

Heliospheric Plasma Sheet and Flow from Streamer Belt

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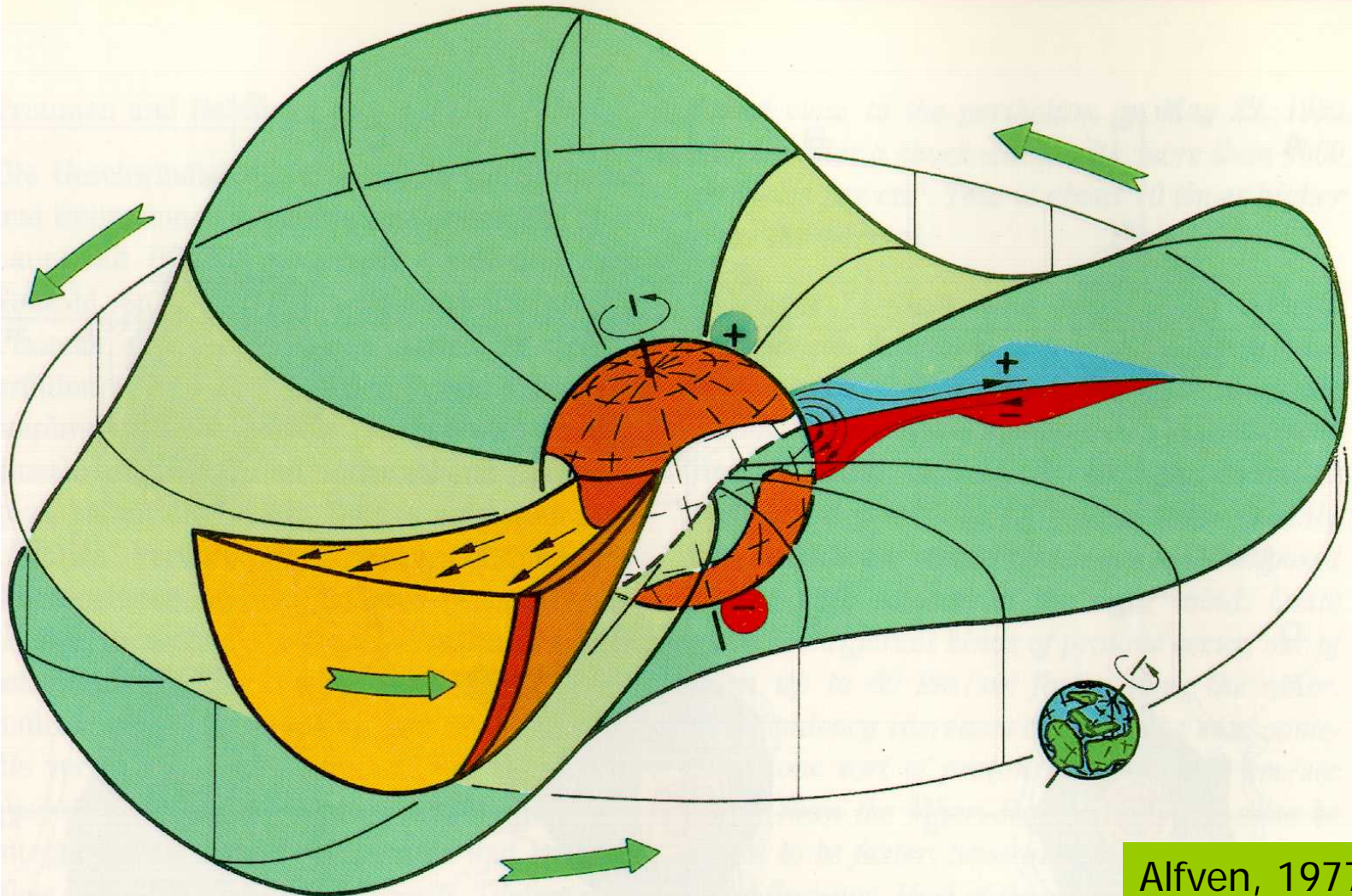
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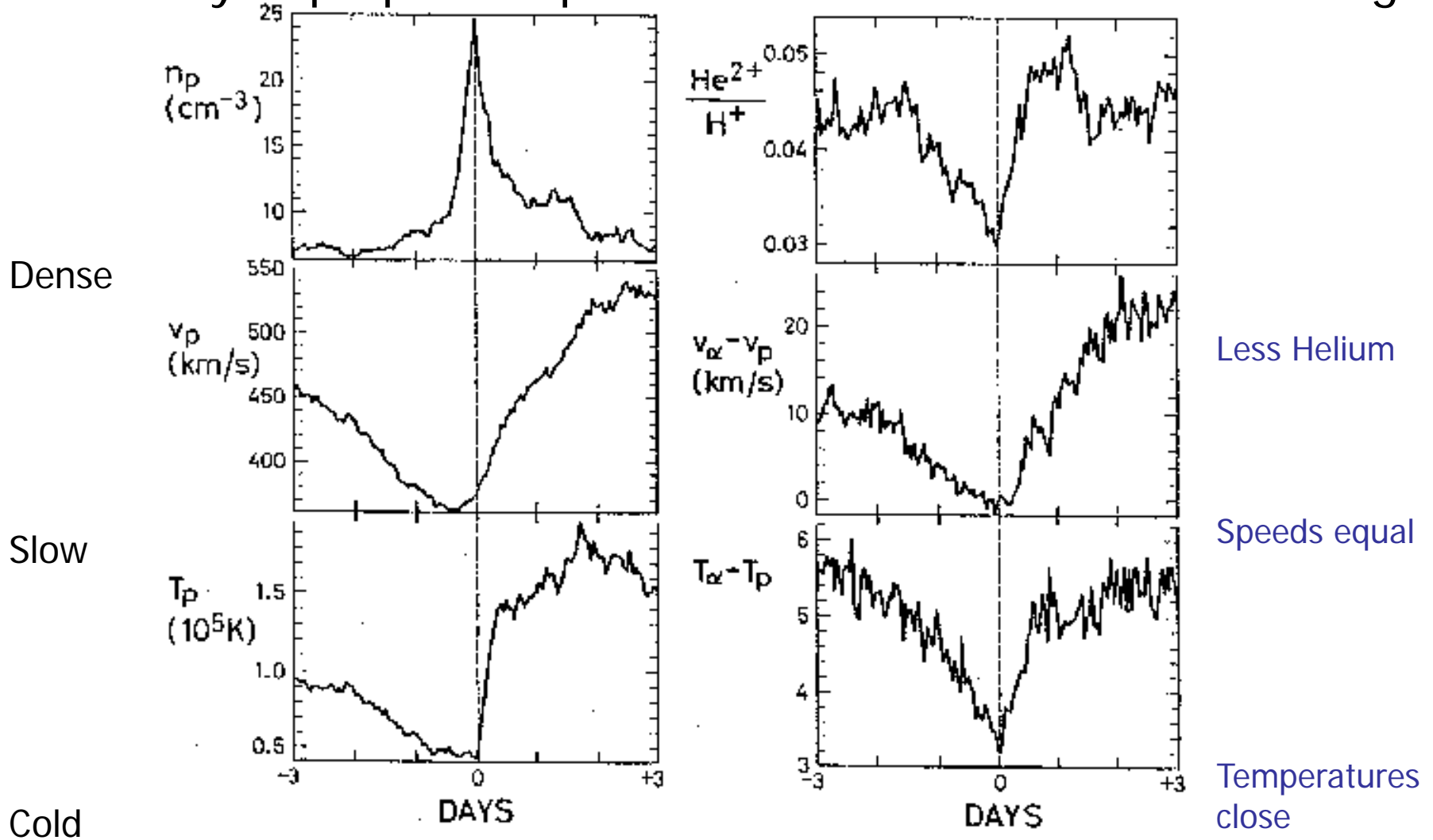
Outline

