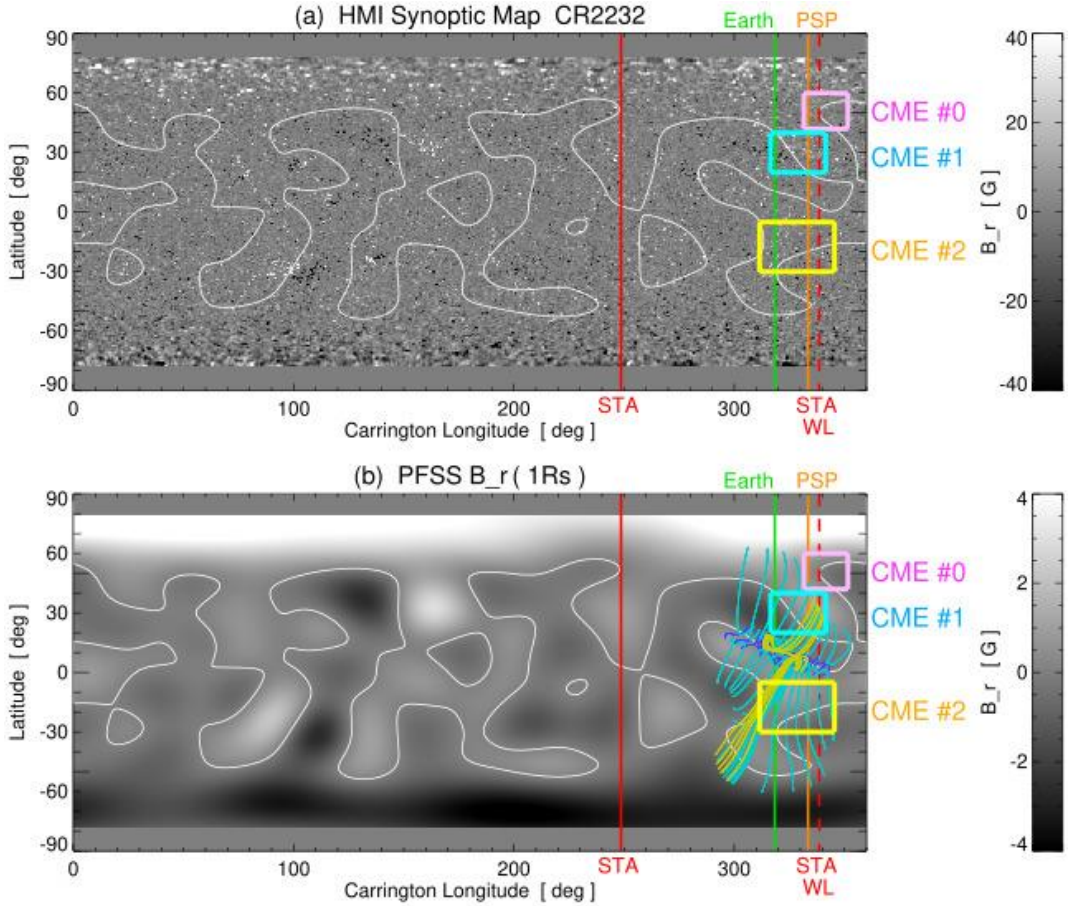
- In the solar corona prior to the event, the overlying streamer gradually swelled (STA/COR1and COR2 observation shows)
- Afterwards a depletion region was detected in the solar corona (STA/COR1observation shows)
- CME location mostly followed the tilt of the heliospheric current sheet (GCS and ForeCAT coronal modelling shows (Palmerio et al. 2021))
- The CME lacked classic low-coronal signatures (SDO/AIA observation shows)--stealth CME
- The CME appeared as a limb event with classical 3 -part structure (STA/COR2 observation shows) on June 22, 2020

