

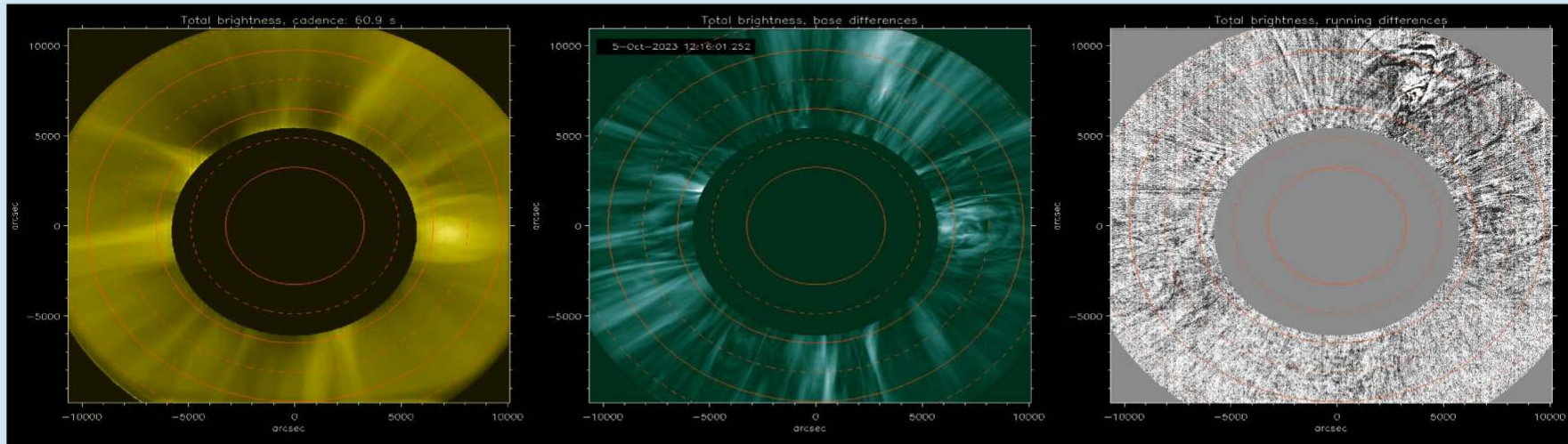
# Metis data during the 4<sup>th</sup> Solar Orbiter perihelion

**V. Andretta**

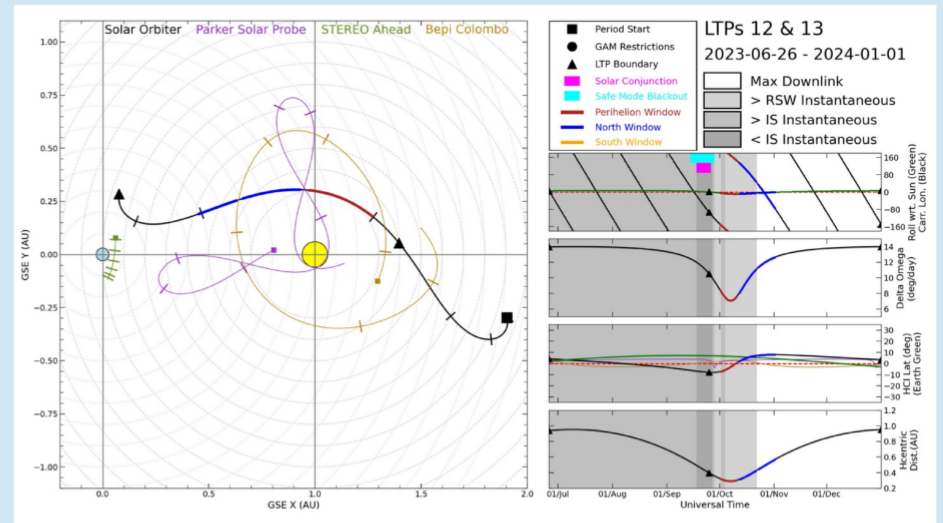
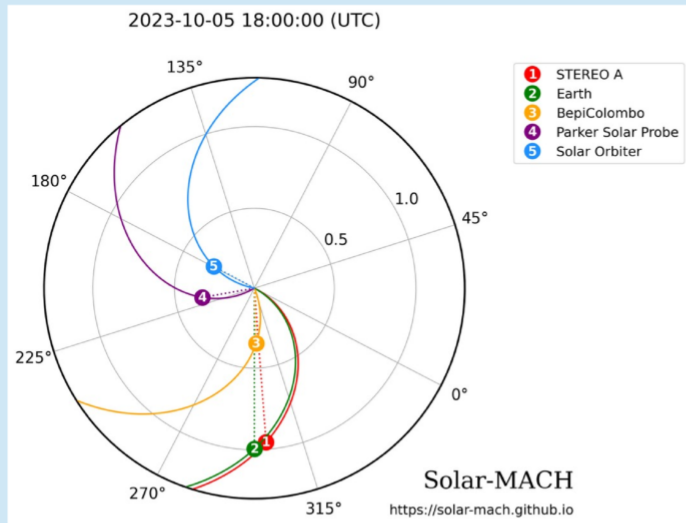
**INAF / Capodimonte Astronomical Observatory**

