Application of CACTus to SWAP/AIA images

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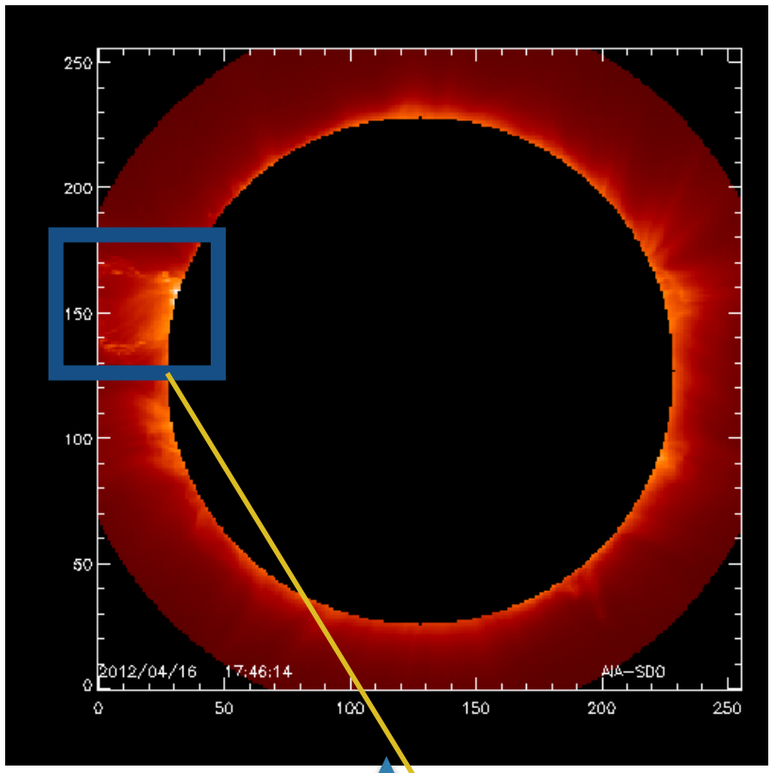
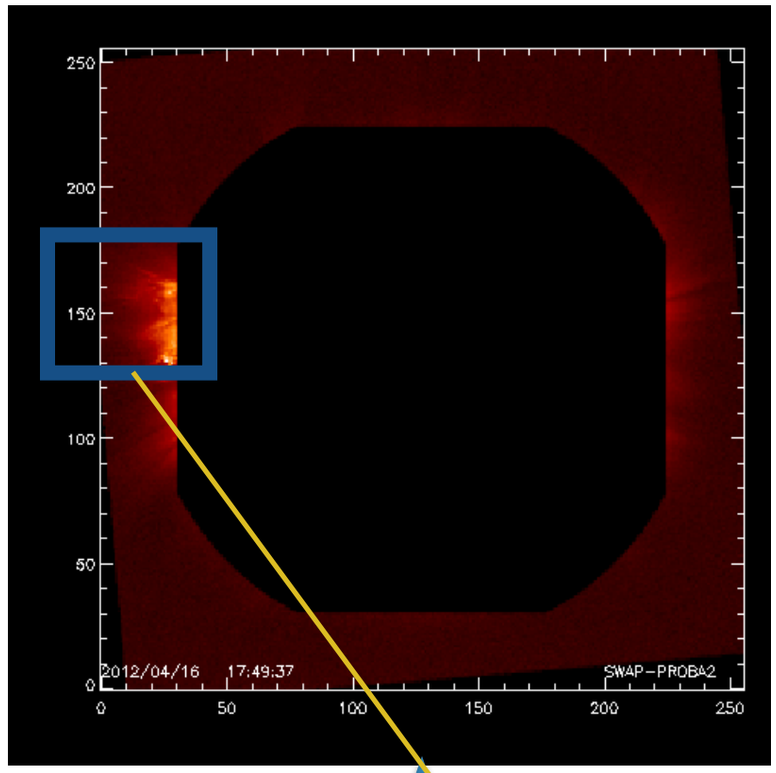
Methodology of Detection