- Introduction to Heliospheric Current Sheet
- Early observations on the ion composition of the Heliospheric plasma sheet
- STEREO Observation
- Remote Sensing of flows out of streamer belt
- Conclusions

Solar wind stream structure and heliospheric current sheet



Early Superposed Epic studies on Current Sheet Crossing



Borrini et al., JGR, 1981

Plasma Sheet

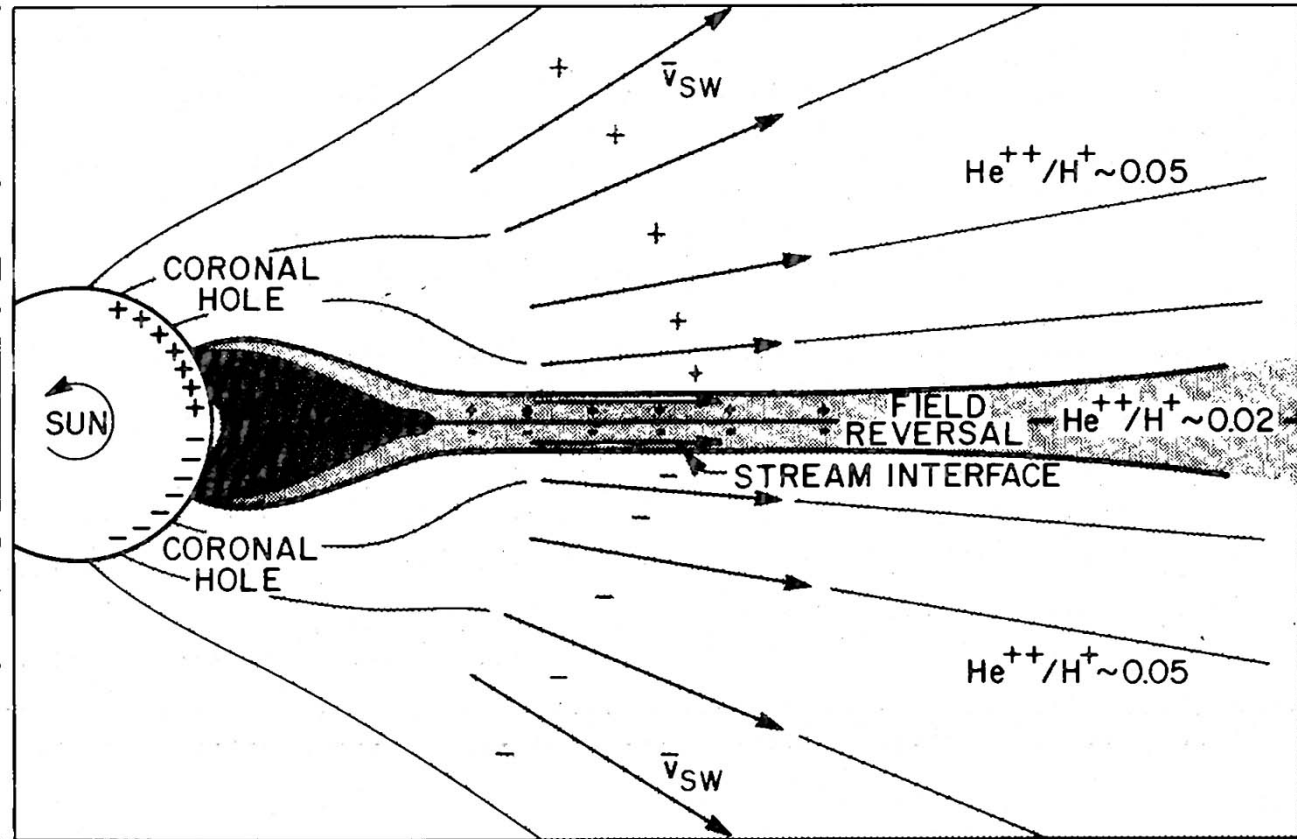
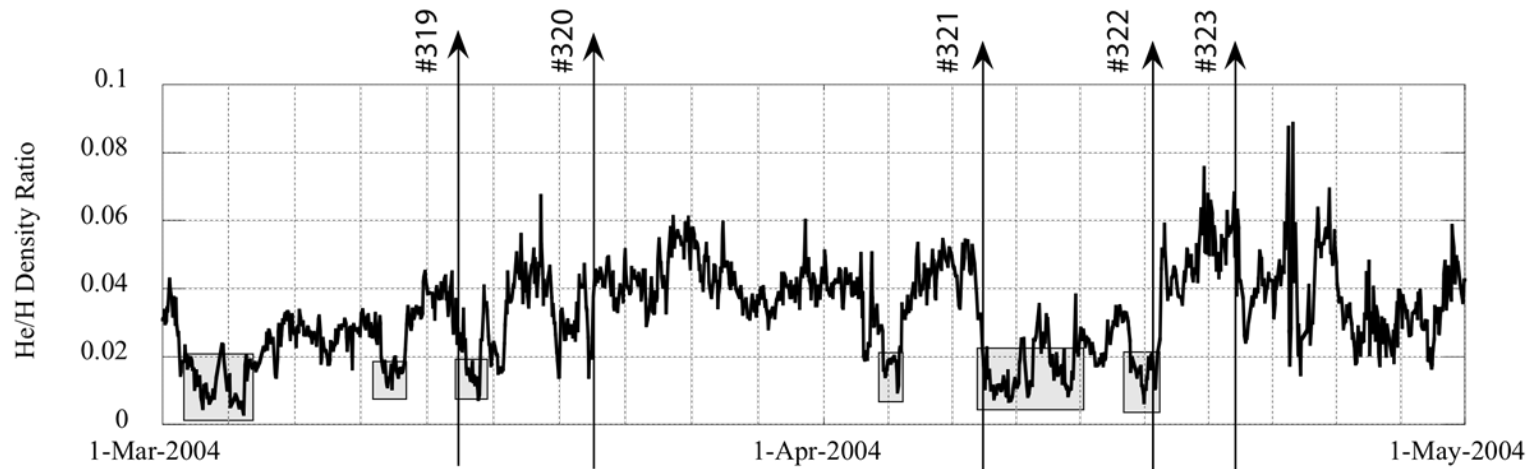


Fig. 8. An idealized schematic view of the intersection of the streamer belt with the solar equator at a longitude where the center of the belt is perpendicular to the equator. Plasma within the streamer is denser, flows slower, and has a lower helium abundance than plasma outside the streamer.

Gosling et al, 1981

Plasma sheet of lower He/H



Plasma sheet is **usually** at the edge of HCS.