**Version 4, 2024-10-24**

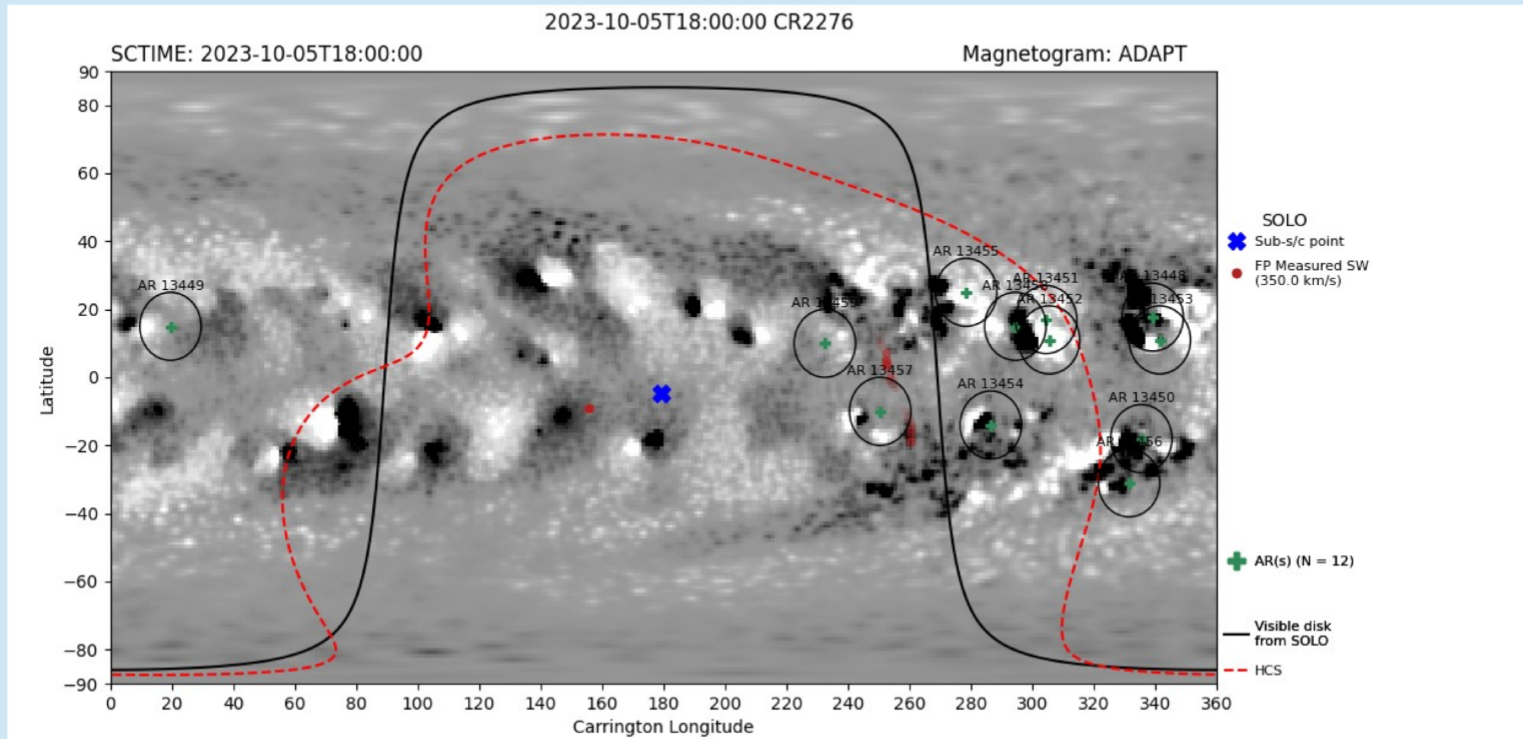
# Sample movie (pB @ 120 s, full FOV)



# Orbital configuration

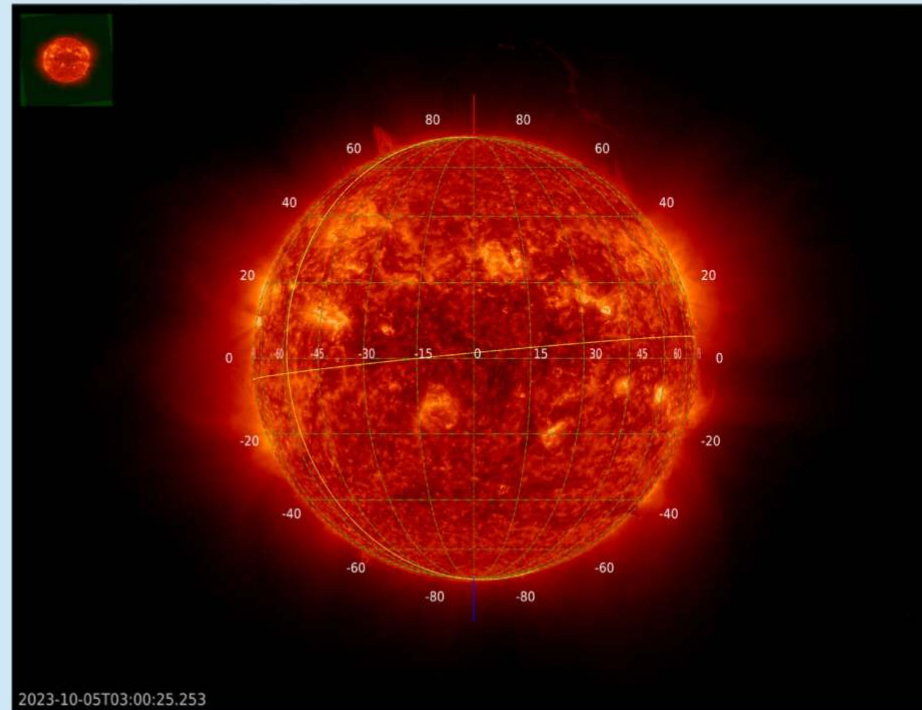
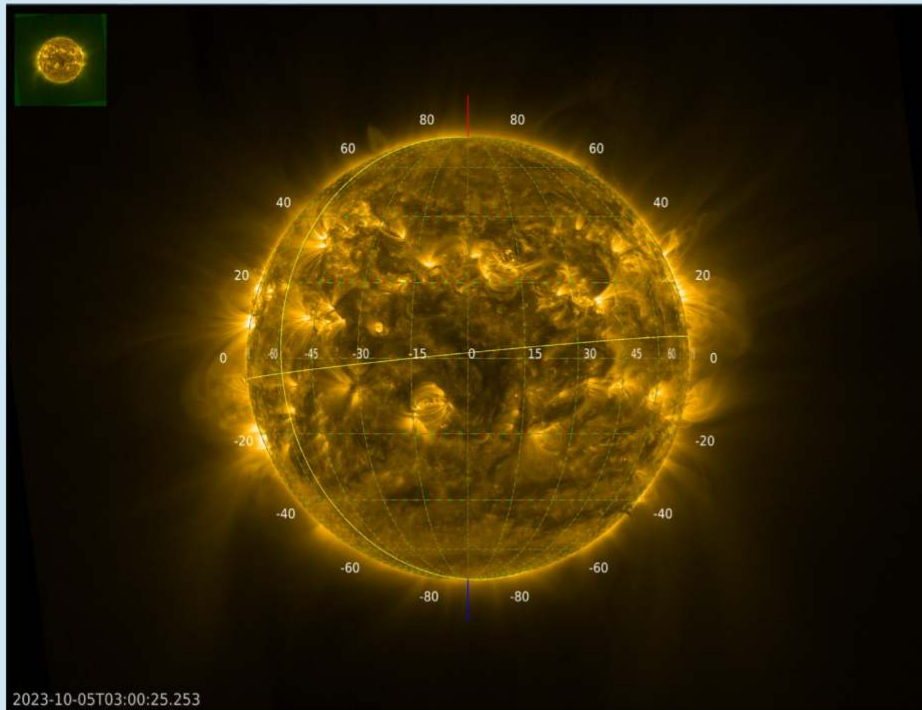


