

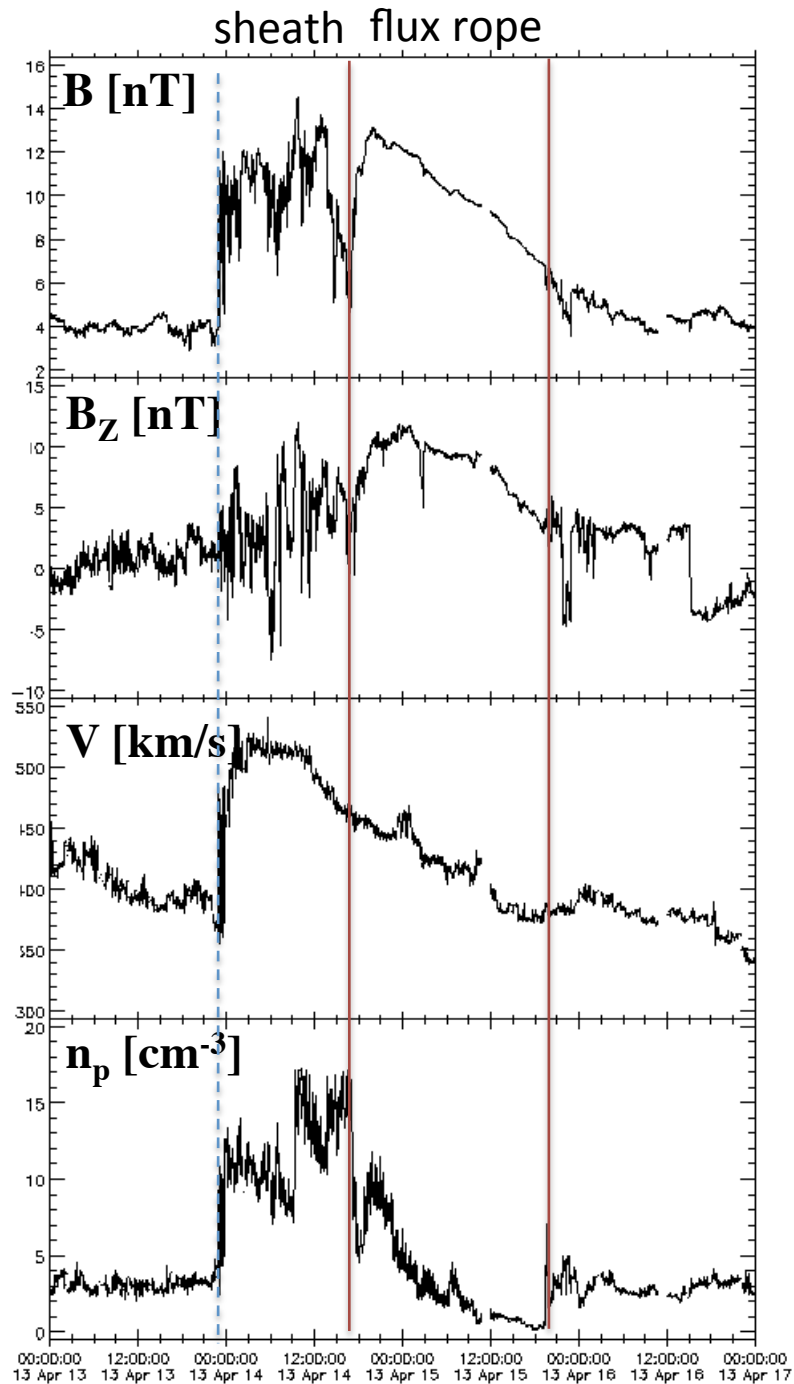
# WP 4.2&4.3: ICMECAT Catalogue and comparison with HI predictions

## **Task 4.2: Comparing to in-situ measurements (UH)**

*Combine in-situ observations from many spacecraft into a single CME database. CMEs based on their physical structure observed in-situ and calculating relevant parameters*