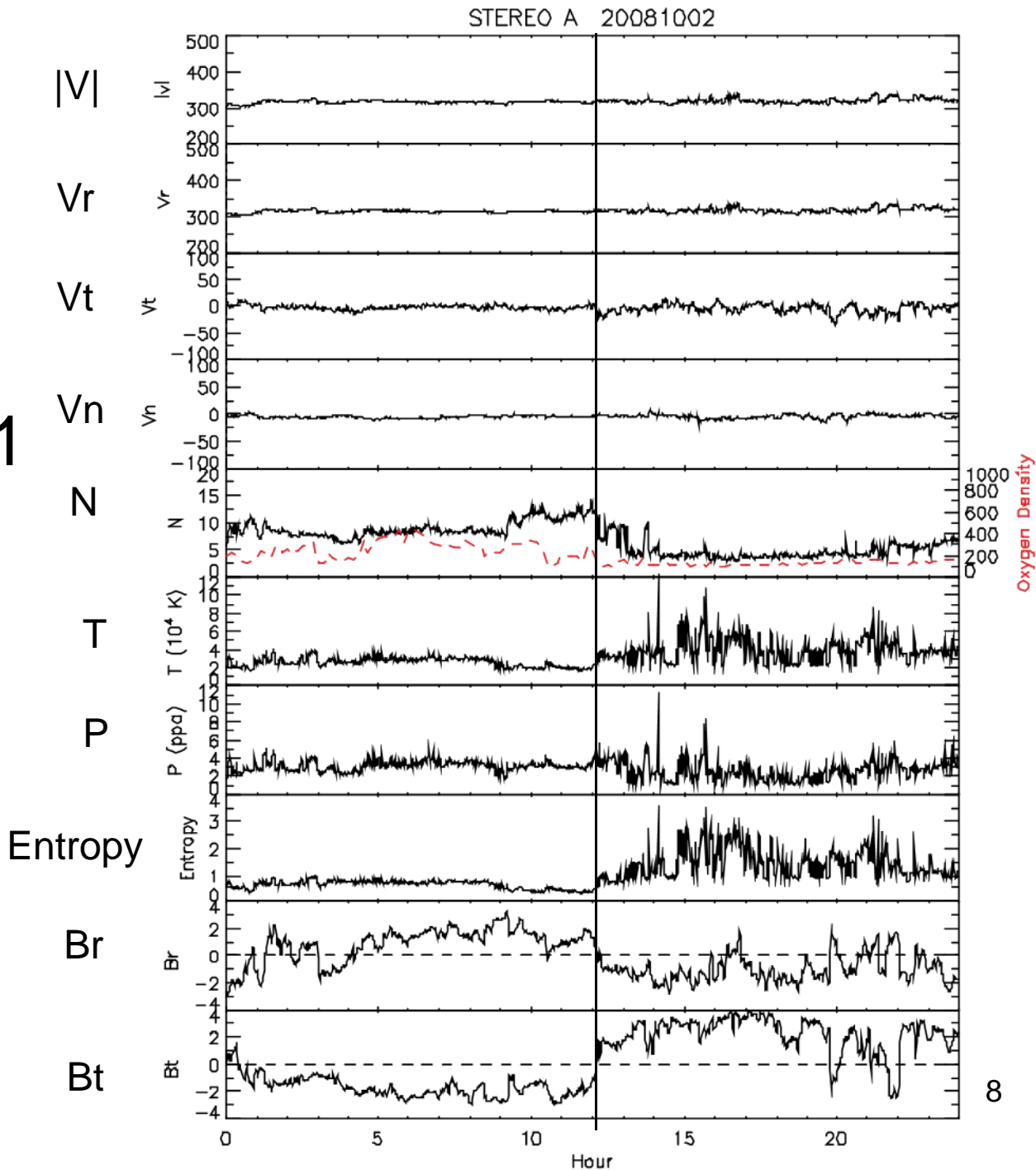
HCS determine

- Using magnetic component
- Both B_r and B_t change sign at the same time
- Both B_r and B_t essentially retain the sign for at least one day before and after the HCS.
- B_r and B_t have different signs precede HCS crossing.