# Synoptic map

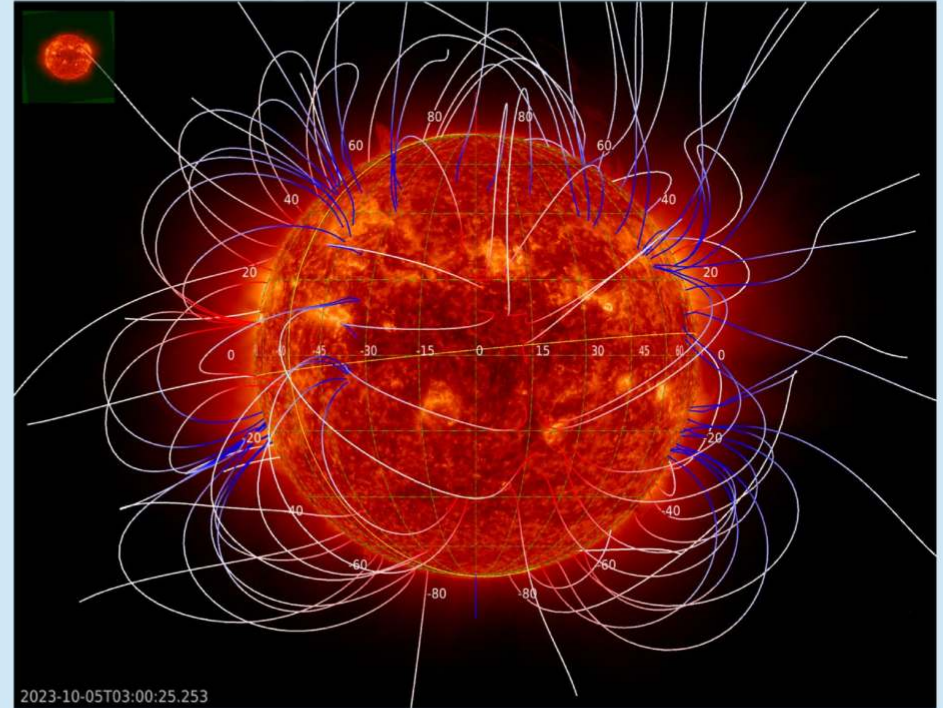
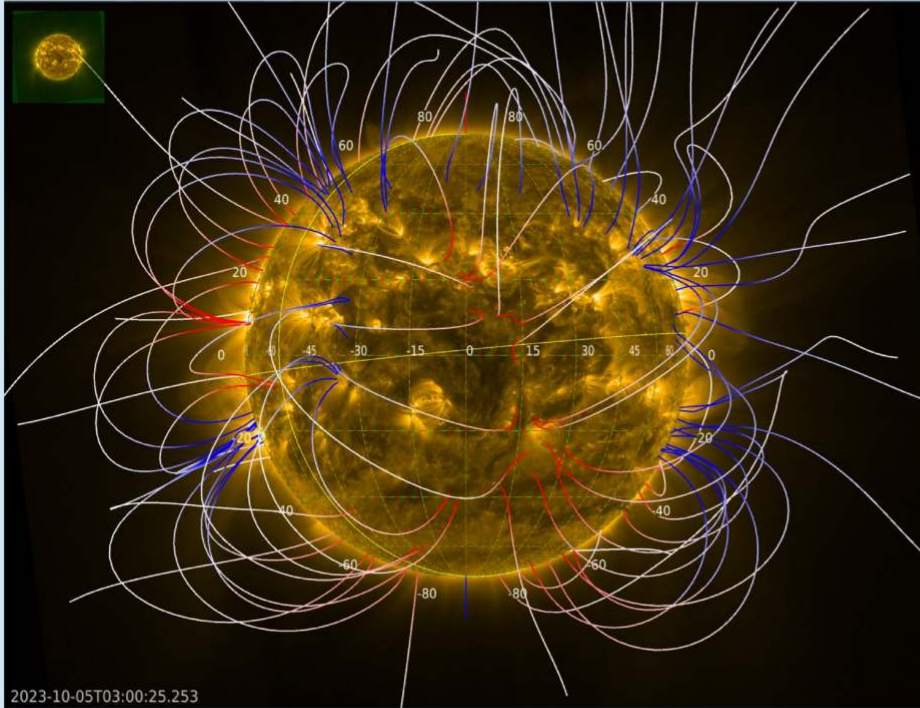




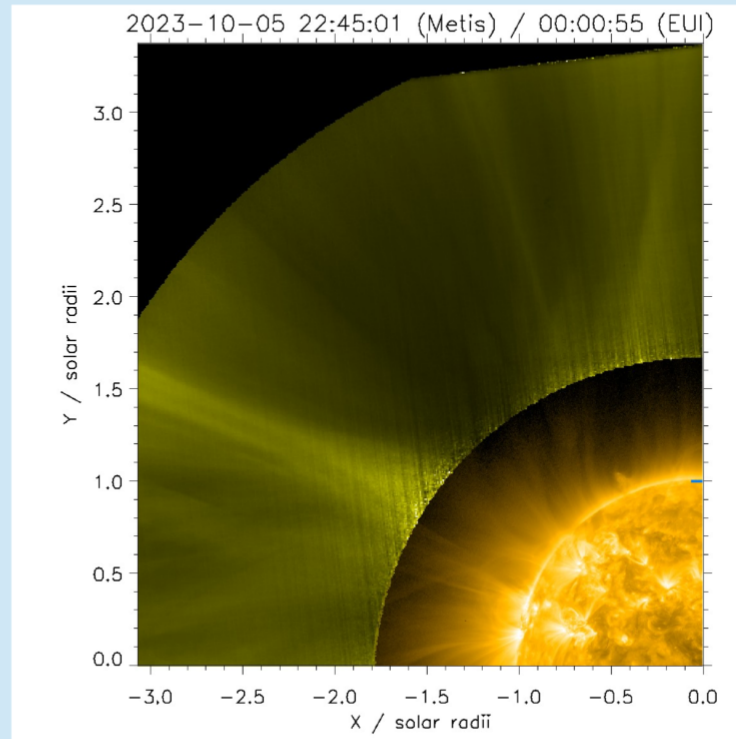
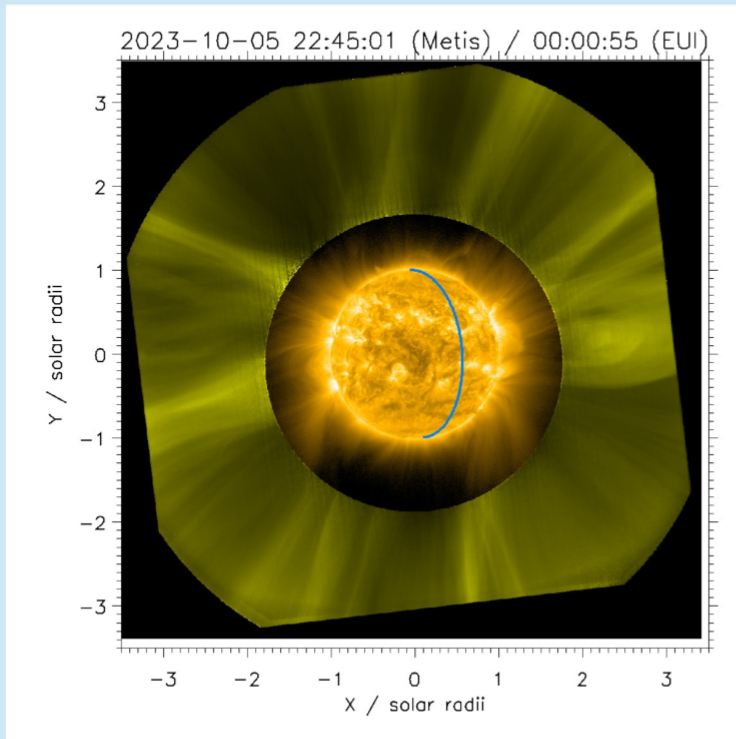
# EUI/FSI images



