

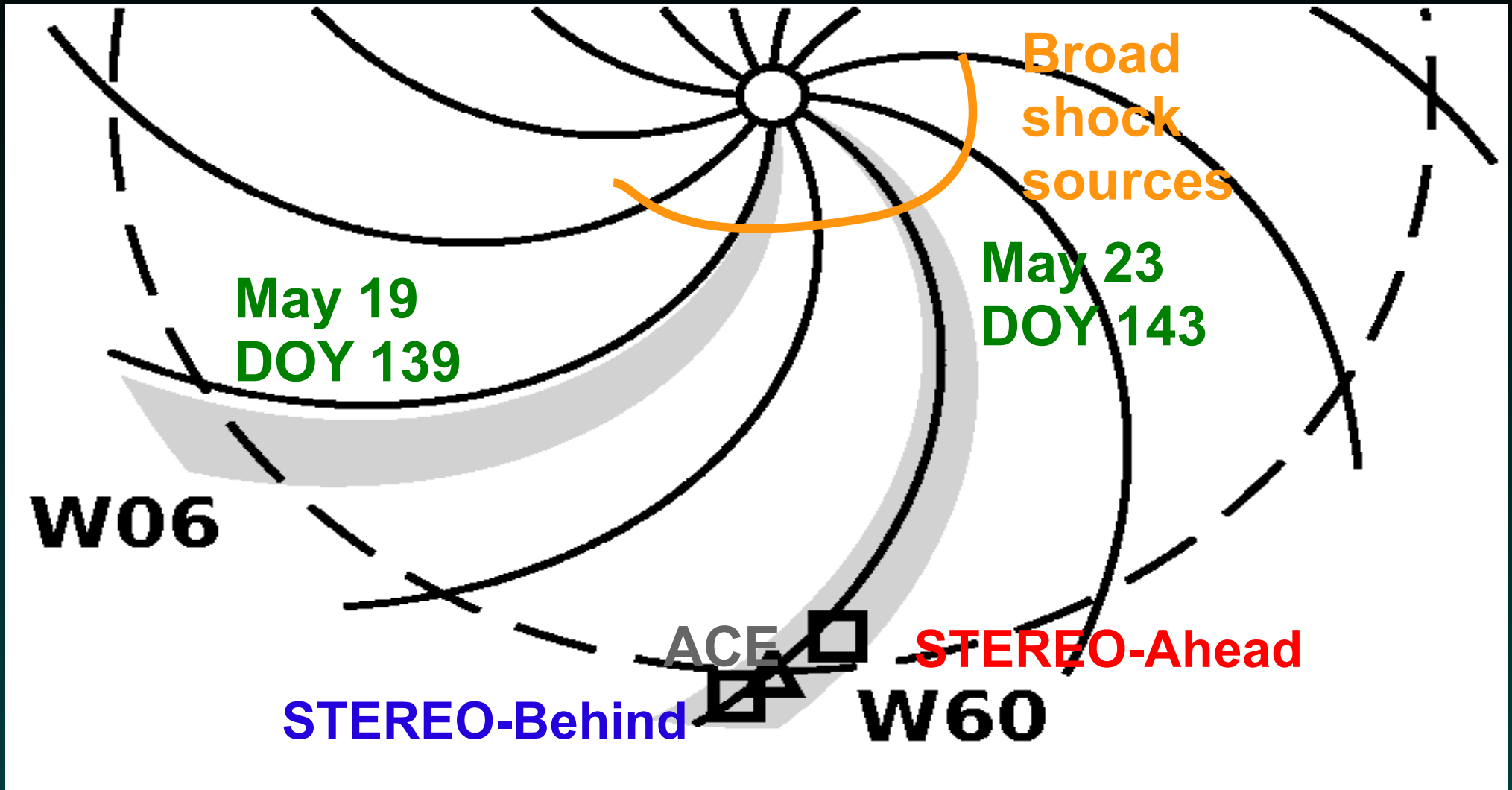
# Multi-point Observations of the May 2007 Solar Energetic Particle Events

Eileen Chollet, Caltech

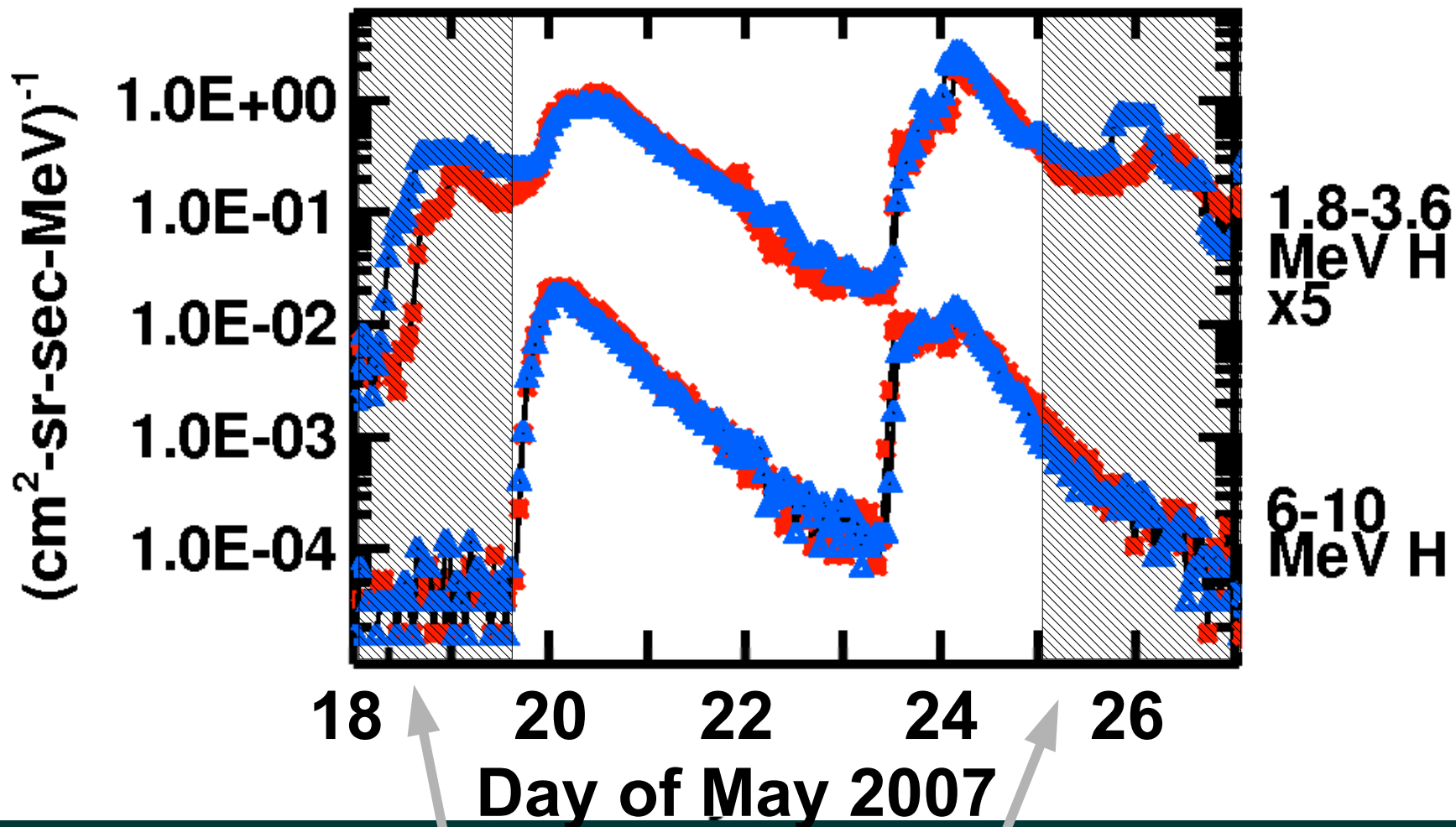
R. A. Mewaldt, Caltech  
A. C. Cummings, Caltech  
J. T. Gosling, LASP, UC Boulder  
D. K. Haggerty, JHU/APL  
Q. Hu, UA Huntsville  
D. Larson, SSL, Berkeley