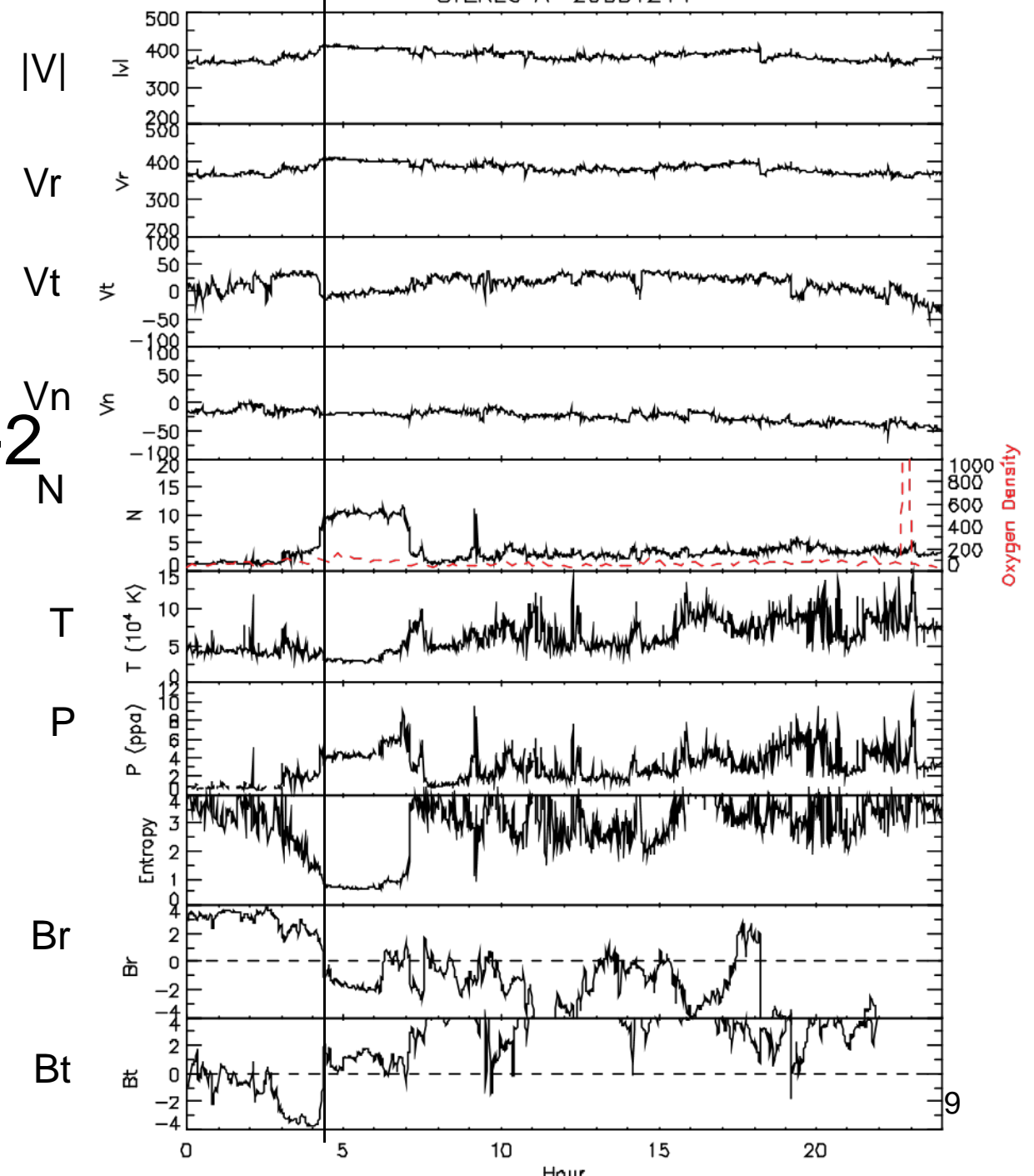
We found 12 events on STEREO A from Jan, 2008 to Dec 2008. They fall into three classes.