## **Task 4.3 Assessing the validity of the HI modelling (Graz)**

*How well can CME arrival times/speeds be forecast using HI data, and how can this be optimized? What is the outcome of binary classifications of CME hits and misses.*



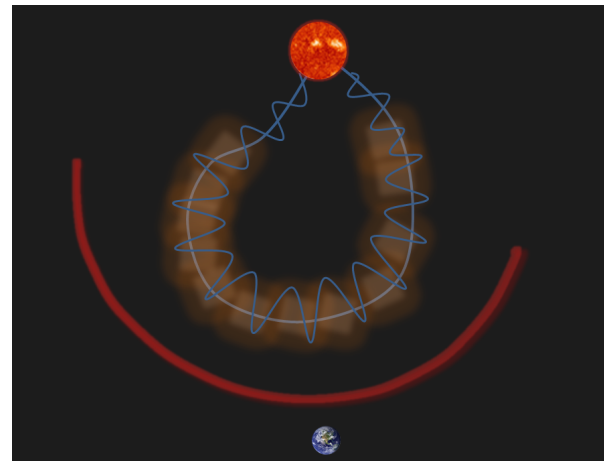
We include first only **clear ICMEs**

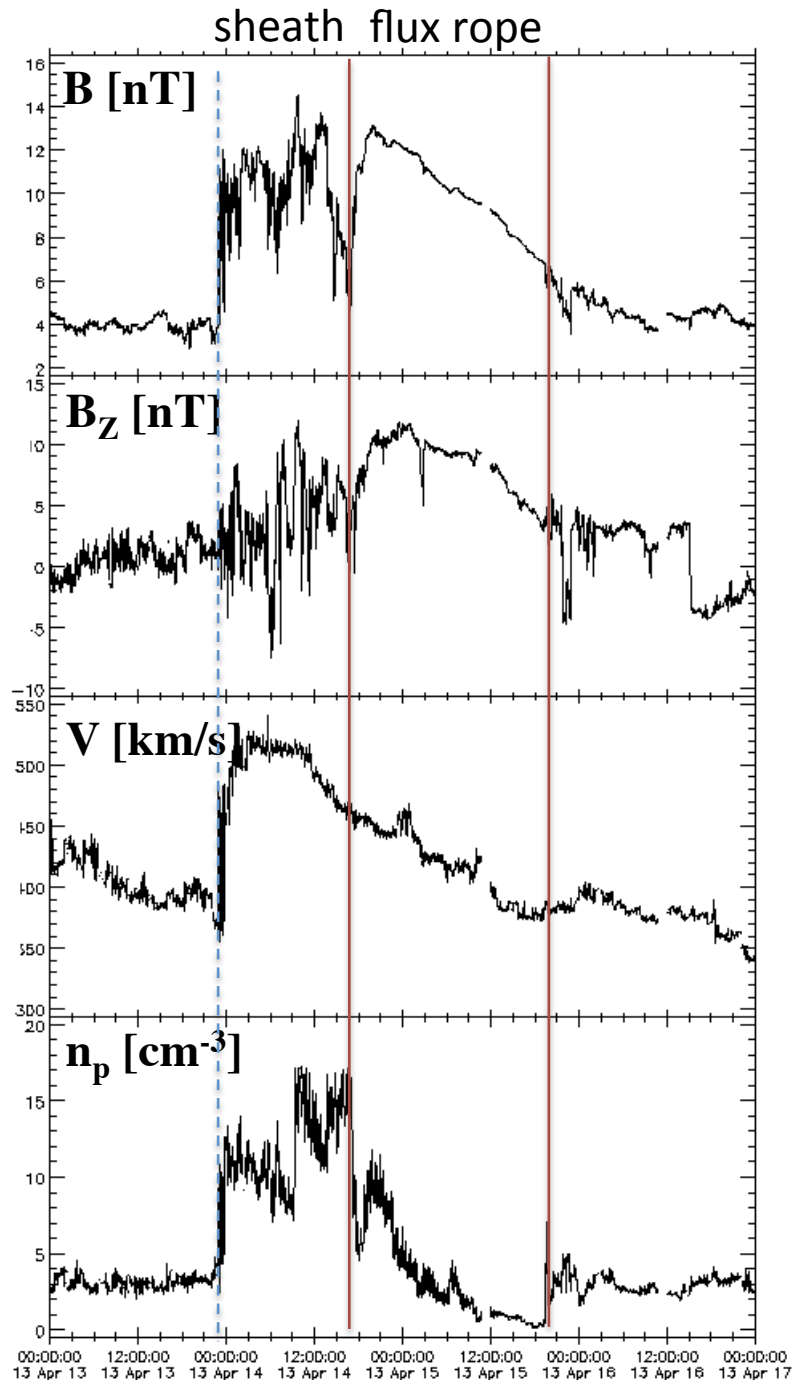