AIA 171 A

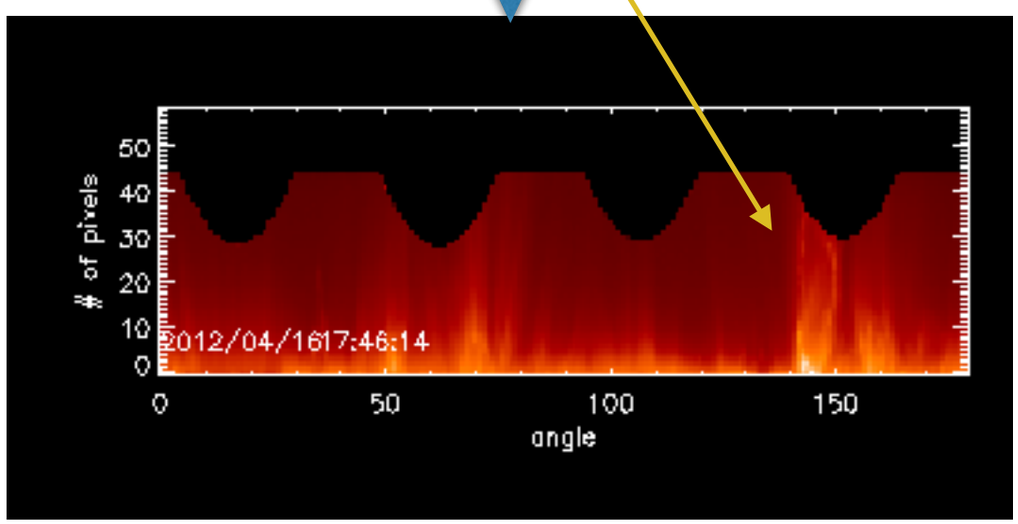
SWAP 174 A

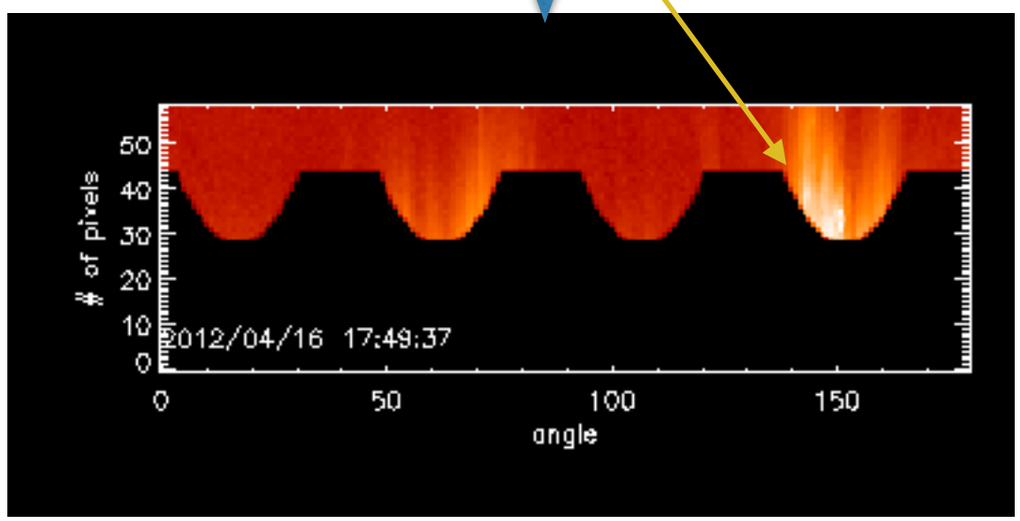