B. Lavraud, CESR, U. Toulouse  
R. A. Leske, Caltech  
G. M. Mason, JHU/APL  
A. Optiz, CESR, U. Toulouse  
E. C. Roelof, JHU/APL  
C. T. Russell, IGPP, UCLA  
J.-A. Sauvaud, CESR, U. Toulouse

# May 2007 STEREO Events



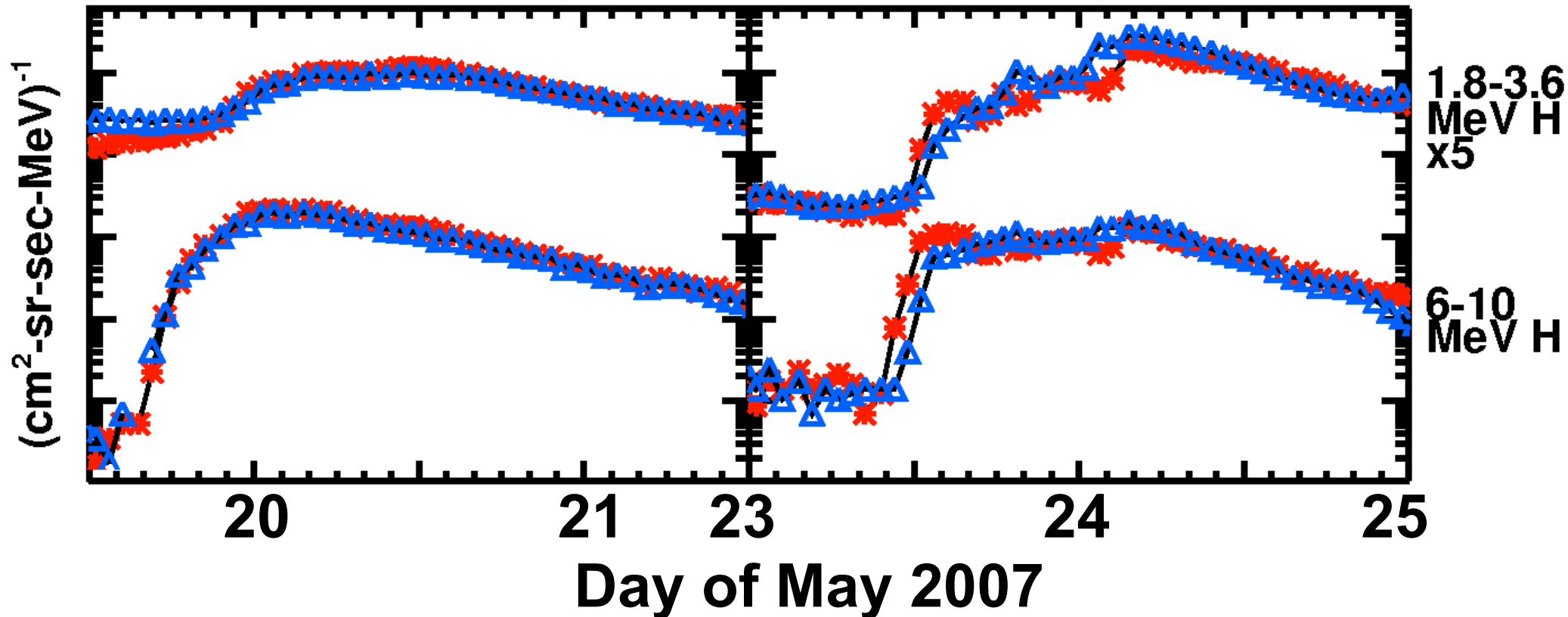
STEREO separation: 9 degrees (~20 million km)