### Already in ICMECAT

- Shock time
- Ejecta (magnetic obstacle) start and end times

Note:

- Even for clear ICMEs the ejecta start and end times may not be unambiguous
- magnetic obstacle time may differ from the flux rope time





We include first only **clear ICMEs**

## Consensus on database parameters

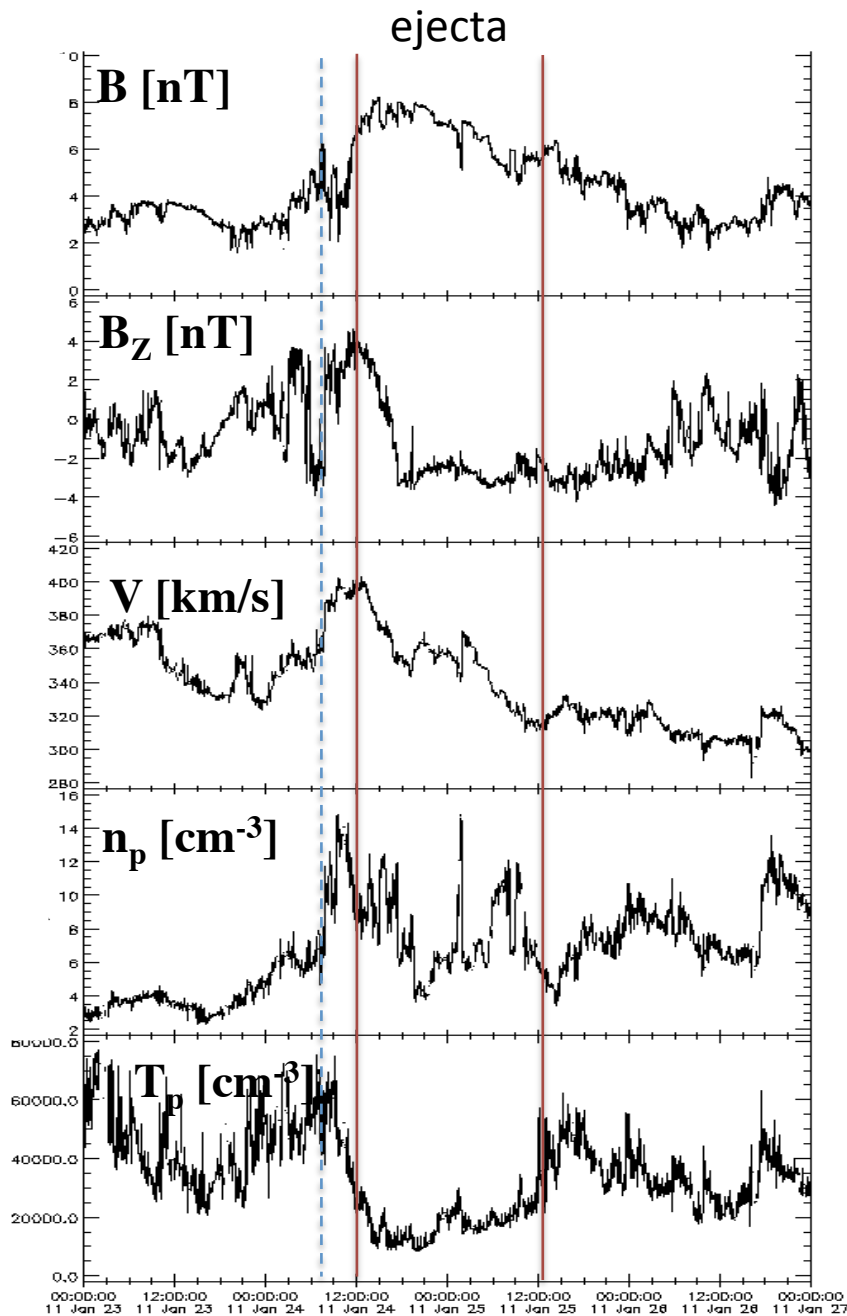
### Easy to include (automated):