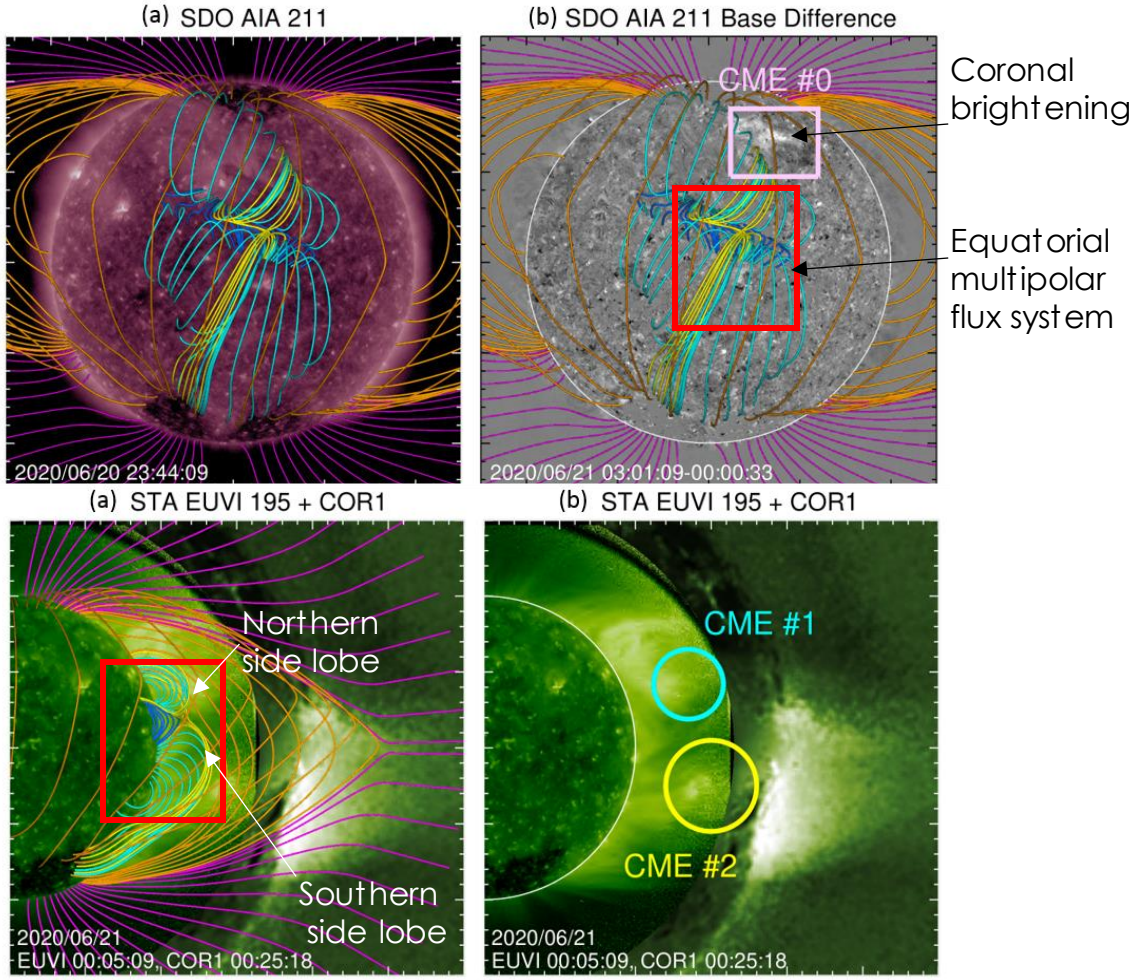




Initiation of the SBO-CME preceded by sequential eruptions

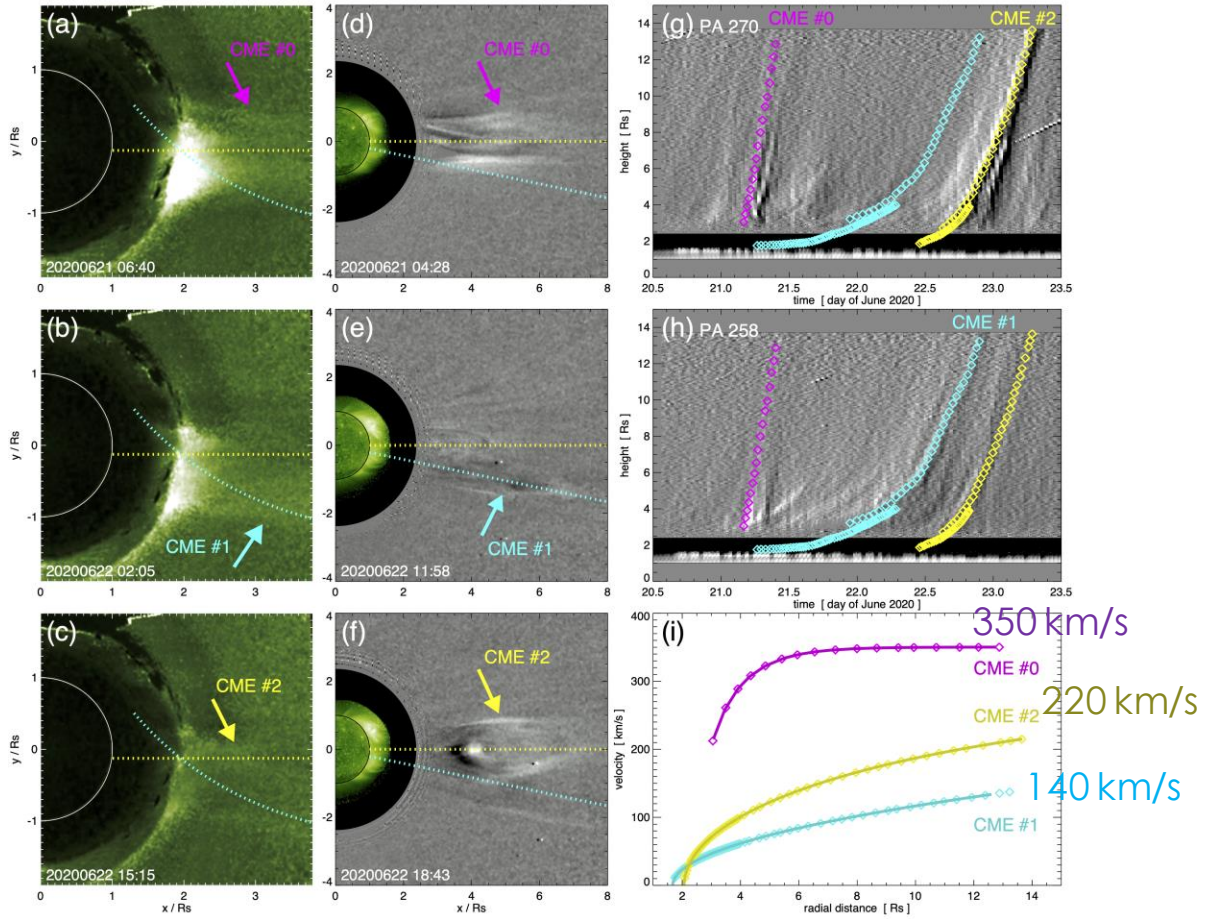
- Off-limb STA/EUVI, COR1, and COR2 imagery and the photospheric magnetic field extrapolation reveal that The SBO CME (CME #2) was preceded by two sequential eruptions -- CME#0 and CME#1.
- Source of CME #0 located outside and to the northwest of the equatorial multipolar flux system originating CME #1 and #2.