**Corotating Interaction Regions**

May 19

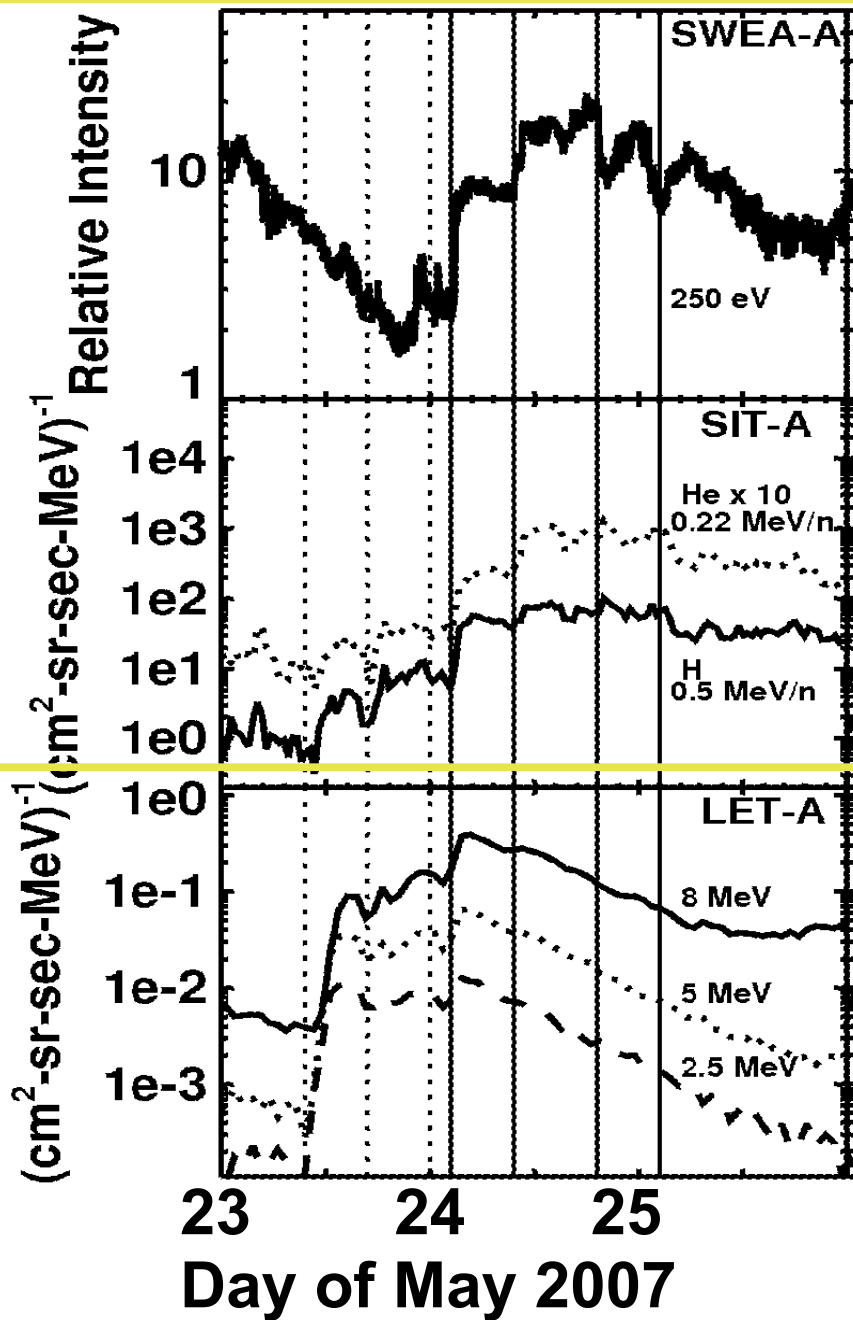
May 23



- Particles arrive at STEREO-A 1 hour earlier.
- Fluctuations around the peak are substantially different.

Species

Travel Time



Suprathermal electrons

~8 hours

Low-energy protons

~8 hours

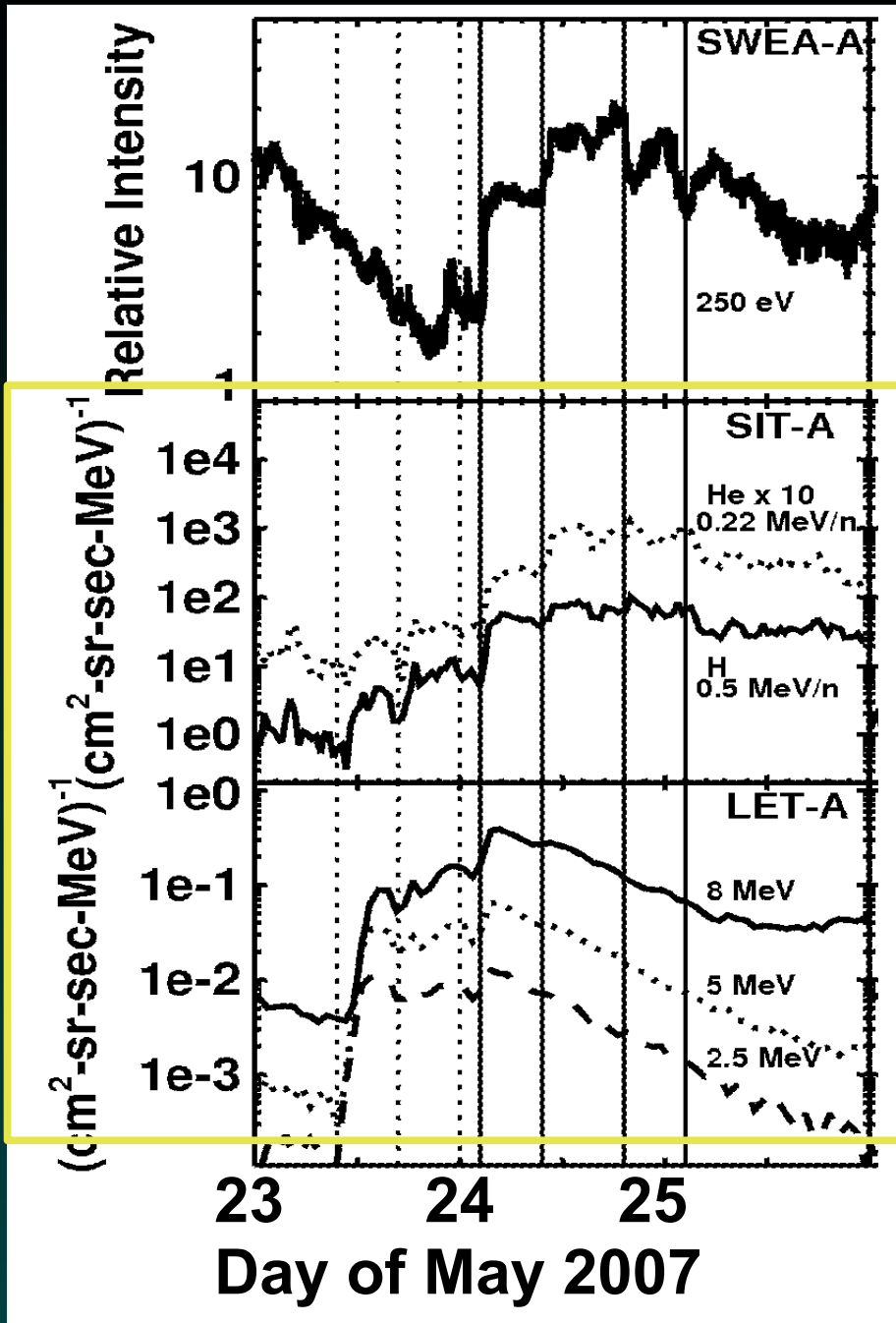
High-Energy protons

~3 hours

Would expect species with same travel times to have similar profiles.

