The May 22-23, 2007 ICME: STEREO and L1 observations

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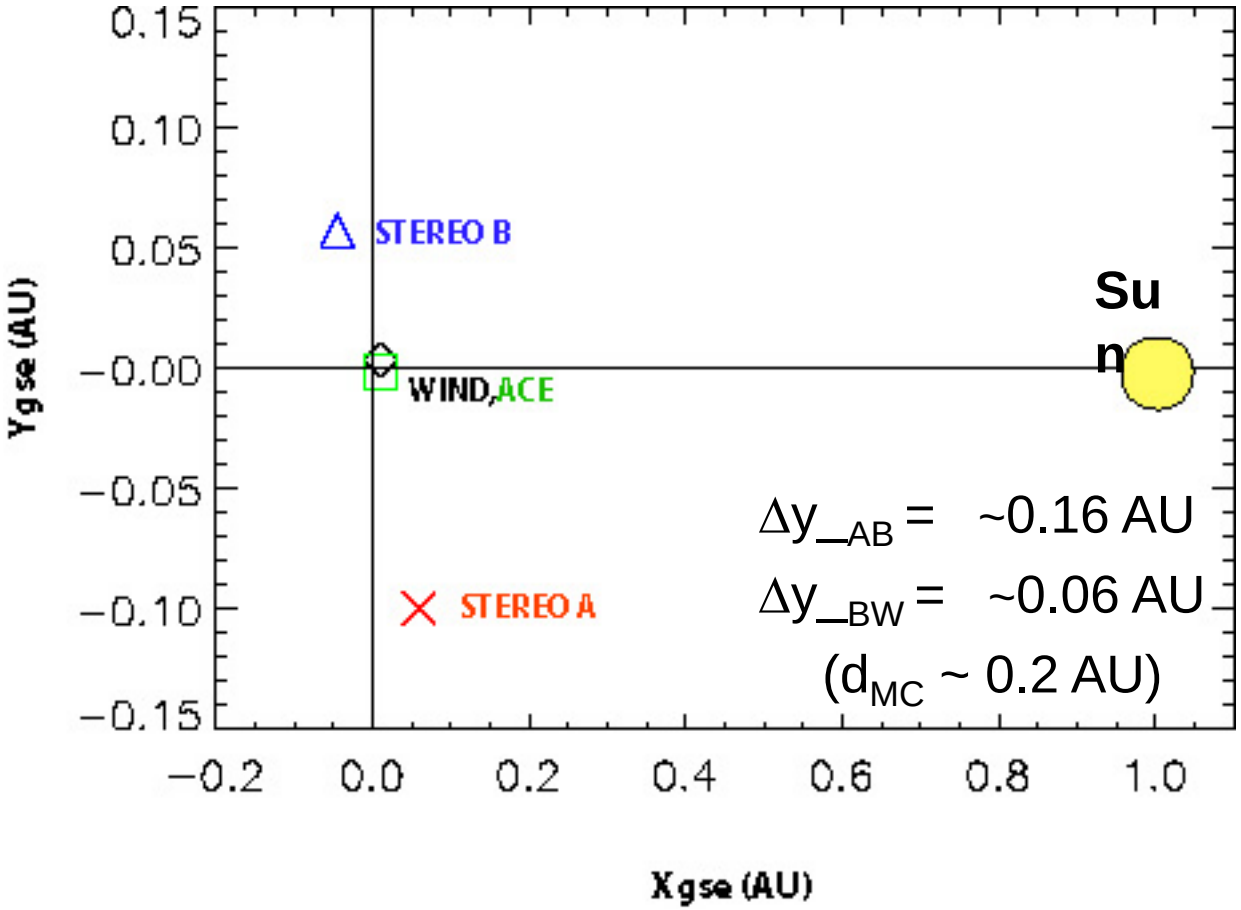
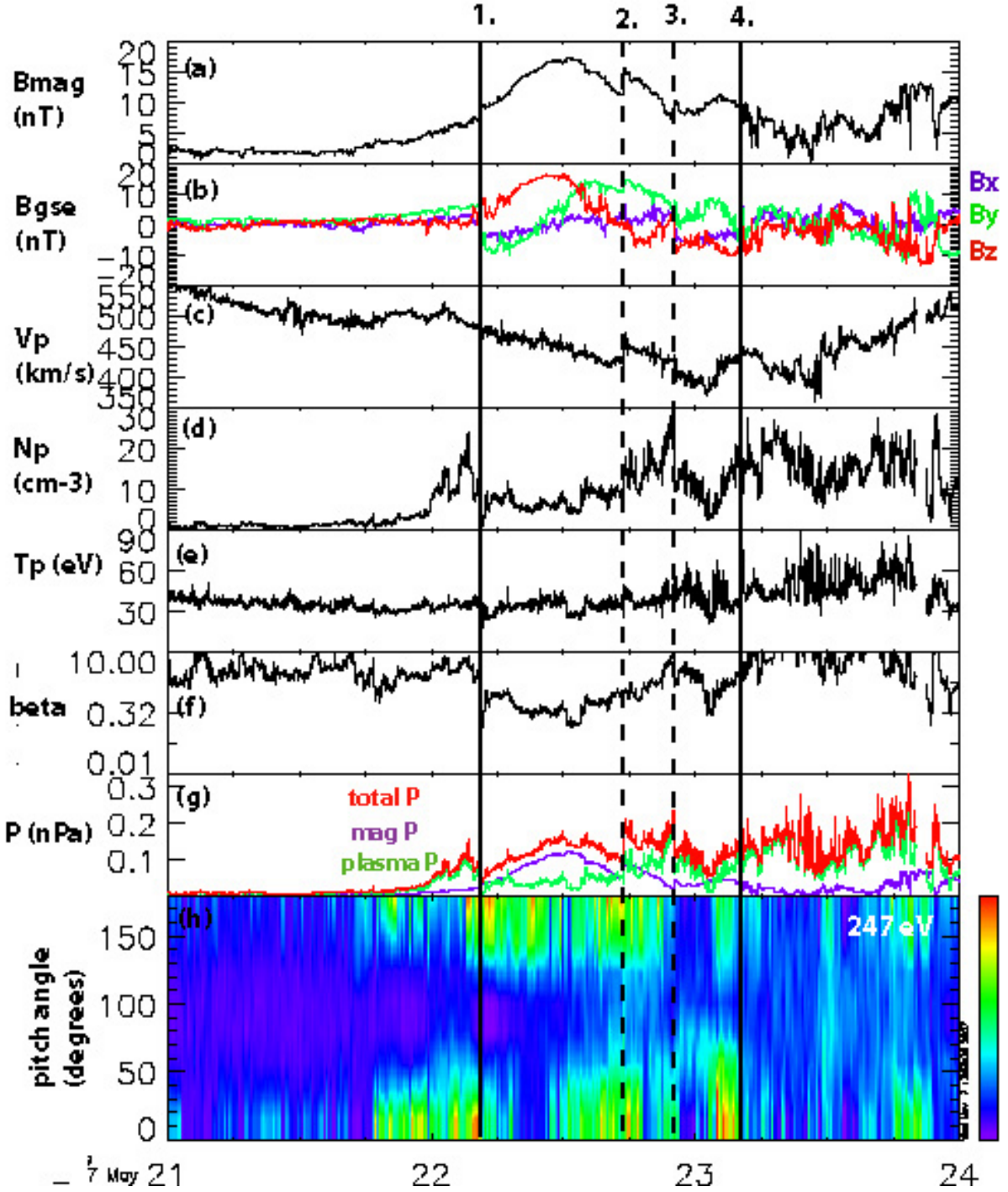
Locations of the STEREO and L1 satellites on May 22, 2007