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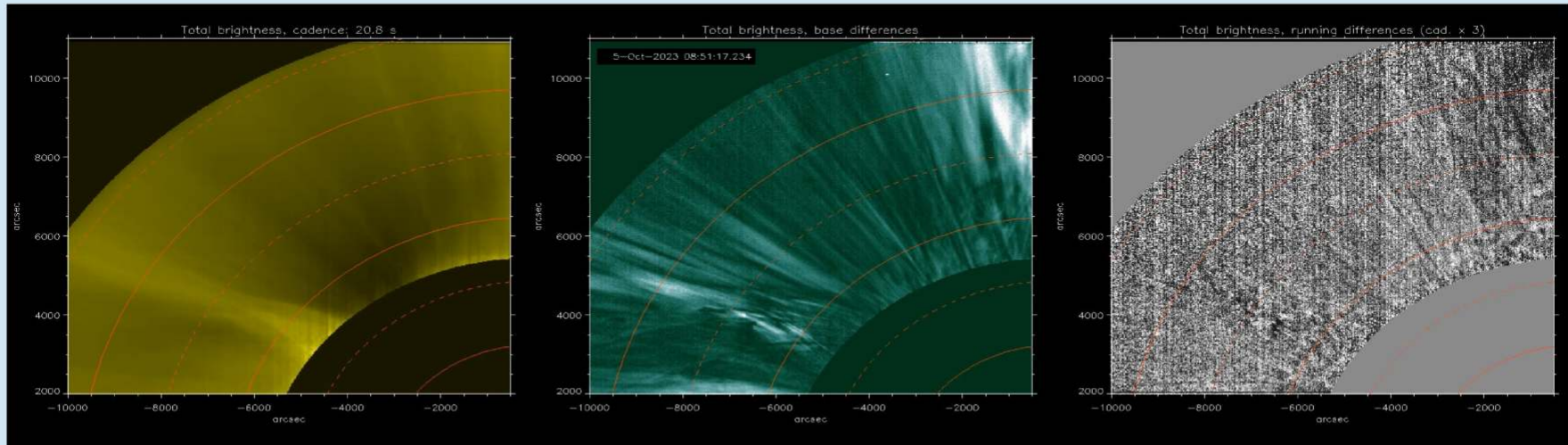