Species

Travel Time



Suprathermal electrons

~8 hours

Low-energy protons

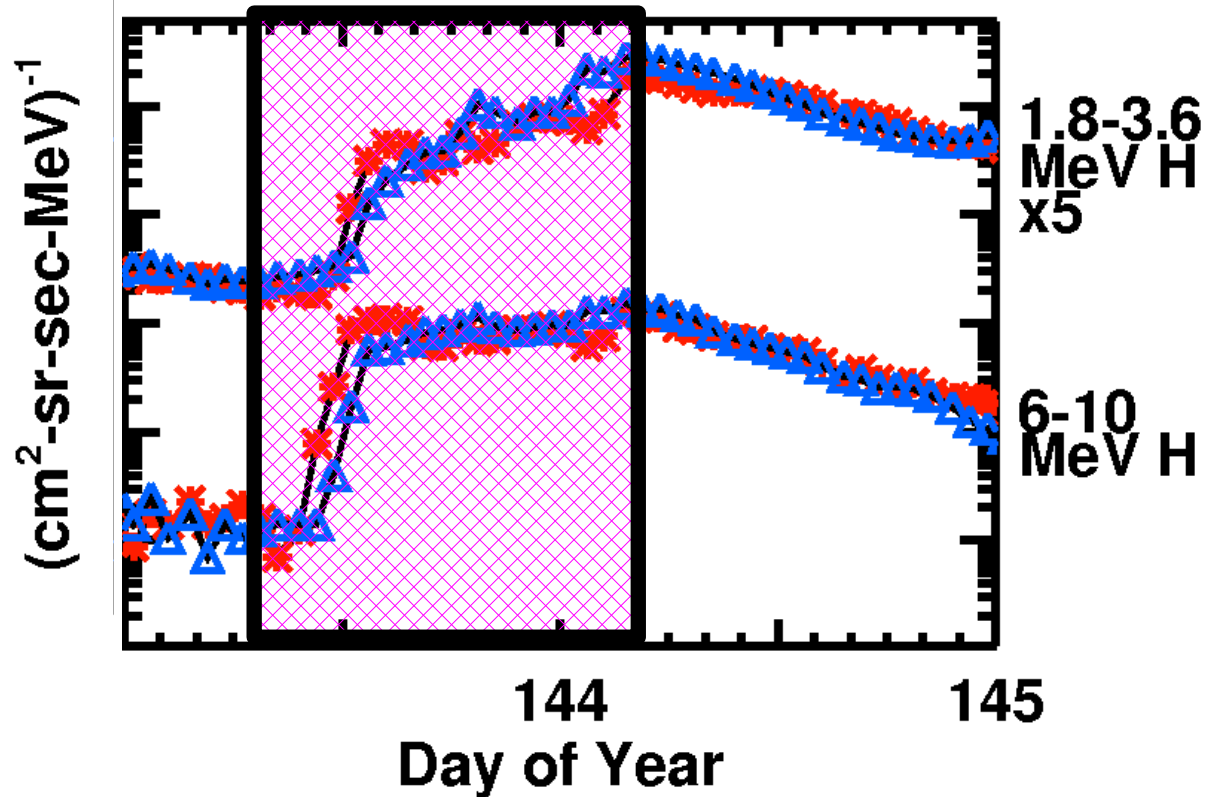
~8 hours

High-Energy protons

~3 hours

Instead, different travel times but same energetic particle features?

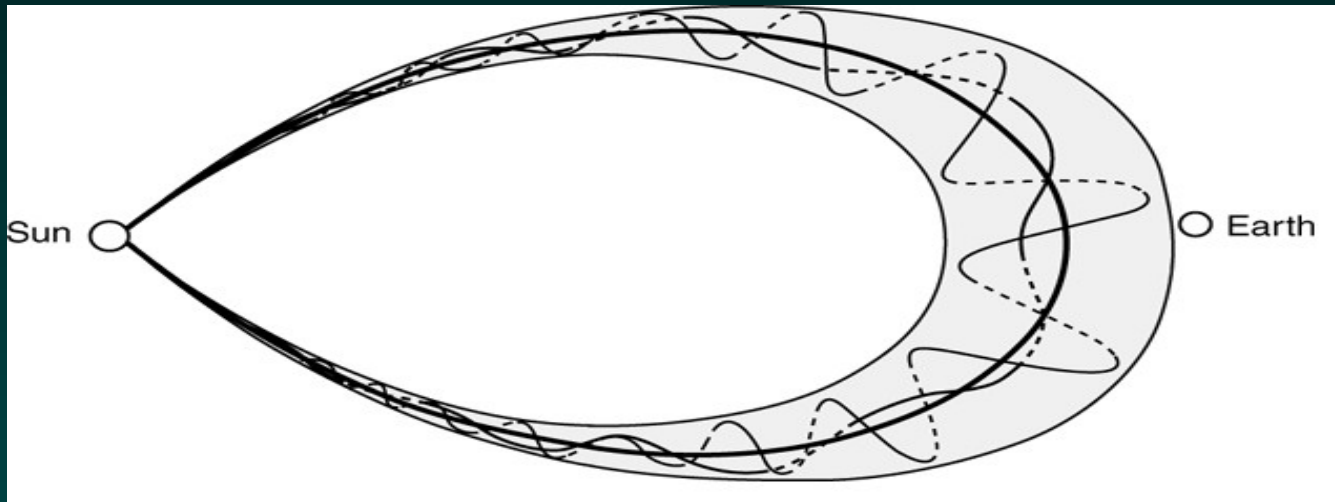
# May 23 Event



Goal: Explain unusual **first half** of the May 23<sup>rd</sup> event.

# In Situ Signatures of ICMEs

- Increase in magnetic field strength
- Field rotation
- Bi-directional electrons
- Plasma signatures.