STEREO Observation -1

HPS precedes HCS



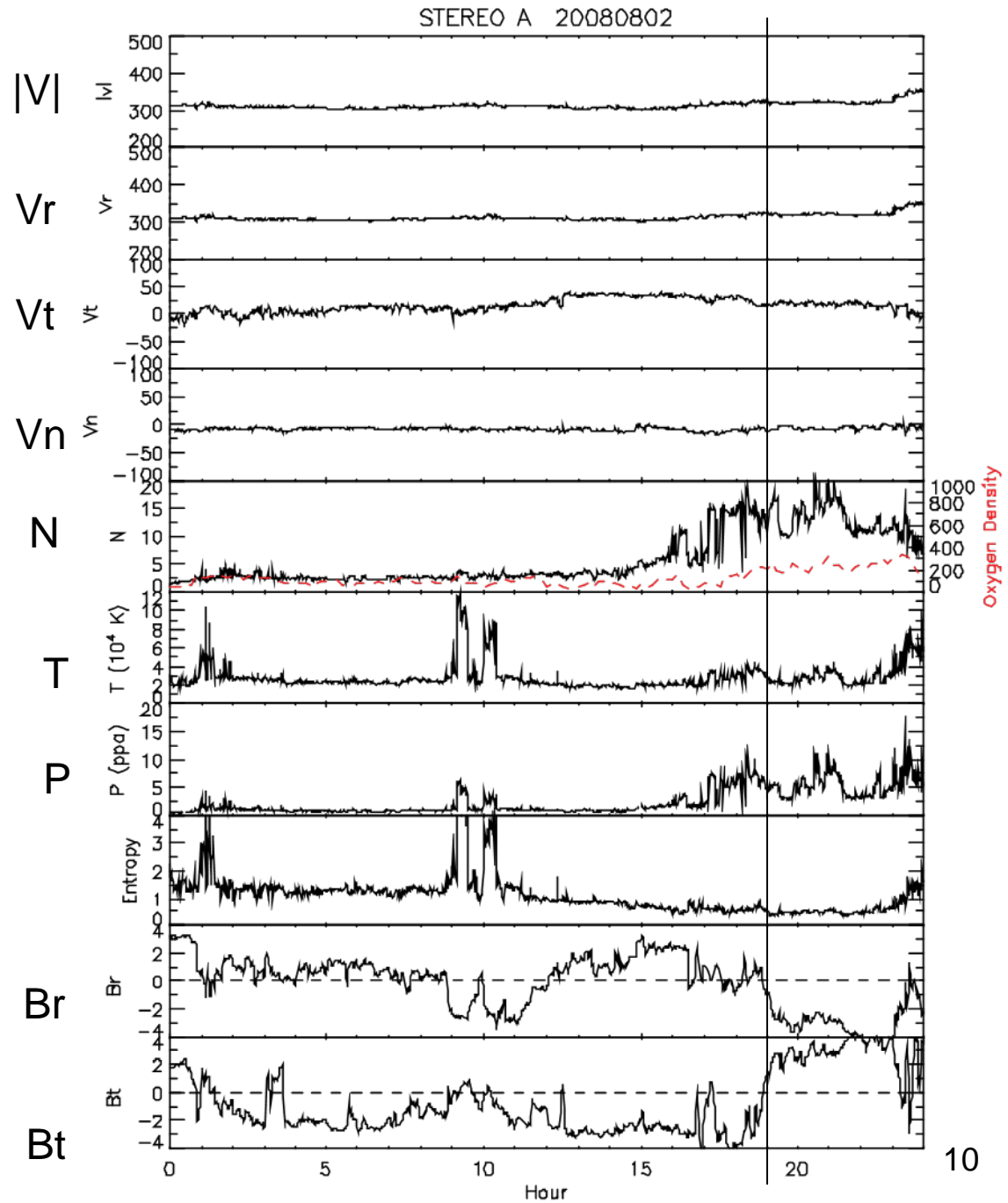
STEREO Observation -2



HPS follow the HCS

STEREO Observation -3

HPS Straddle the HCS



HCS Crossings by STEREO A

<i>Date (MONTH /DAY)</i>	<i>Time (HHMM-HHMM)</i>	<i>HPS</i>	<i>Precede, follow or straddle?</i>	<i>HPS duration</i>	<i>CIR time difference</i>
01/06	15:10-15:11	Y	straddle	8 hours	< 1 hour
01/13	21:16-21:24	Y	precede	5 hours	>1 day
02/02	08:45-08:55	Y	straddle	6 hours	< 1hour
02/10	07:15-07:16	N			
04/05	17:04-17:06	Y	precede	2 hours	> 10 hours
04/24	13:41-13:42	Y	follow	3 hours	< 1 hour
05/21	08:31-08:33	Y	Straddle,	5 hours	3 hours later
06/26	10:02-10:06	Y	follow	2 hours	>8 hours
08/02	18:51- 18:52	Y	straddle	6 hours	<2 hours
08/18-19	End of 18	Y	Straddle	8 hours	< 1hour
09/16	02:08-02:20	Y	Precede	7 hours	> 10 hour
11/17	13:42- 13:43	Y	Follow	2 hours	> 24 hours
12/14	04:18-04:19	Y	follow	3 hours	> 24 hours

Total 13 events. Only 1 without plasma sheet. 5 straddle, 4 follow and 3 precede. All straddle are related with CIR or SI.