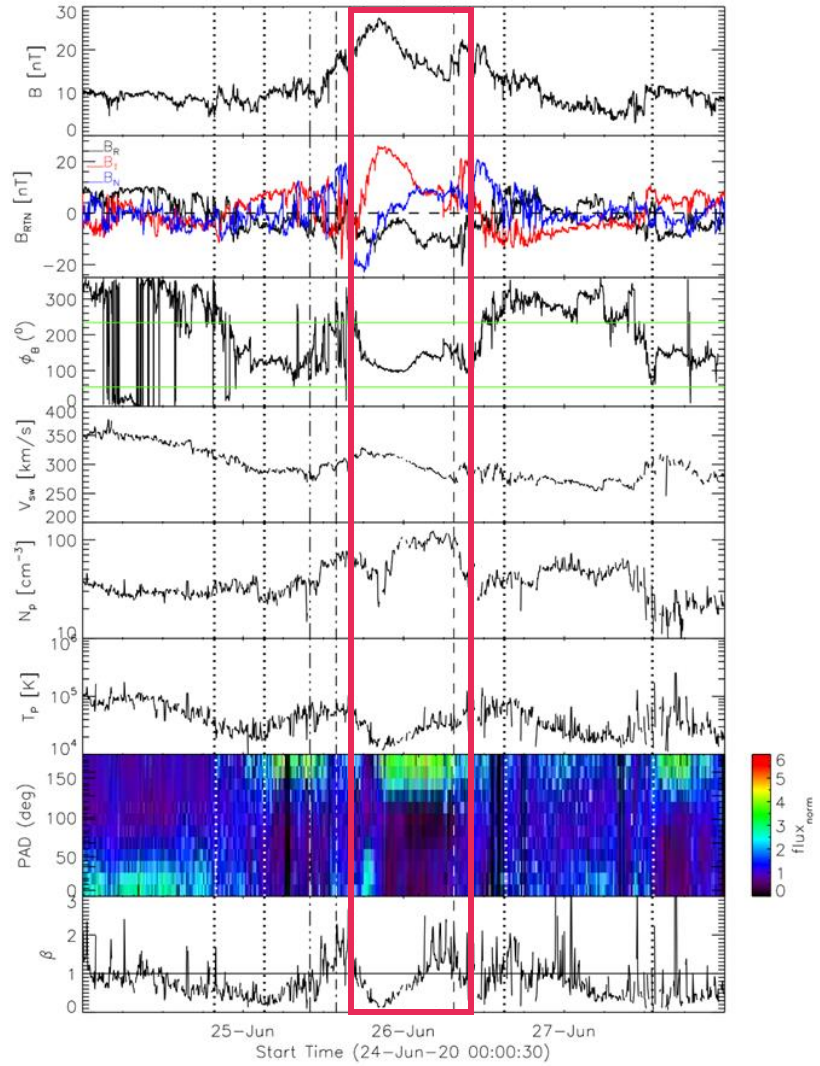


Heliospheric observations of the sequential CMEs

- STA/HI observation shows CME #0 speed> CME #2 speed> CME #1 speed at 14 Rs.
- Only the SBO CME was identified with flux rope structure by the Parker Solar Probe at ~0.5 AU



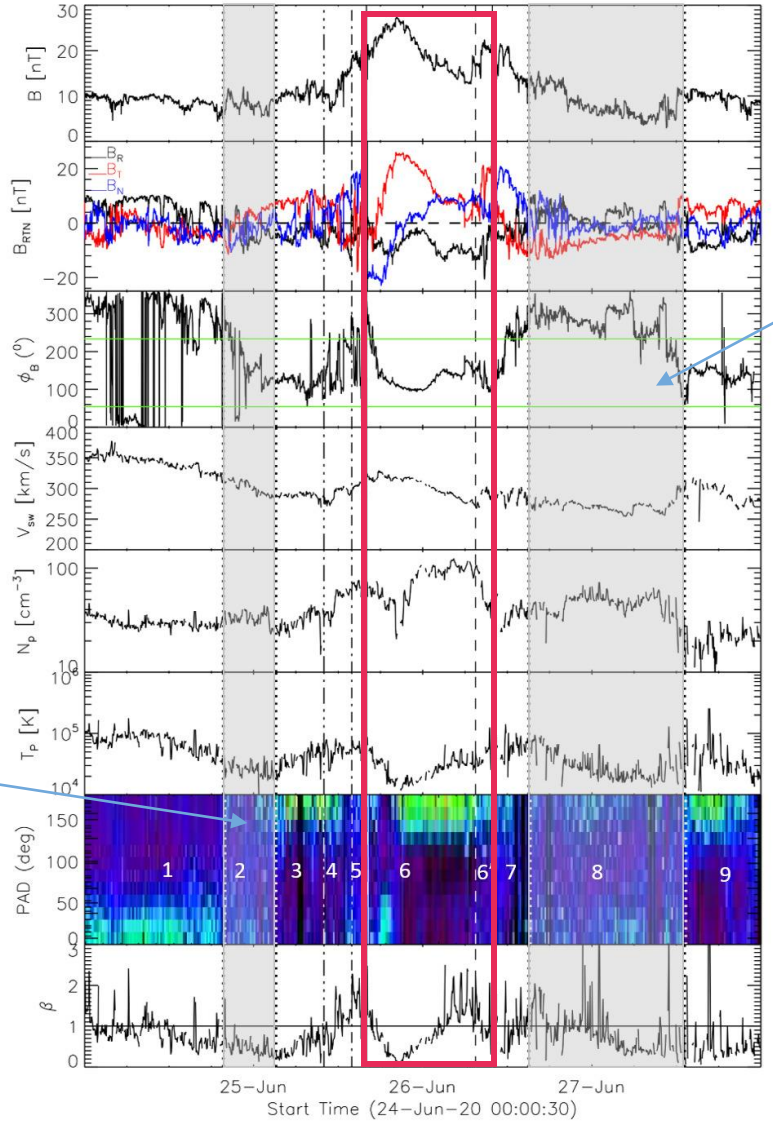
Coronal dynamics for each of the three sequential CMEs