angular separation between STEREO satellites 9.1˚



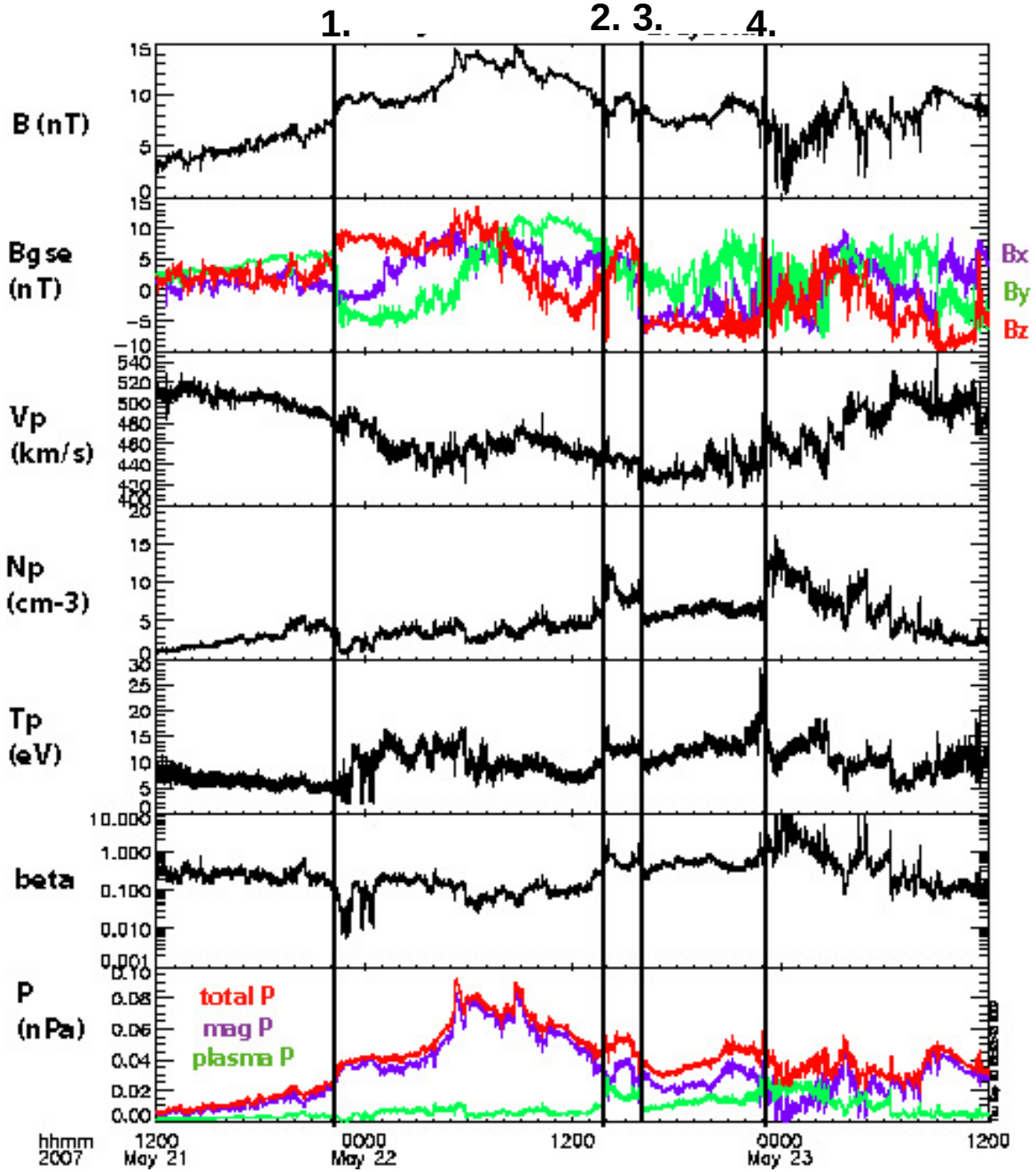
STEREO B

t = ~16 h (1.-3.)
d = ~0.16 AU

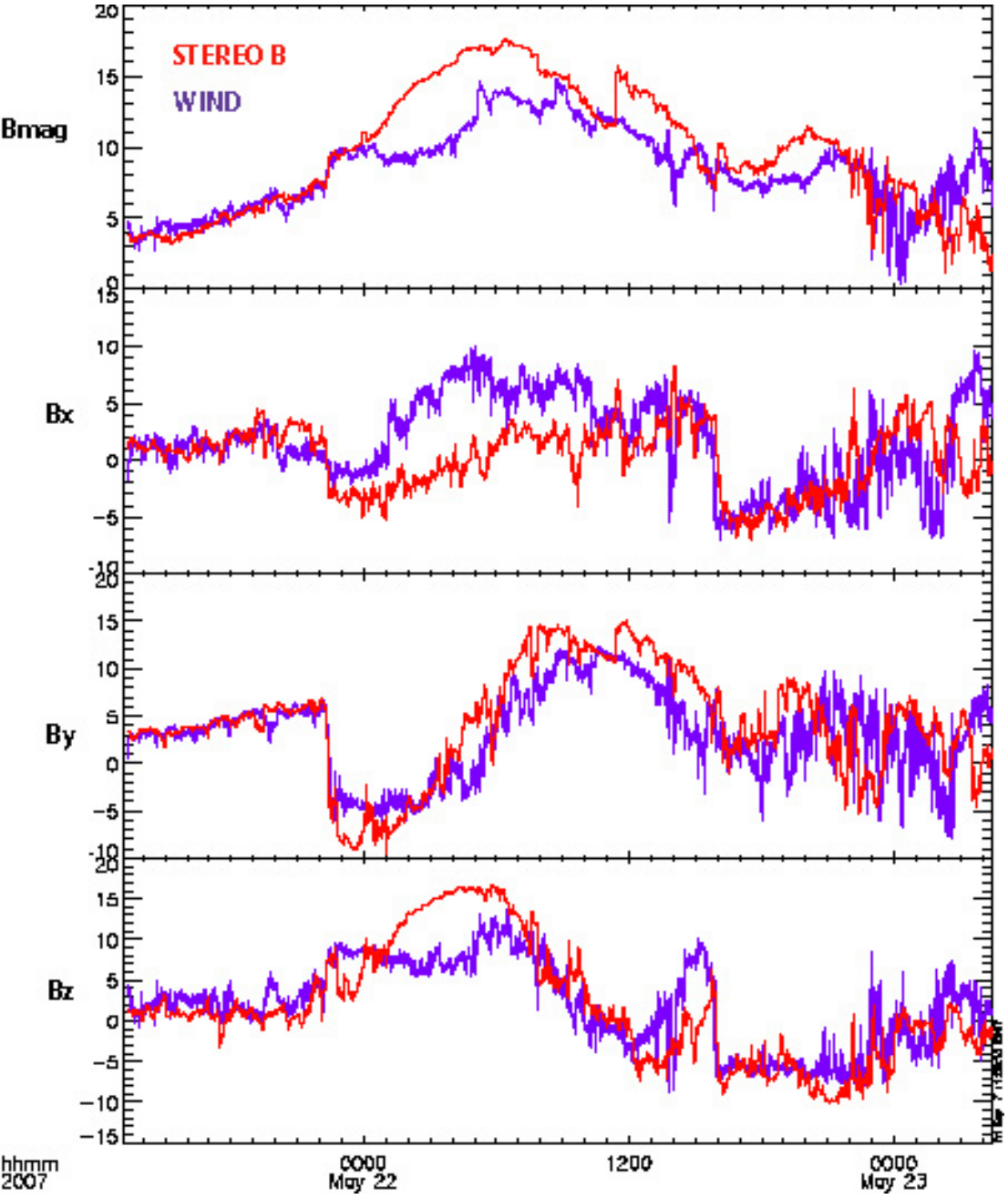
1. leading edge
2. shock-like feature