- Duration
  - peak magnetic field
  - peak and average velocities
  - peak and average density
  - ejecta speed gradient (expansion)
  - sheath stand-off distance
- } sheath and  
ejecta  
separately?

density is one of the key parameters to compare with HI observations

- ambient solar wind characteristics?  
average speed, density, etc.  
calculated automatically upstream and downstream of ICME (e.g. 12-h averages)

average/peak quantities can be easily added in the catalogue for the other parameters as well



Blue line: magnetic obstacle

We include first only **clear ICMEs**

### Consensus on database parameters

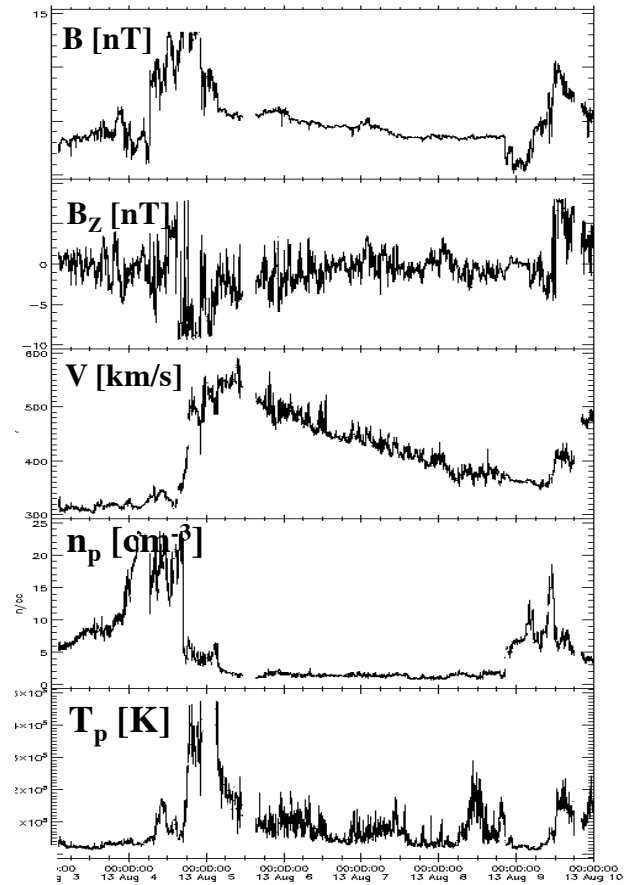
**More difficult to include (requires analysis/modeling)**

- Ejecta morphology: FR (smooth and rotating fields), FR-like (smooth constant fields), ejecta (disordered fields)
- Grad-Shafranov parameters: impact parameter, helicity, axis orientation, GS quality (residual to the fit,  $R_f$ )
- MVA parameters: axis orientation, quality (eigenvalue ratio)