# Metis + EUI

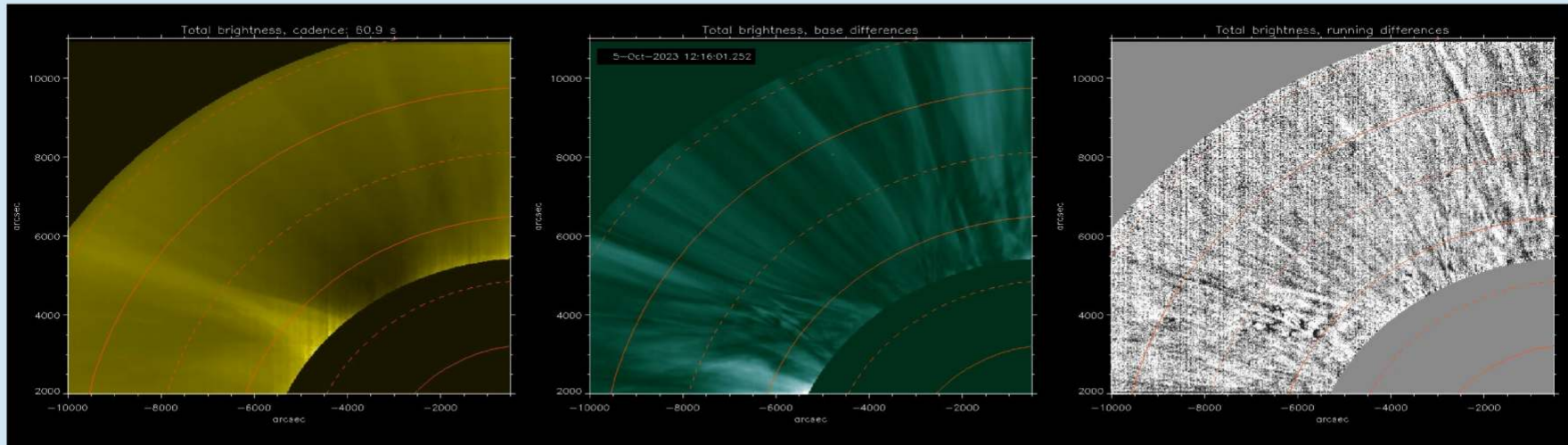




# Sample movie: B @ 20 s

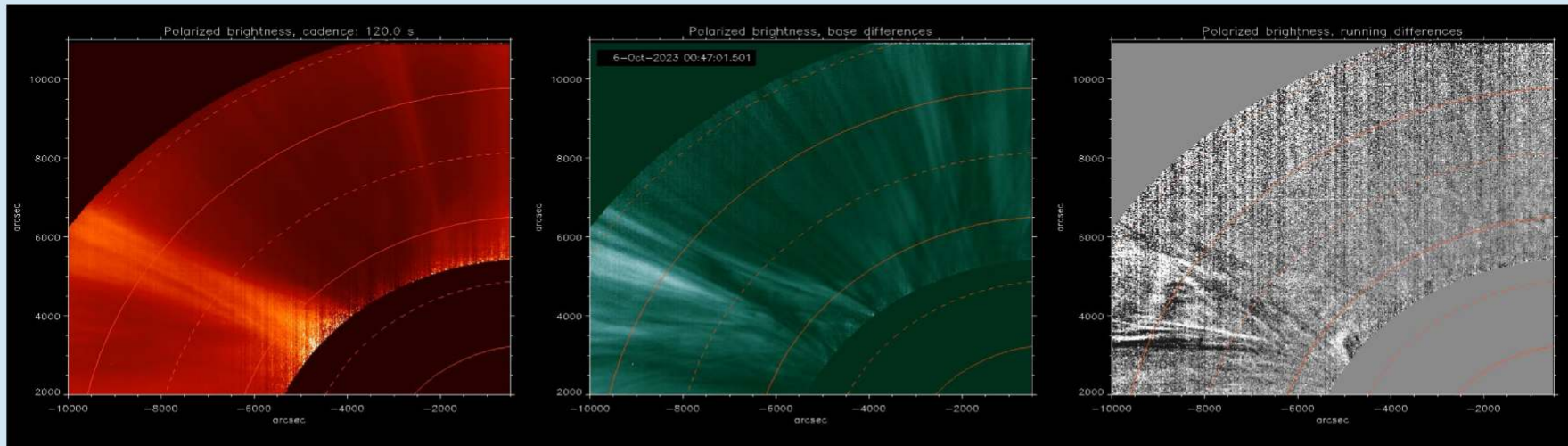


# Sample movies: B @ 60 s



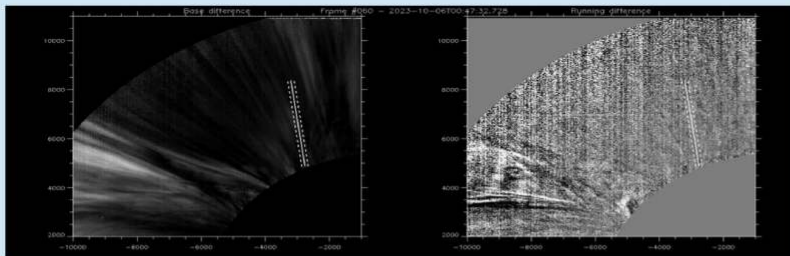


# Sample movies: pB @ 120 s



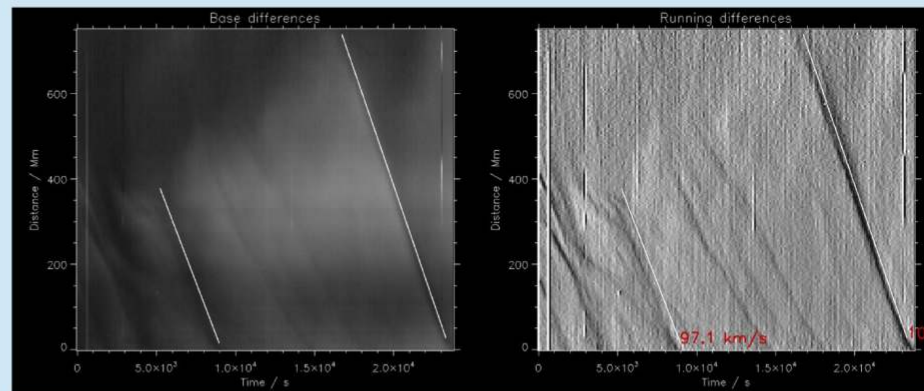
# Fast downflows (open flux region?)

Base diff.  
(norm.)



Running diff.  
(norm.)

Time-distance diagrams along path



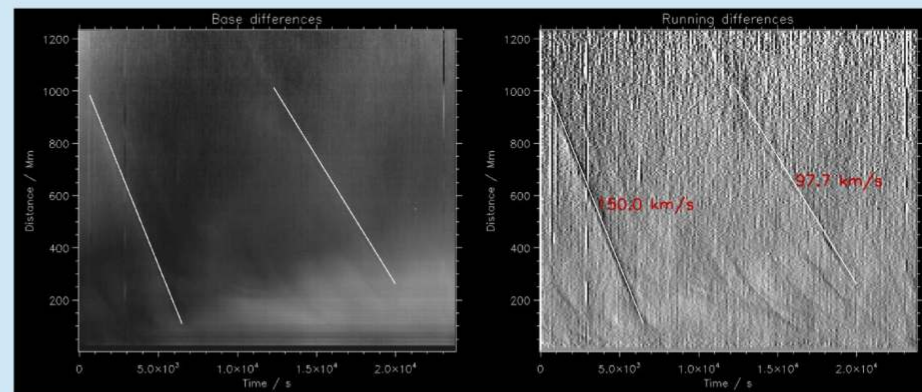
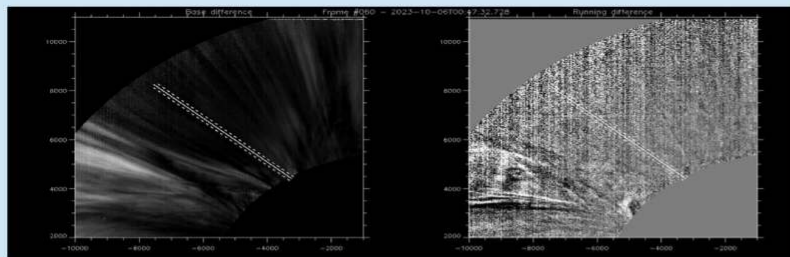
pB @ 120 s

# Fast downflows (open flux region?)

Base diff.  
(norm.)

Running diff.  
(norm.)