Ns = (0.86,-0.50,-0.13)
Vs = 493.4 km/s
(courtesy of Charles Farrugia)

WIND



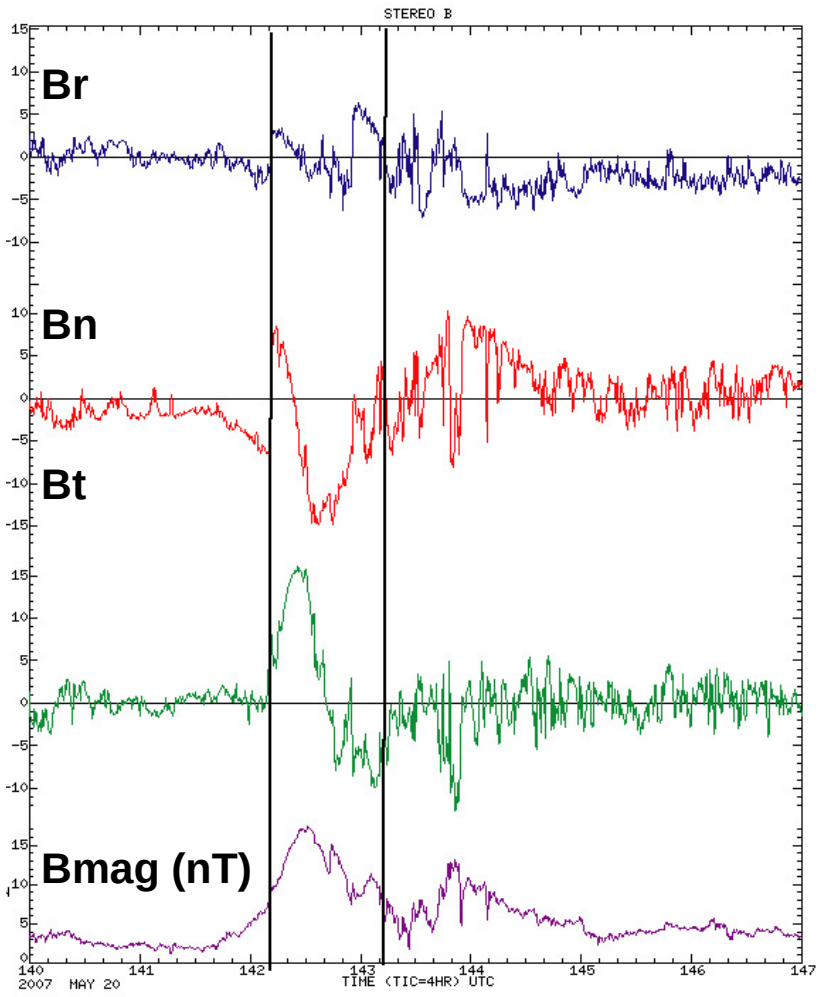
no shock +
Bz northward
→ no severe
geomagnetic response
(Dst > -50 nT, Kp < 5)