Ejecta morphology defined using visual inspection

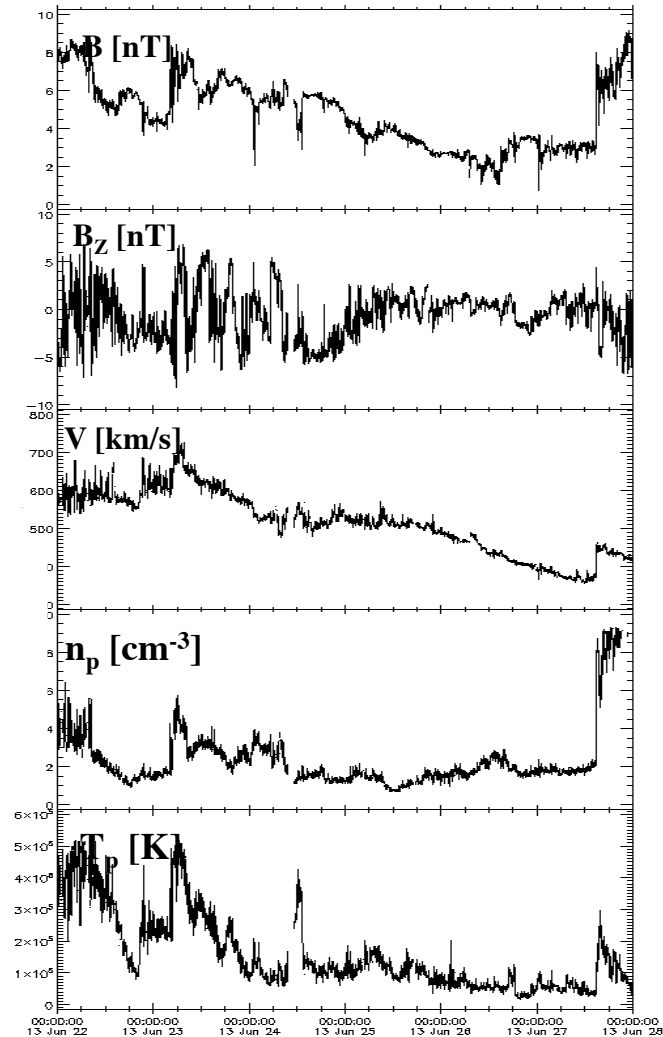
GSR: Wind and STEREO

MVA: all (magnetic field data only)