Summary of the in situ observations

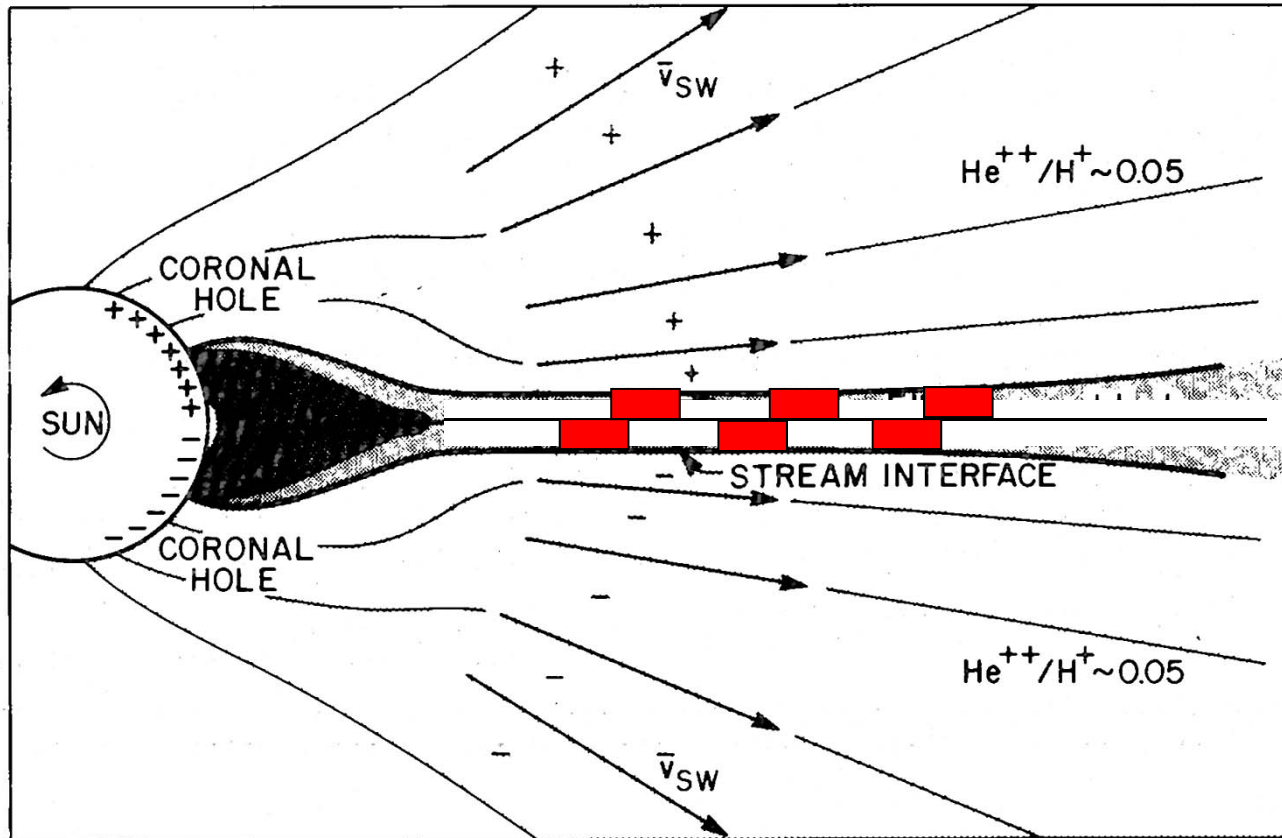
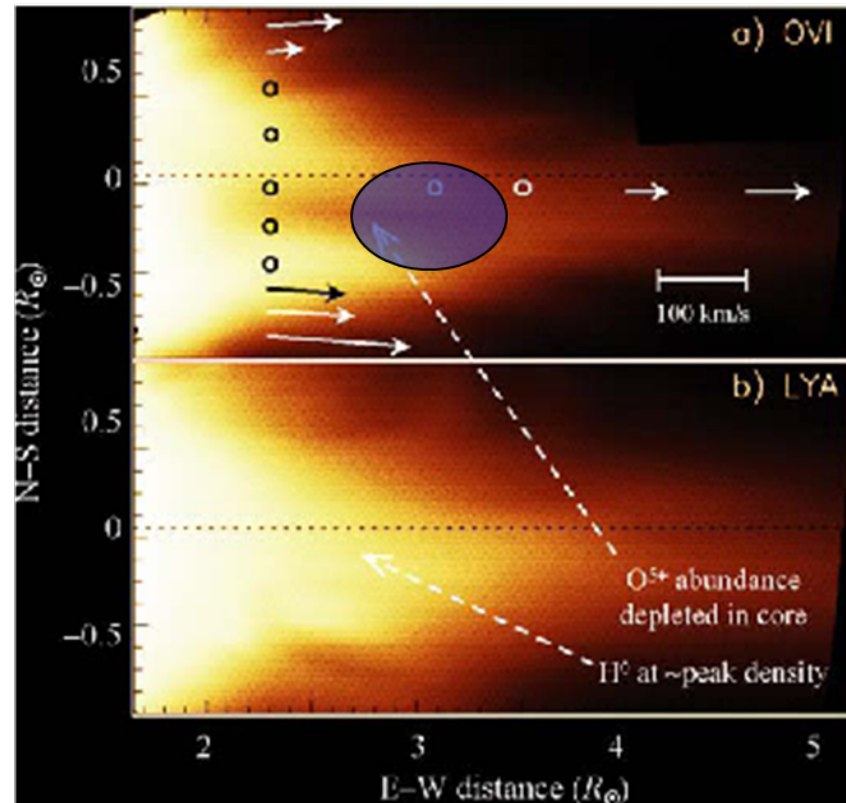