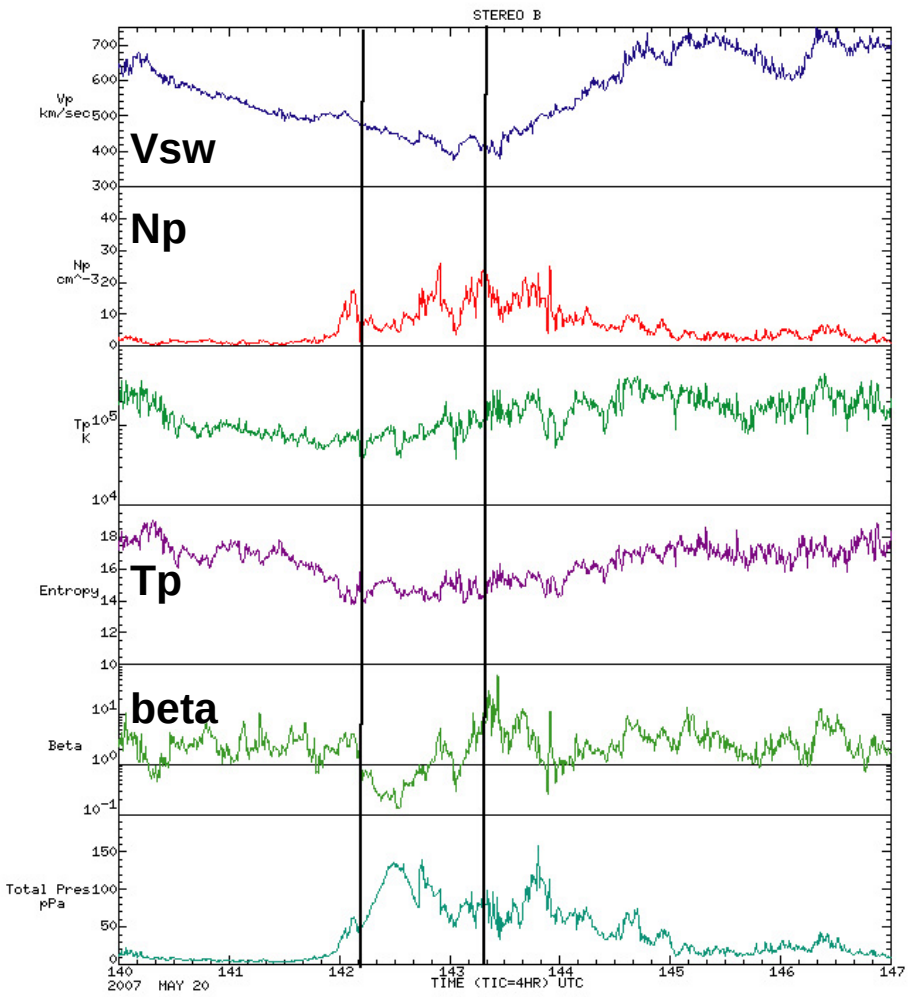


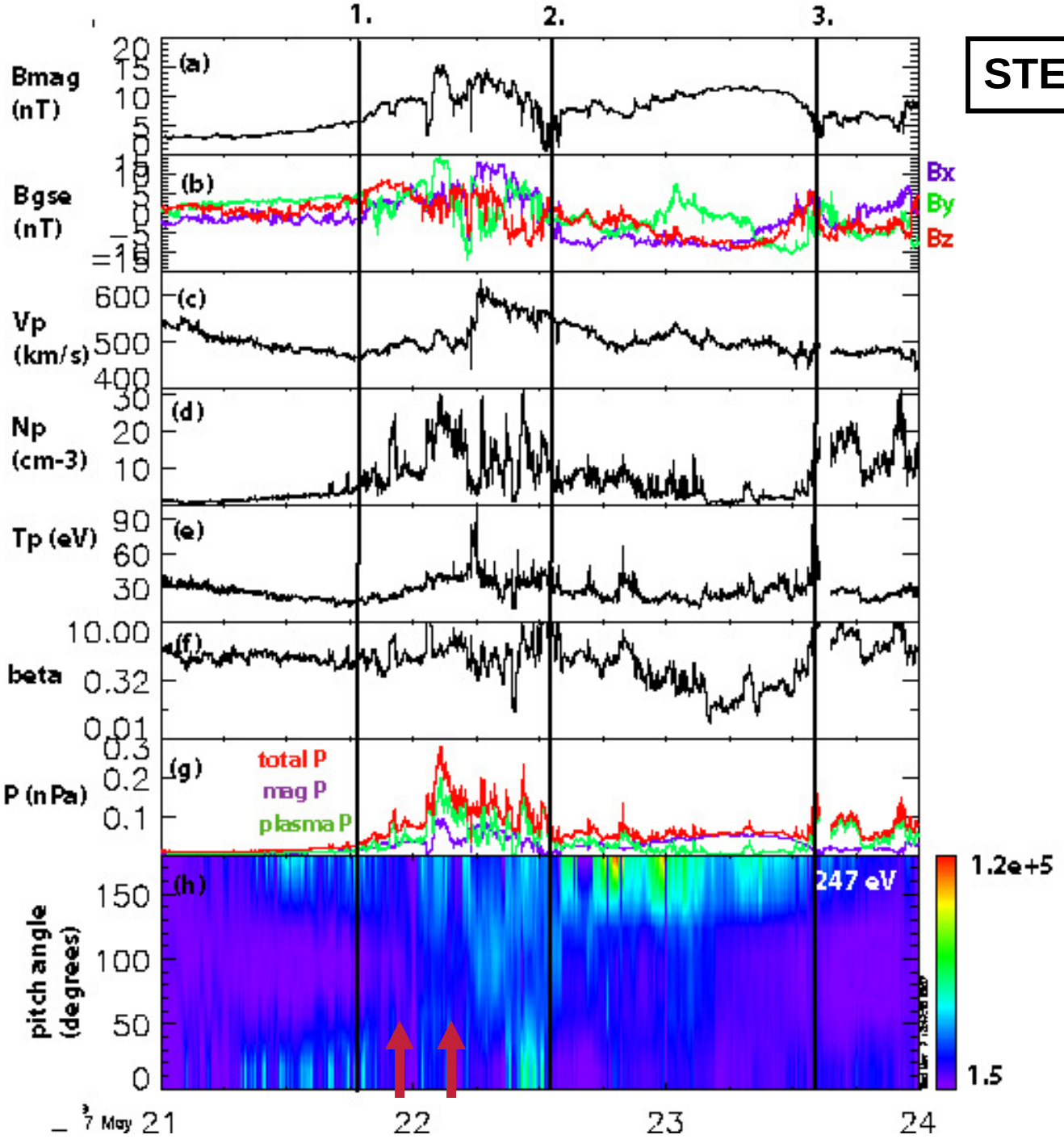
Aligning the leading edge:
Δt_{BW} = 6.07 h
Δx_{BW} = ~0.055 AU
$\rightarrow$376 km/s