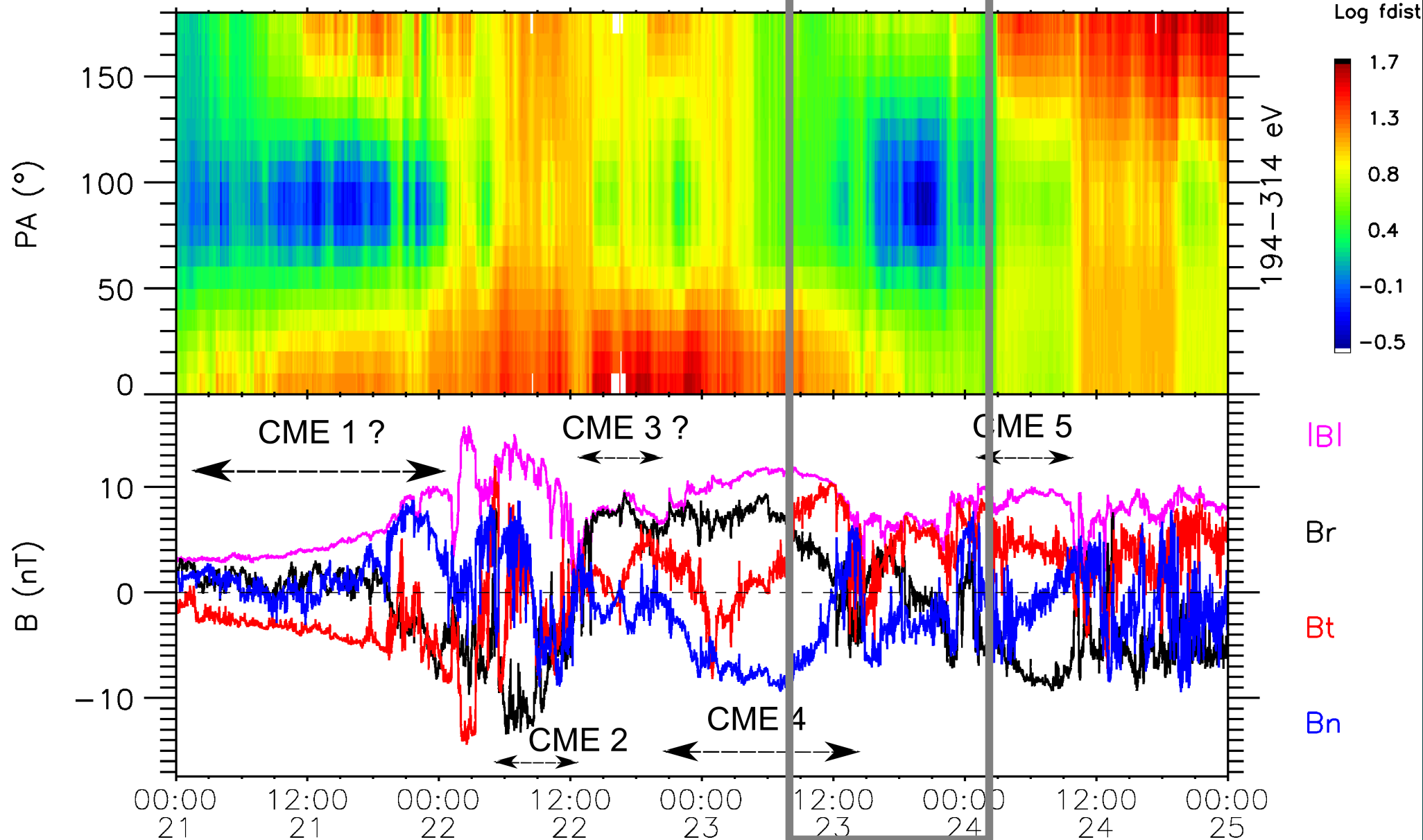




STEREO-SWEA

AHEAD (SC 1)