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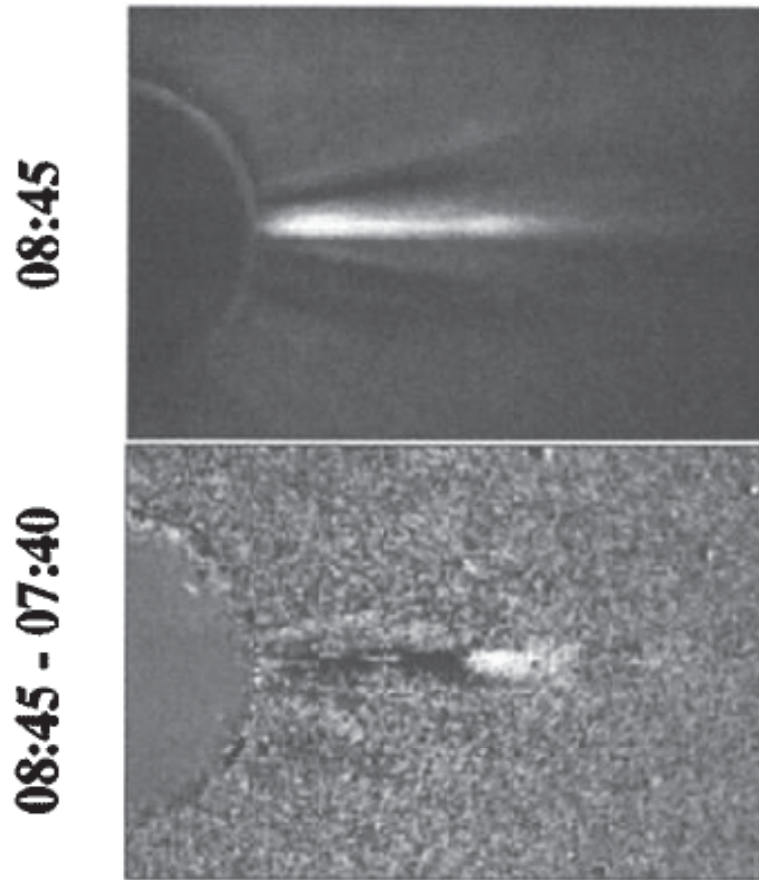
Plasma in the core of the streamer belt in the solar corona

Higher neutral hydrogen and lower O5+ density is observed



SOHO/UVCS. Kohl et al, 2005

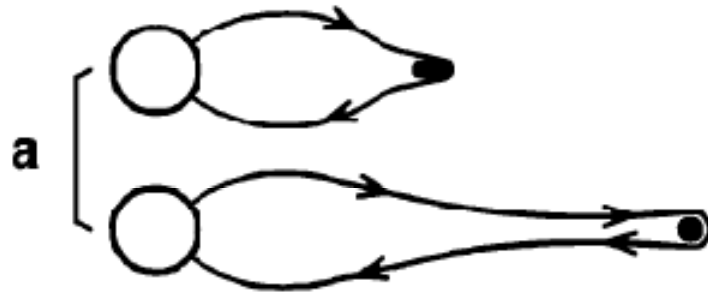
Blobs flow out of the Streamer Belt



Wang et al, 2000

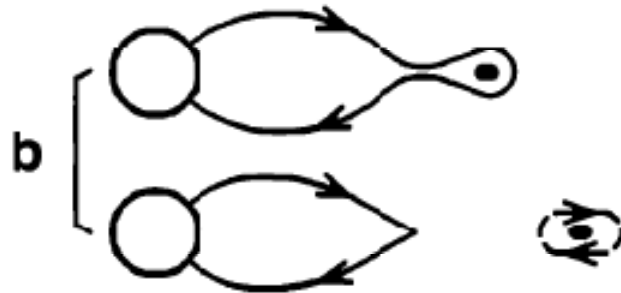
SOHO/LASCO

How blobs flow out?-possible mechanisms

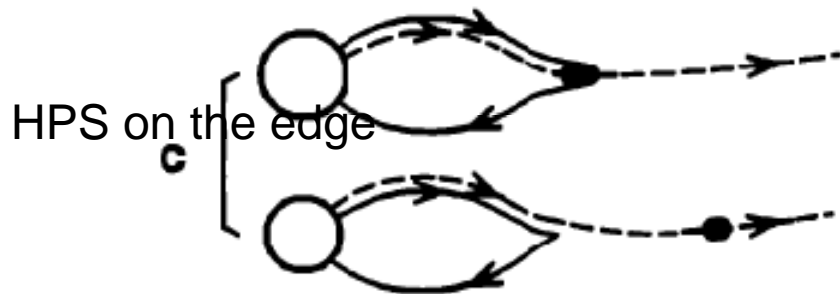


Lead to more open magnetic flux and Less close flux

HPS straddle HCS



Reconnect with the same magnetic field. Hard to realize in a realistic 3D configuration



Interchange reconnection is the dominant process

Occurrence Rate

- The blobs should be observed the similar rate as plasma sheet if a plasma sheet corresponds to a blob
- However, Wang et al. was vague on the occurrence rate.

Four blobs a day: 1998

Continuous ejection: 2000

Conclusions and Questions

- HPS is flowing out from the streamer belt
- How it happens, blobs or the ray-like structure after the ejection of the blobs.
- The temporal or spatial scale of the HPS and its variations.
- How dynamic is the process? Can A and B show different result?