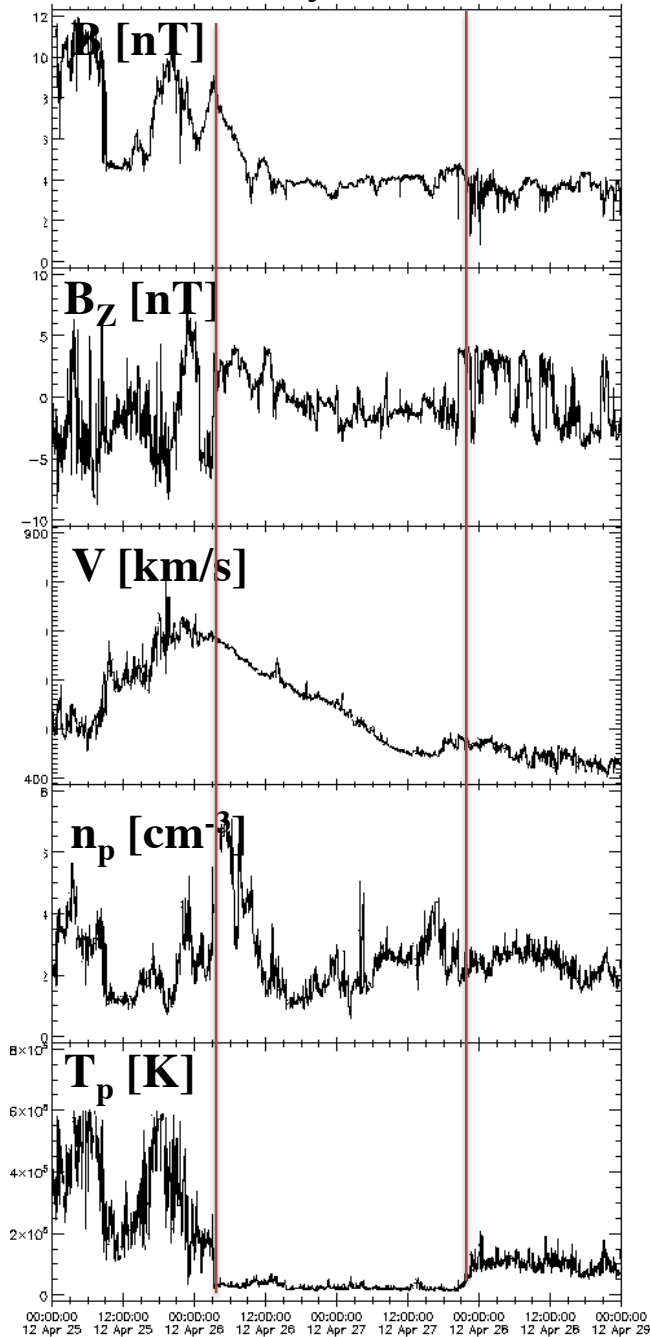


Are these ICMEs?