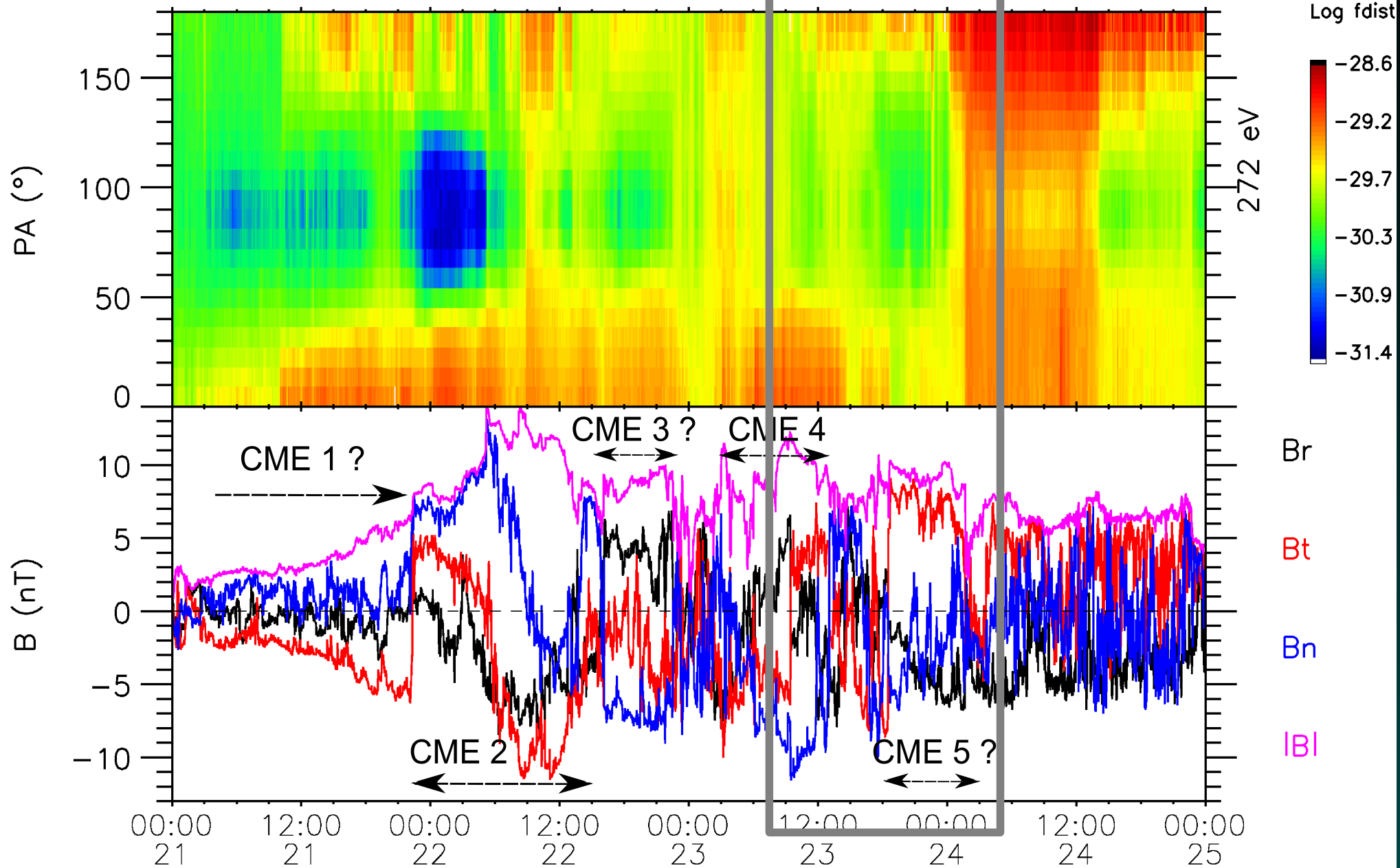
21/May/2007



SWEPAM

ACE

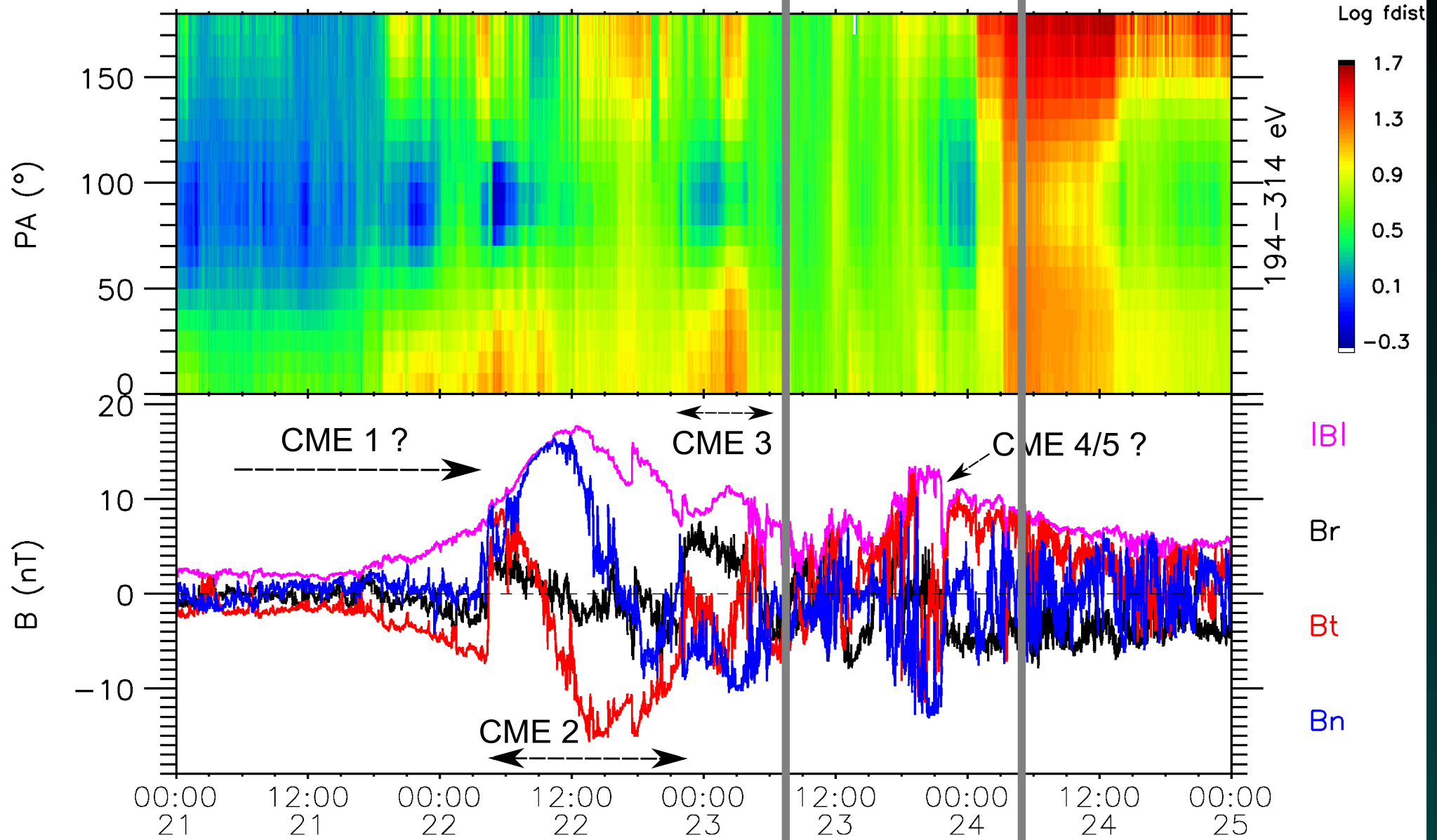
21/May/2007

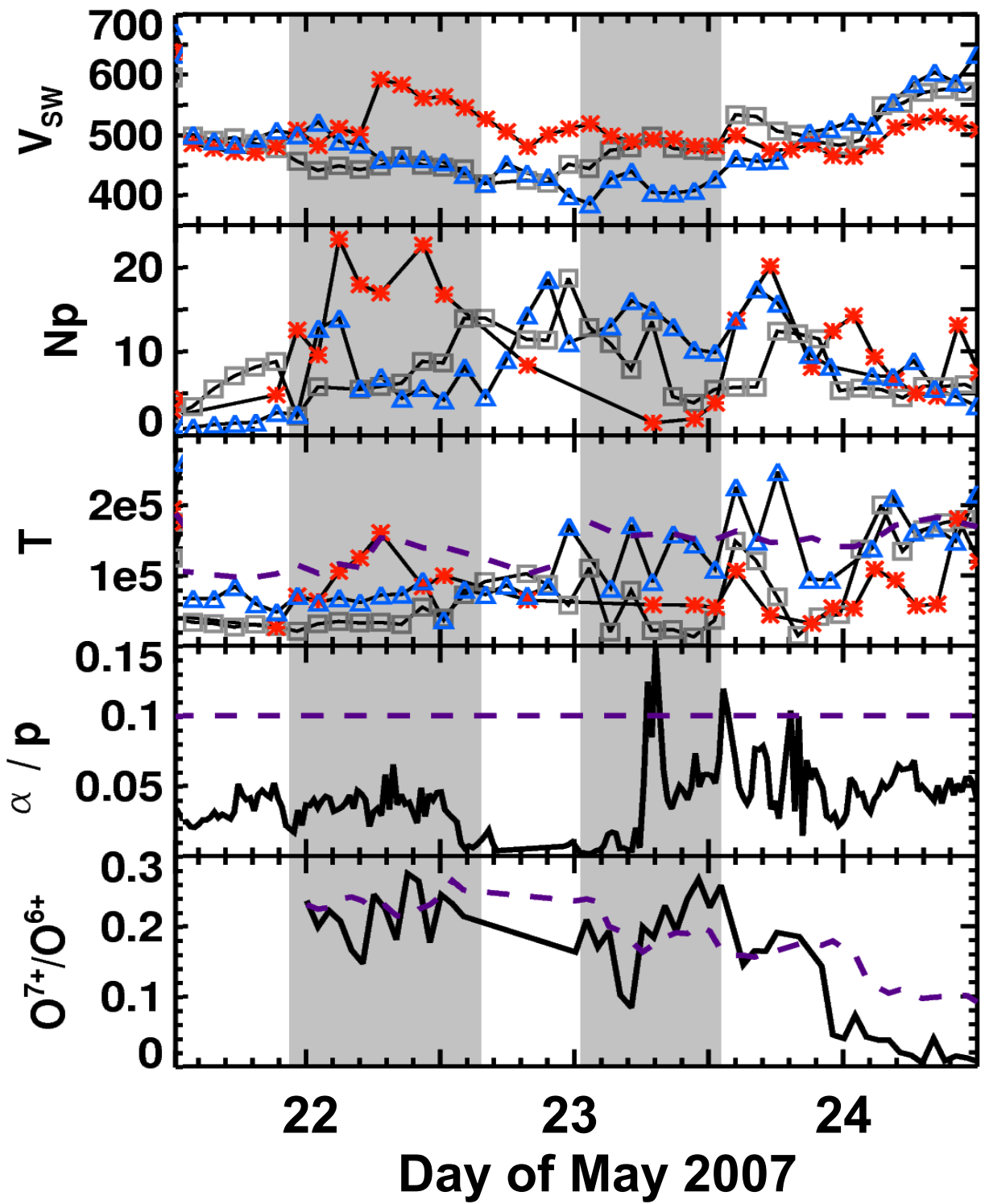


STEREO-SWEA

BEHIND (SC 2)

21/May/2007





← Low Temp.

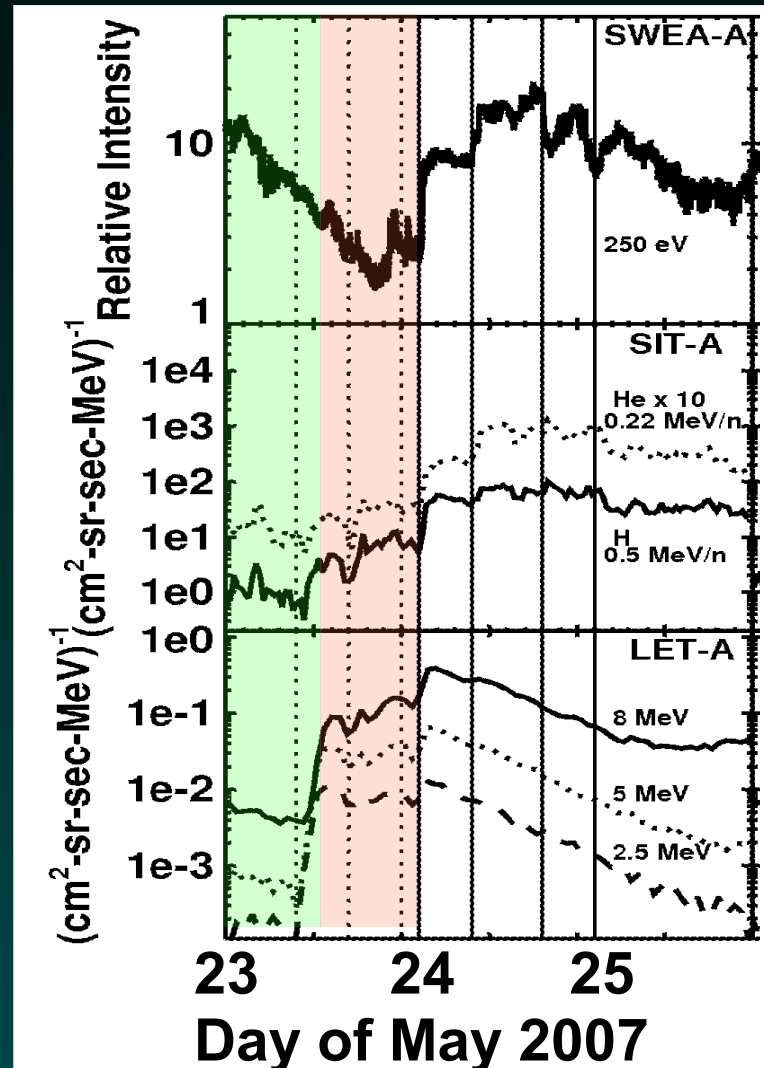
← High  $\alpha/p$

← High  $O^{7+}/O^{6+}$

# Conclusion: STEREO-A is embedded in an ICME for the first ~12 hours of the event

- STEREO-B and ACE are outside and on the edge.

Enhanced scattering inside the ICME changes the arrival time as a function of energy?