PSP's In situ observation of the SBO-CME at ~0.5 AU

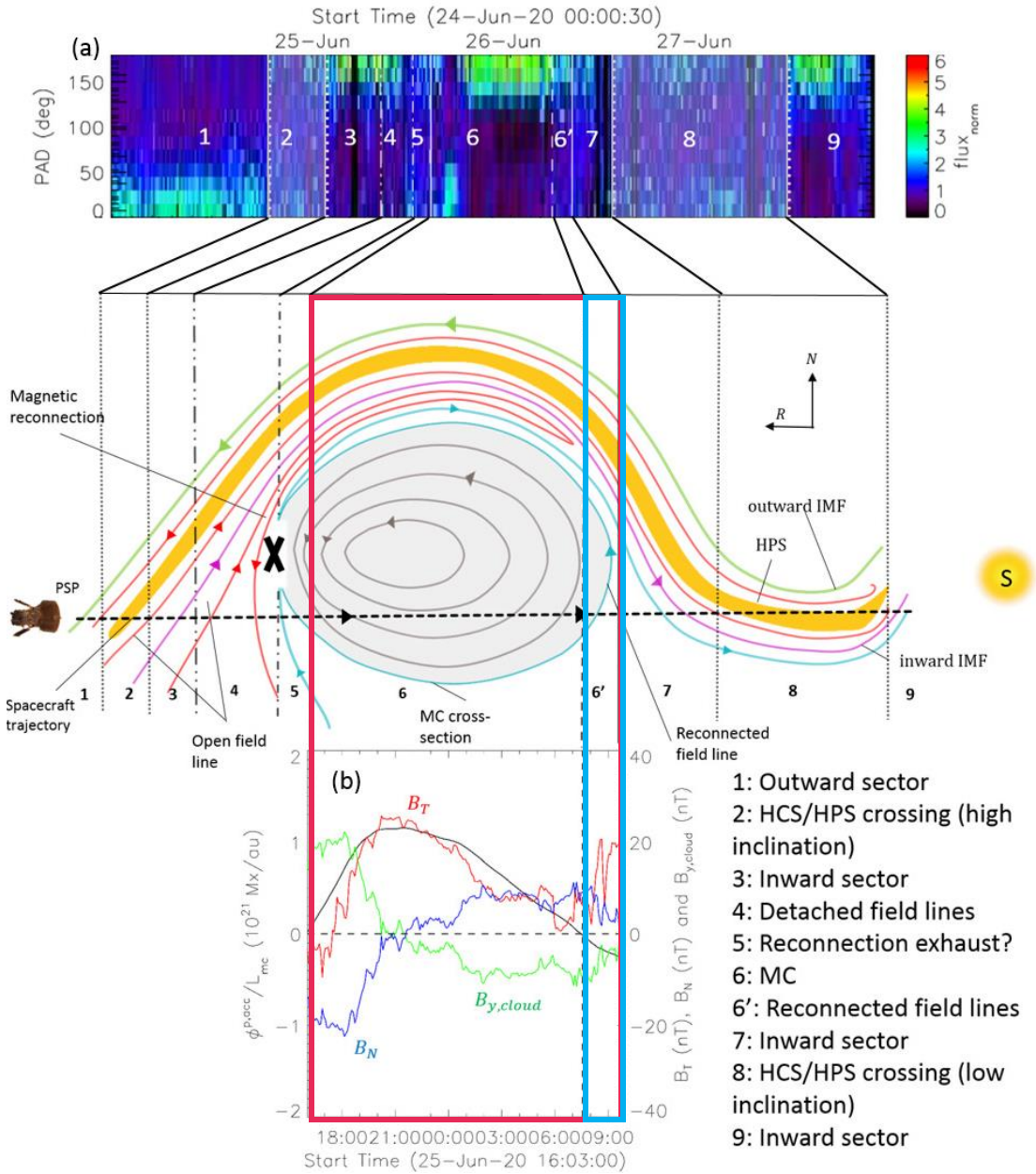
SBO-CME adjacent interplanetary structures at ~0.5 AU

- In situ probing shows heliospheric large-scale structure – heliospheric current sheet, plasma sheet -- draped about the CME flux rope resulting CME erosion.



Isotropic PAD +peak in beta + phi_B hovering between sector boundary --> HCS/HPS encounter

True sector boundary + isotropic PAD + elevated beta with duration of mins --> HCS/HPS crossing



Schematic of IMF draping and flux asymmetry analysis at ~0.5 AU

Summary and Conclusions

- The SBO CME eruption was part of a multi-stage, sequential (and most likely sympathetic) eruption scenario (Lynch and Edmondson 2013).
- PSP witnessed the draping of heliospheric field lines and HCS/HPS about the SBO CME flux rope at 0.5 AU.
- Inclination (~29◦) of HCS behind the CME was smaller than the inclination(~41◦) of plasma sheet in front of the CME – the CME had an asymmetric, expanding, and non-circular FR structure.
- Draped heiospheric field lines had magnetic reconnection with the CME flux rope resulted in erosion of ~18±11% of the CME's azimuthal flux.
- Analyzing the MC's back region populated with reconnected field lines, we estimated that the reconnection initiated after a heliocentric distance of ~0.35 AU.

For more details on this work, please scan

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This event has importance from several different perspectives for more details visit

- Palmerio et al. 2021, ApJ, 109
- Möstl et al. 2022, ApJL, 924:L6 (ST1.10 EGU22-1964)