Time-distance diagrams along path

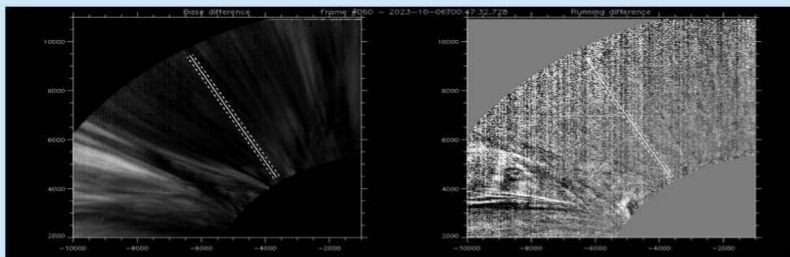


pB @ 120 s



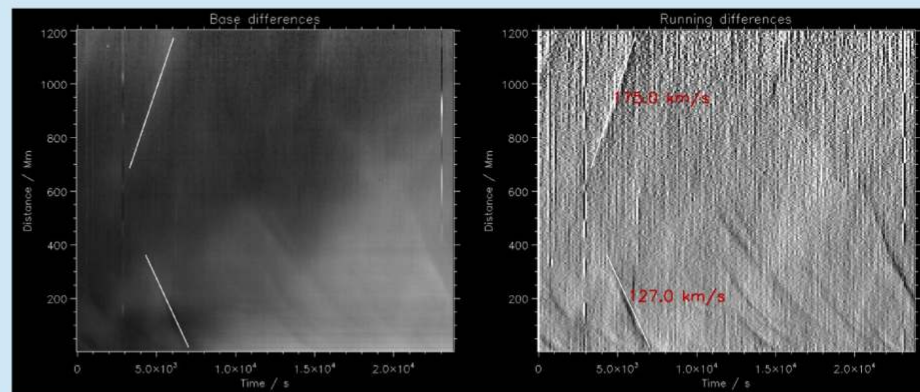
# Fast upflow/downflow pair (open flux region?)

Base diff.  
(norm.)



Running diff.  
(norm.)

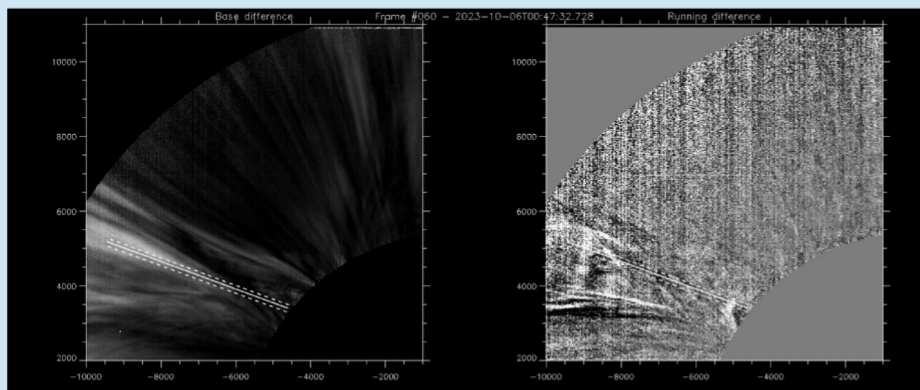
Time-distance diagrams along path



pB @ 120 s

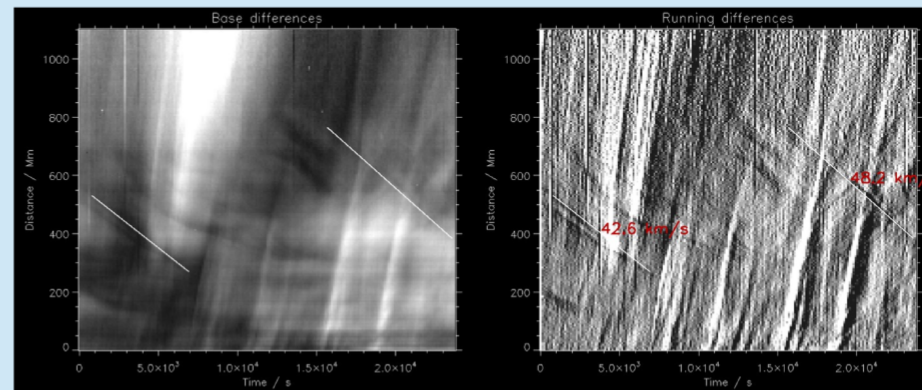
# Slow downflows (streamer)

Base diff.  
(norm.)



Running diff.  
(norm.)

Time-distance diagrams along path



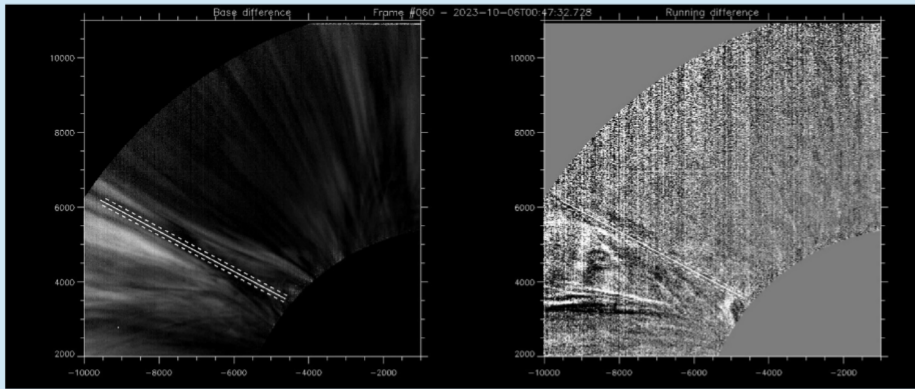
pB @ 120 s

„Retracting“ loops? Upflow/downflow pairs?  
(see talk by Abbo+)



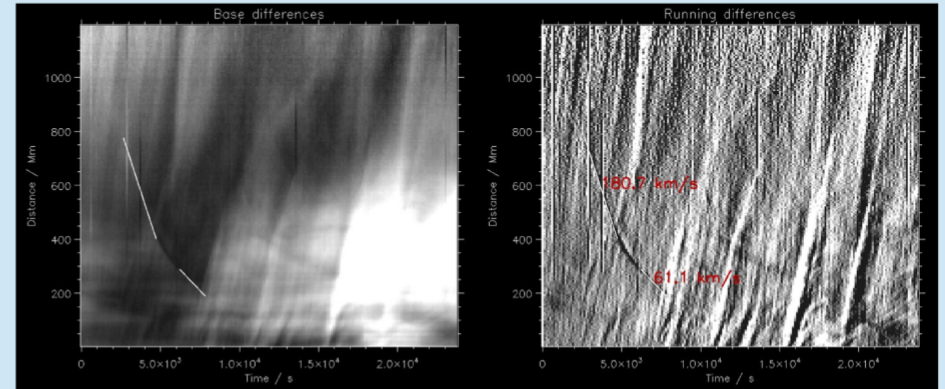
# Fast, decelerating downflows (streamer)

Base diff.  
(norm.)