time for the shock-like feature to propagate from Wind to STEREO B:
2.3 hours < convection time

STEREO B


UCLA IGPP 2007
STEREO B
Br
Bn
Bt
Bmag (nT)
2007 MAY 20
TIME (TIC=4HR) UTC


UCLA IGPP 2007 NOV 13
STEREO B
Vp km/sec
Vsw
Np cm^-3
Np
Tp K
Tp
Entropy
beta
Beta
Total Pres pPa
2007 MAY 20
TIME (TIC=4HR) UTC

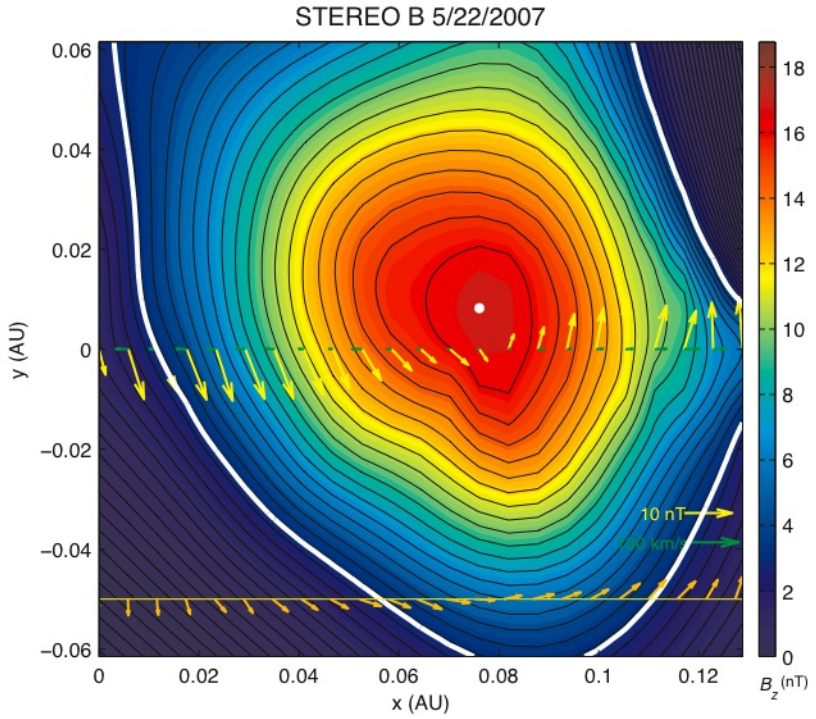

STEREO A
1.
2.
3.
Bmag (nT)
(a)
Bgse (nT)
(b)
Bx
By
Bz
Vp (km/s)
(c)
Np (cm-3)
(d)
Tp (eV)
(e)
beta
(f)
P (nPa)
(g)
total P
mag P
plasma P
pitch angle (degrees)
(h)
247 eV
1.2e+5
1.5
7 May
21
22
23
24