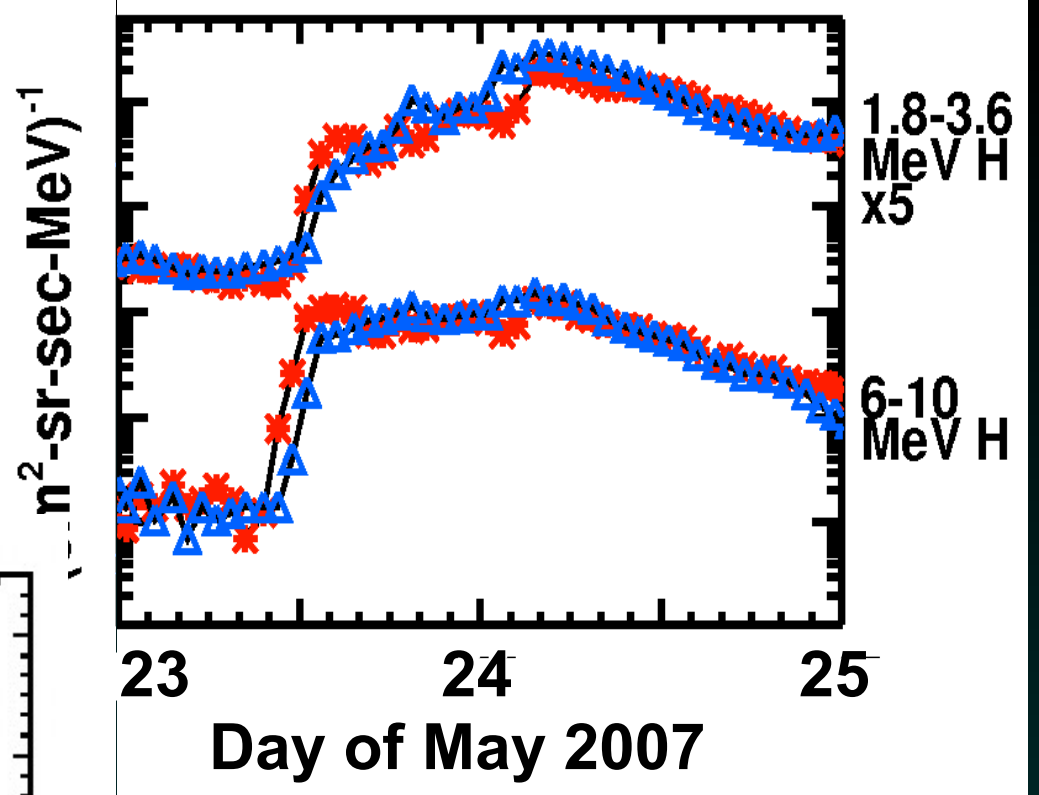
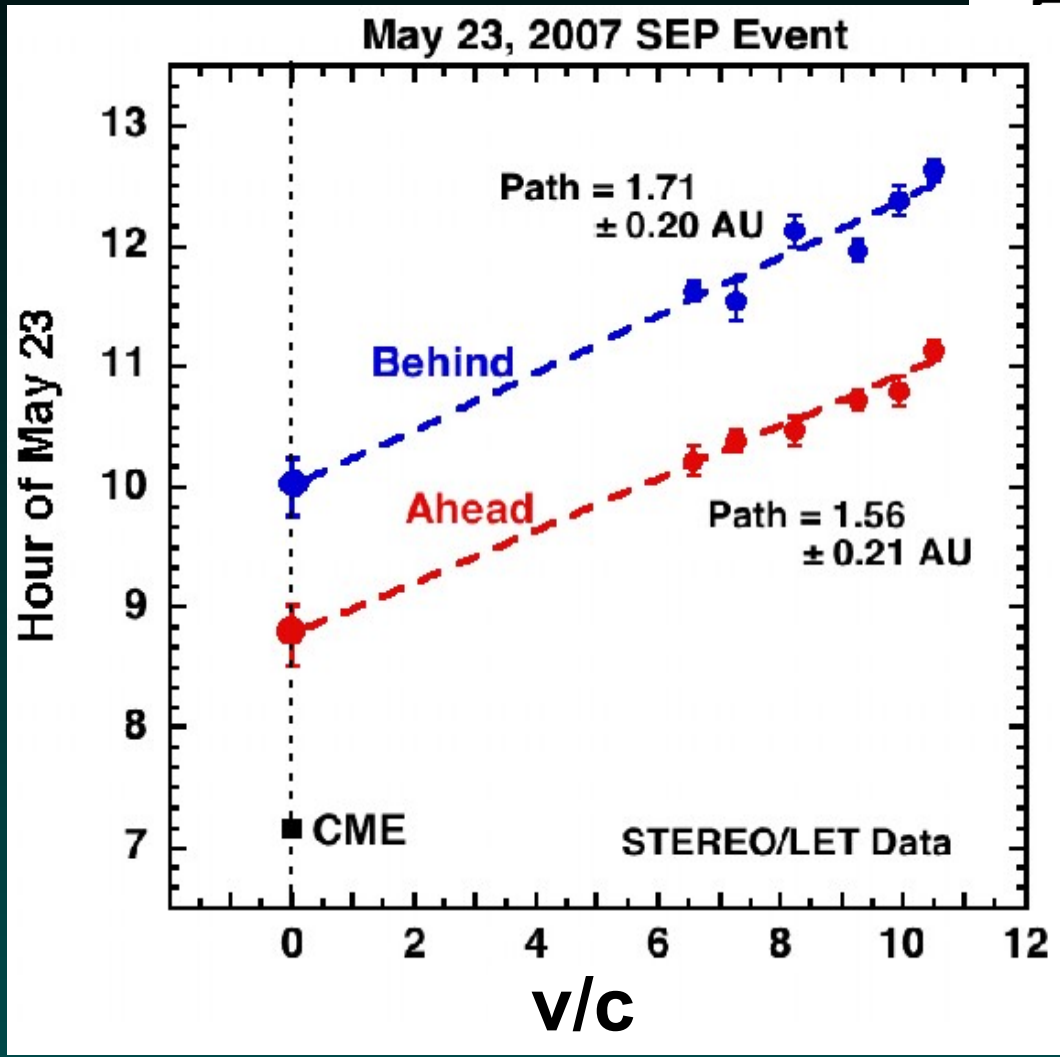


Travel Times

~8 hours

~8 hours

~3 h



**The ICME shifts STEREO-A's connection point at the Sun to a place where particles are being accelerated ~1 hour earlier.**

# Conclusions: What can we learn from studying these events?

**A very few degrees can make a difference in observing SEP events.**

**A good example of the power of multi-spacecraft observations of SEP events.**