Running diff.  
(norm.)

Time-distance diagrams along path



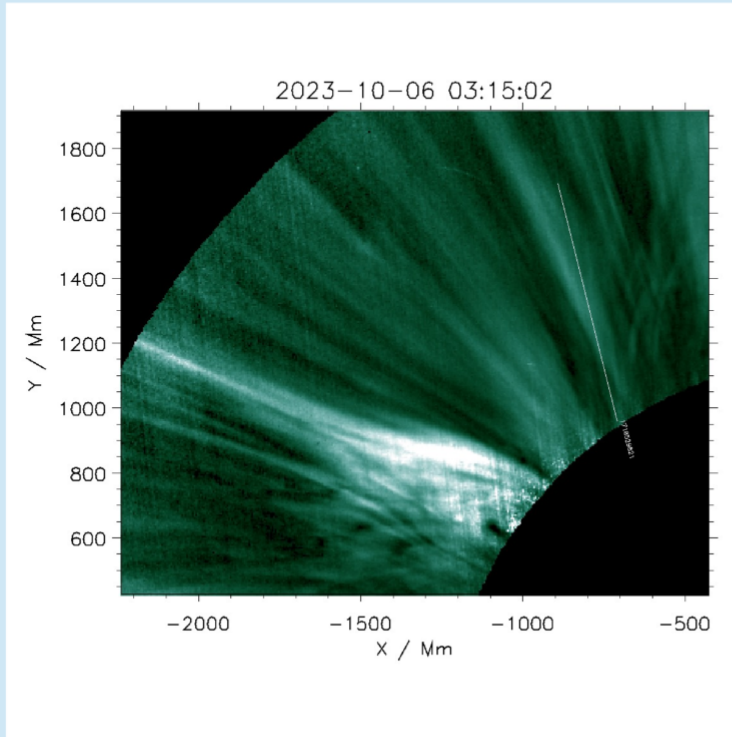
pB @ 120 s

„Retracting“ loops? Upflow/downflow pairs?  
(see talk by Abbo+)

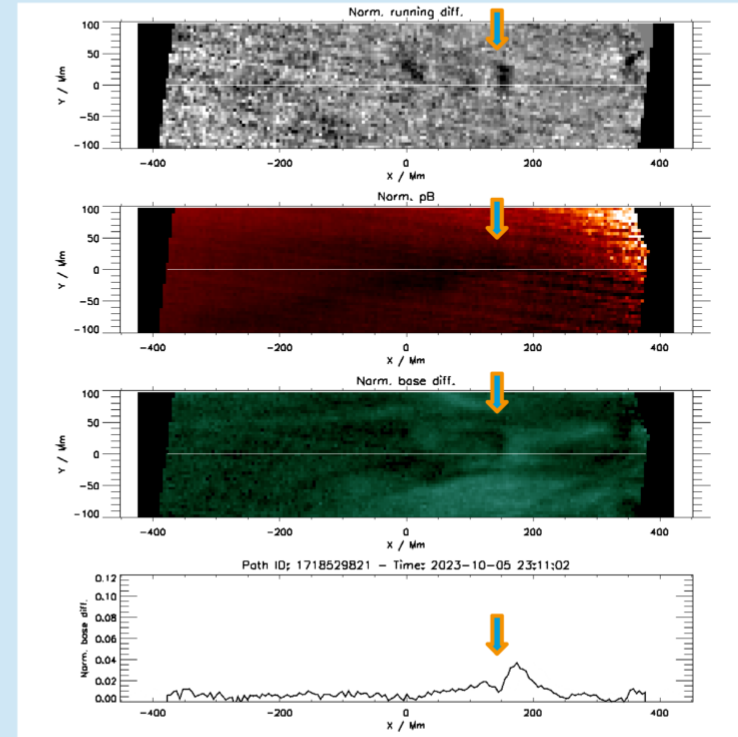


# A close-up view along a path

pB @ 120 s



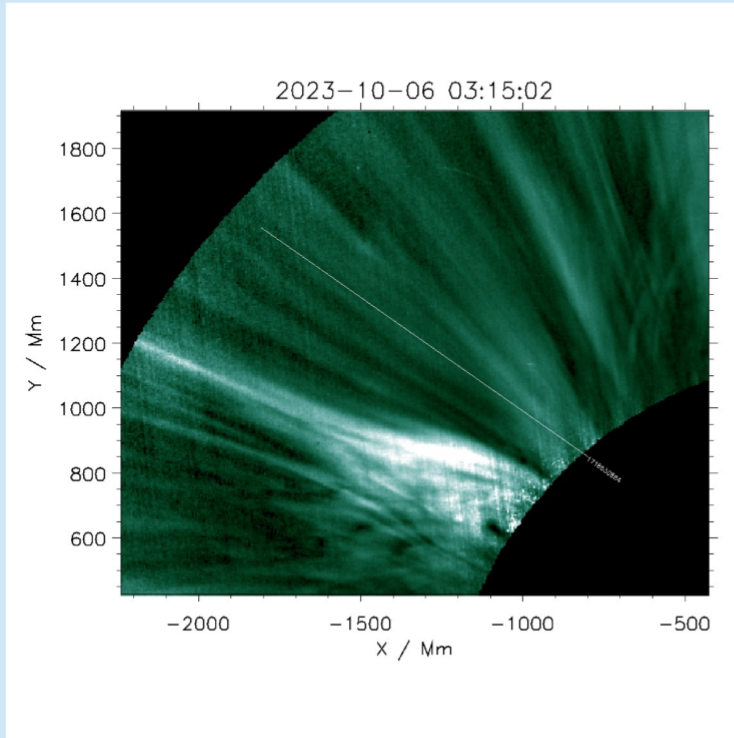
(movie available)