Structure of the magnetic cloud

- highly inclined magnetic cloud (**WNE**), **left-handed**
- Minimum Variance Analysis: Inclination of the axis higher at STEREO B (~55˚) than at WIND (~46˚).
- Reconstruction of the magnetic cloud using Grad-Shafranov equations (courtesy of Christian Moestl, Charles Farrugia)

STEREO B: θ_{CL} ~ 60˚

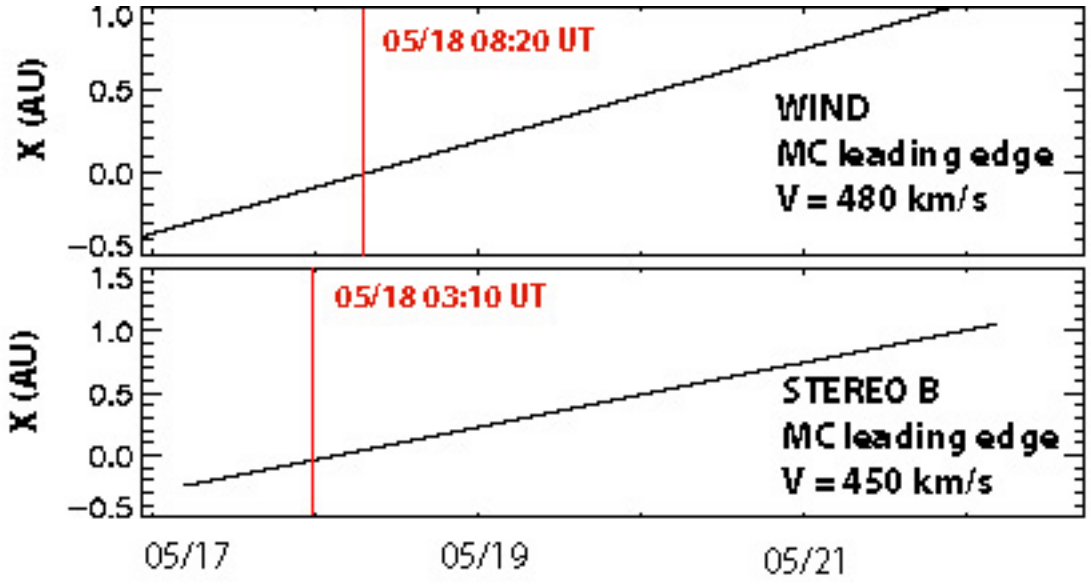
impact parameters:
STEREO B: 0.008 AU
WIND: 0.0507 AU



Under work:

Lundquist, 1950; *Burlaga*, 1988: linear force-free fit.

Associated solar activity



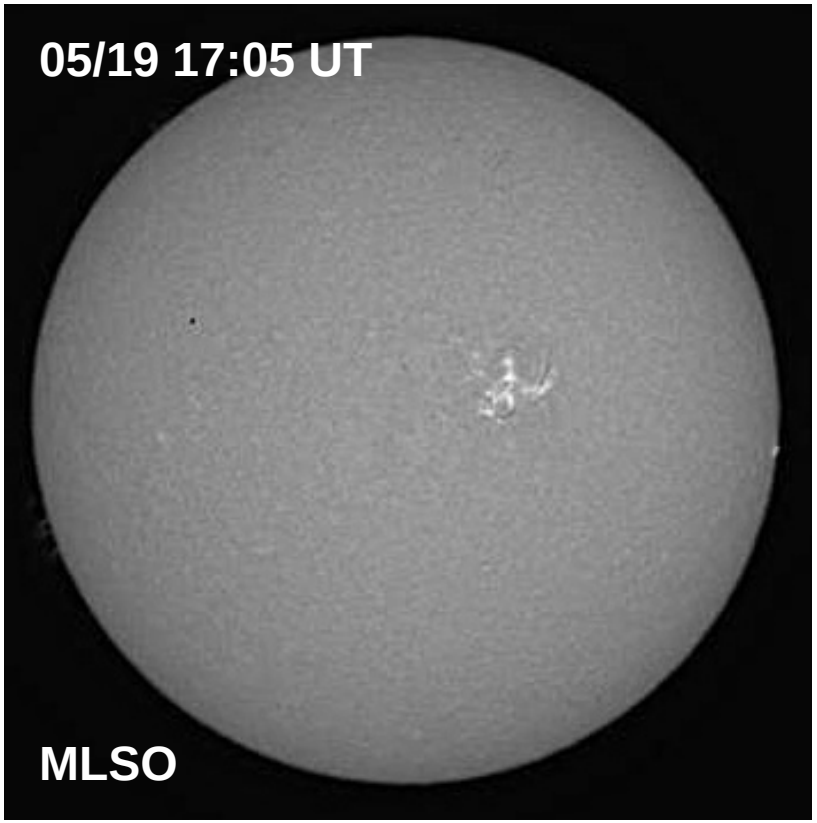
- constant propagation speed assumed
- On 05/18 no big CMEs or surface activity