Check carefully ICMEs in ICMECAT for which no CME association in ARRCAT



ejecta

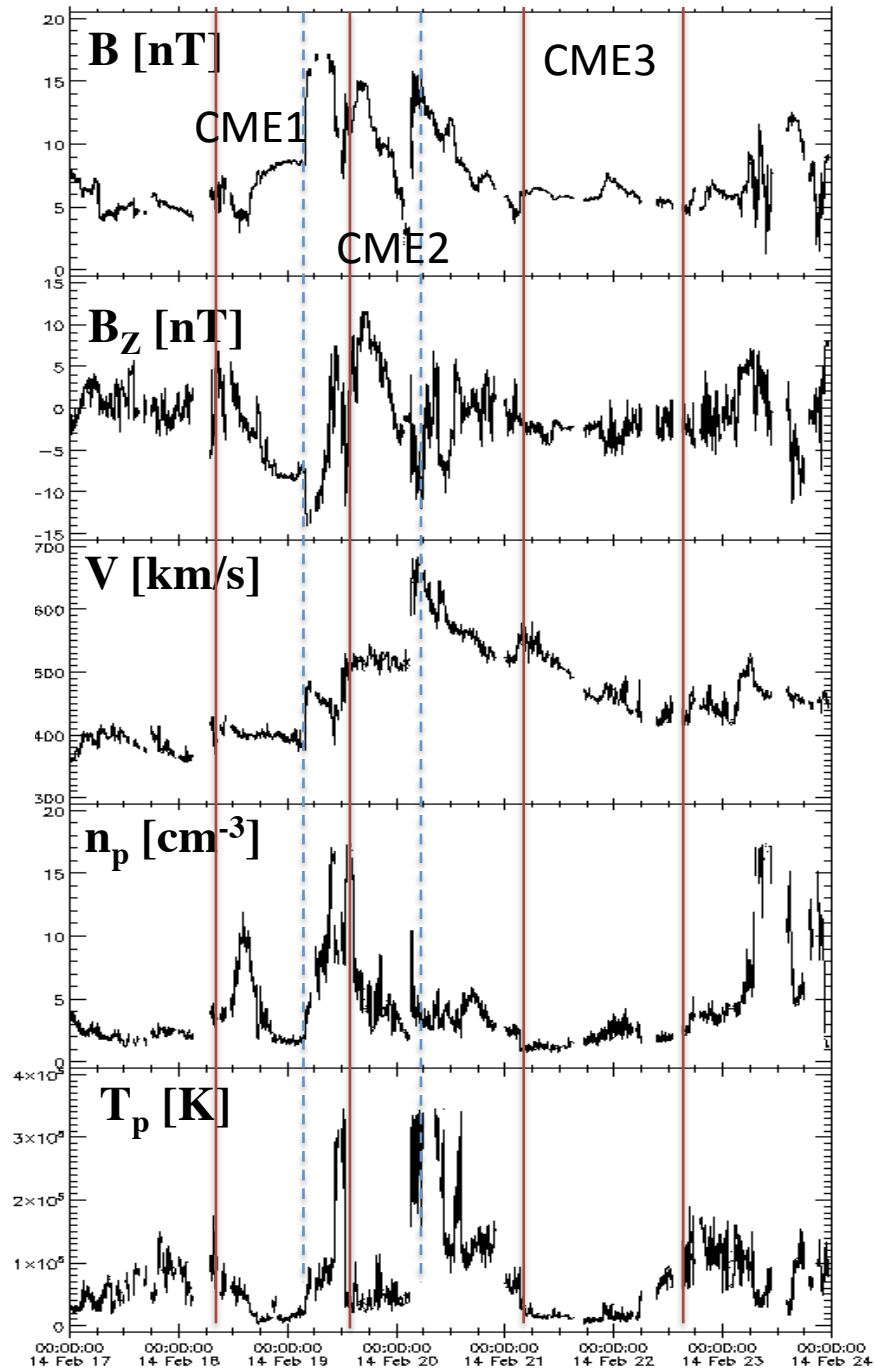


## unclear CMEs

This ICME is included in the Richardson and Cane ICME list, but not in Nieves-Chinchilla list

# Interacting CMEs

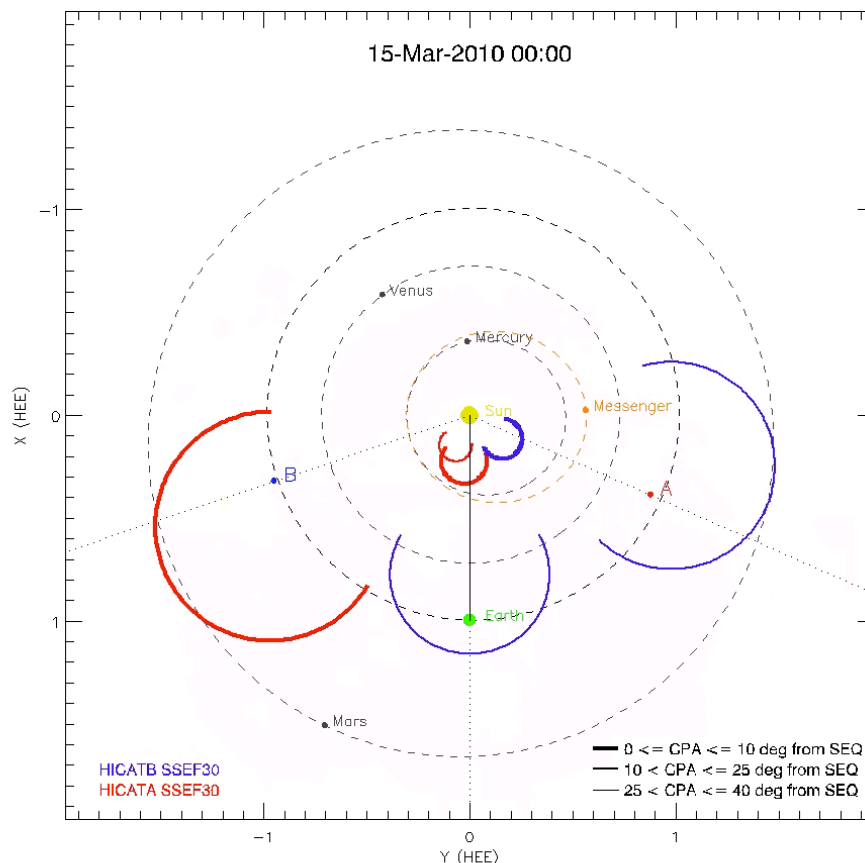
OMNI data Feb 27-Feb 24, 2014



# ASSESSING THE VALIDITY OF HI MODELING (WP 4.3)

A large number of events which should arrive in-situ, but no clear ICME detected

HELcats visualization of CME fronts



Plotted CMEs extend over PAs 90/270 and SSEF was successful. C. Moestl & P. Boakes (Graz) and Jackie Davies (RAL)

**266 predicted arrivals**  
(from one HI imager) at the Earth  
**BUT only 107 detected!**

WHY?

- Unclear ICMEs not in ICMECAT
- Large impact parameter
- CME deflection
- Narrower CME or high inclination

Analysis of such events follows

FM-based estimations from ROB for comparison (Rodríguez et al., 2011)