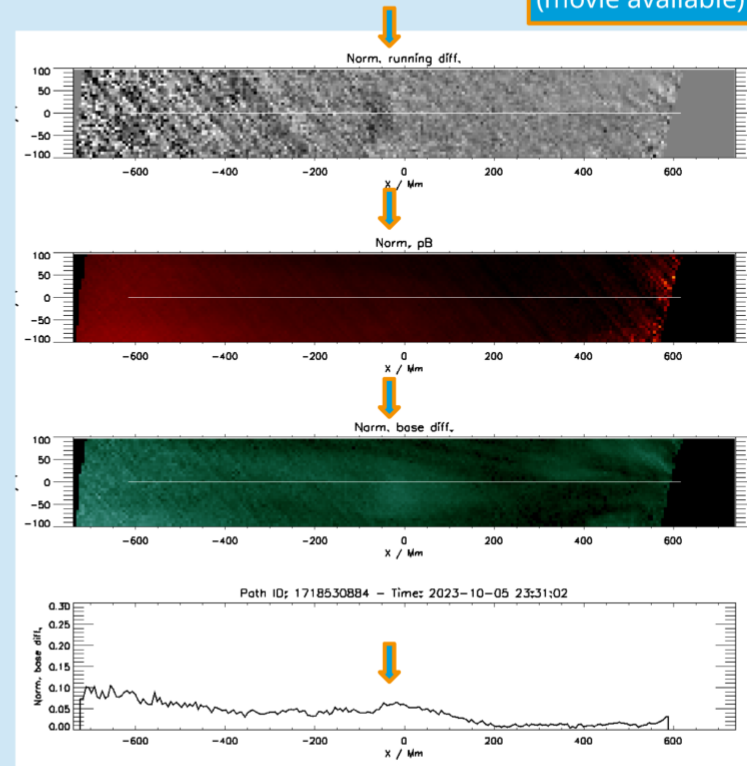
Snapshot of a strip along the path, with a few „dark“ features traveling downwards.  
The feature marked with arrows seems to have a „bright“ front ahead, and an intensity depression behind.  
The shape resembles a „crescent“ or „reversed loop-top“

# A close-up view along a path

pB @ 120 s



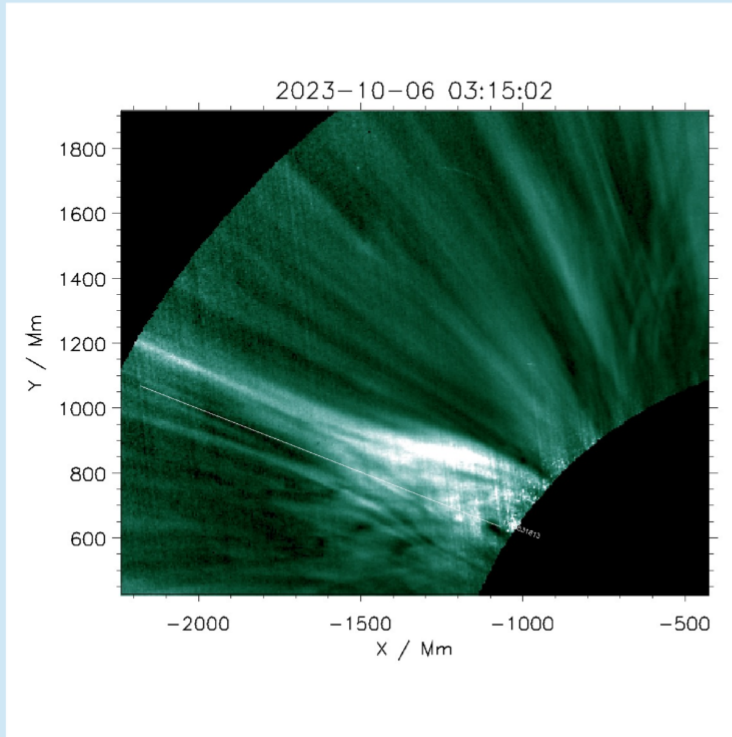
(movie available)



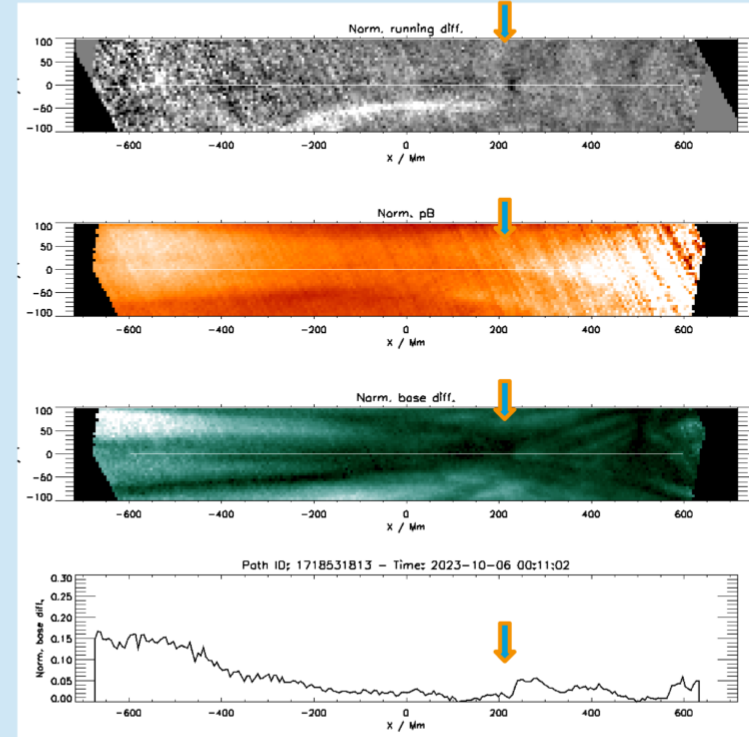
A „crescent-like“ feature similar to the one in the previous slide is marked by arrows.

# A close-up view along a path

pB @ 120 s



(movie available)



Snapshot of a strip along the path in the helmet streamer. A „retracting loop“ is easily seen at the cusp at about  $x=+200$  Mm (relative units from the center of the path).



# Concluding remarks

- Metis High-cadence data, from pB at 120 s cadence down to B („tB“) at 20 s, reveal many apparently downflowing features.
- Coronal inflows have been observed in the past and have been interpreted as due to dynamic and intermittent release of solar wind plasma associated with the helmet streamer belt as the counterpart to outward-propagating streamer blobs, formed by magnetic reconnection (e.g.: Lynch 2020). See also talk by L. Abbo.
- The features observed by Metis seem much more frequent than observed in the past. However, inflows seem to outnumber the observed outflows by a large factor, indicating perhaps reconnection events beyond the edge of the Metis FoV.
- But: examples can be found of apparent downflows even in open-field regions.
- These downflowing features are most apparent in running-difference images. However, they can also be seen in base-difference images or even in normalized brightness images. A closer inspection reveals that these features are characterized by a front brighter than the surrounding corona, sometimes with a „crescent-like“ shape, followed by a depression in brightness.
- It has been suggested (R. B. Scott et al., „Simulation of Thermal Nonequilibrium Cycles in the Solar Wind“, in preparation) that Thermal Non-Equilibrium (TNE) could occur even in the context of a transonic solar wind with appreciable mass and energy fluxes.
- An interpretation of the observed phenomena by Metis as manifestation of TNE cycles is begin explored.