Associated solar activity

- CME on May 19th, 2007
  COR1: 12:53 UT
  LASCO: 13:24 UT 958 km/s, AW: 106, PA: 260°

QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

Disappearance of a big filament on May 19th from AR0956



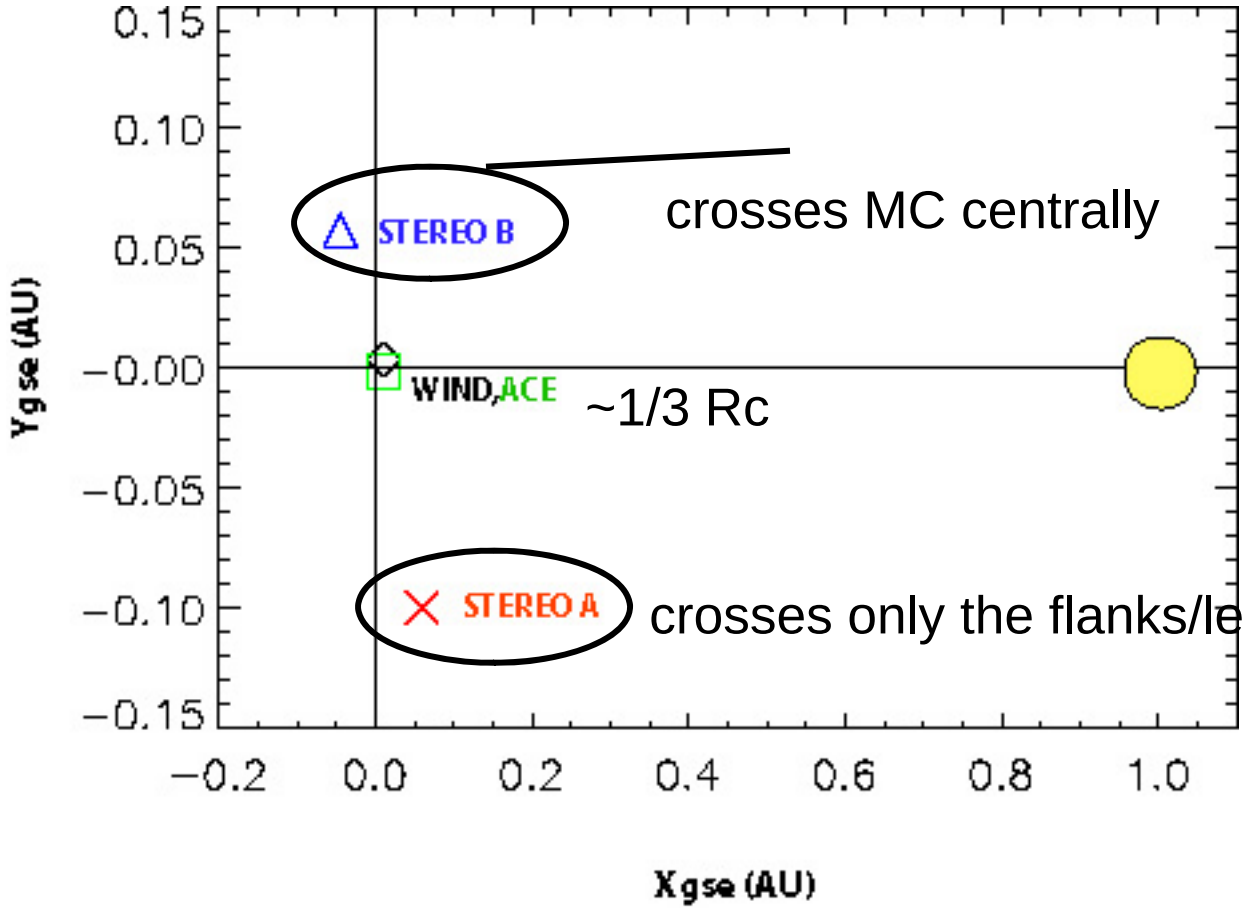
Disappearance of a big filament on May 19th from AR0956

QuickTime™ and a
H.264 decompressor
are needed to see this picture.

courtesy of Paulett Liewer

Summary and future work

- magnetic cloud observed by STEREO B and L1 satellites



crosses MC centrally

~1/3 Rc

crosses only the flanks/leg of the MC?

Summary and Future work

- large separation of satellites allows to study the large-scale structure of the MC
- Type II emission?
- solar source vs. MC structure?
- filament material?
- hopefully we will see more MCs soon
  (WIND magnetic cloud list: http://lepmfi.gsfc.nasa.gov/mfi/mag_cloud_pub1.html
  1996: 4 MCs
  1997: 15 MCs)