Region of interest is enclosed in box



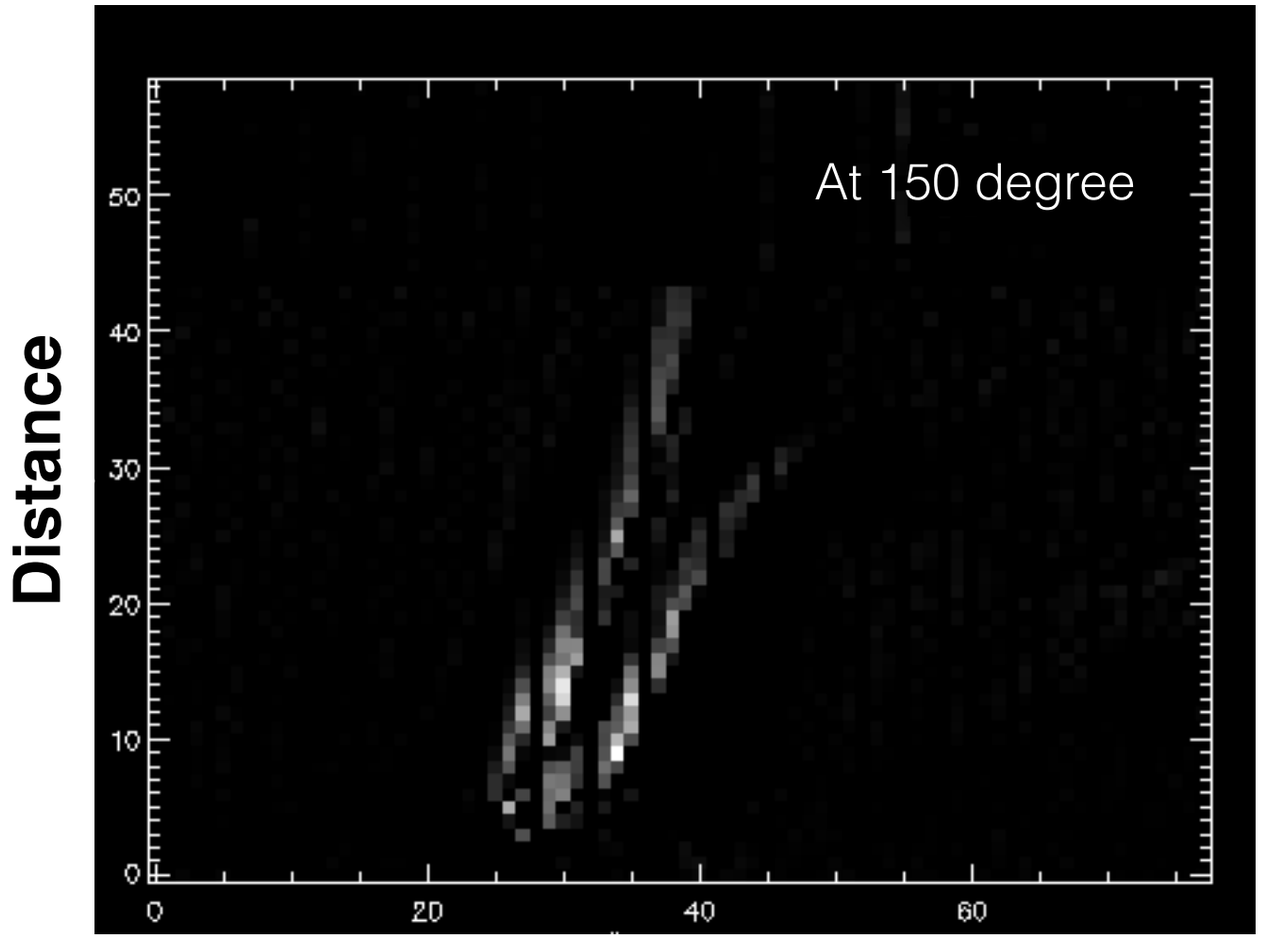
Polar Transformation





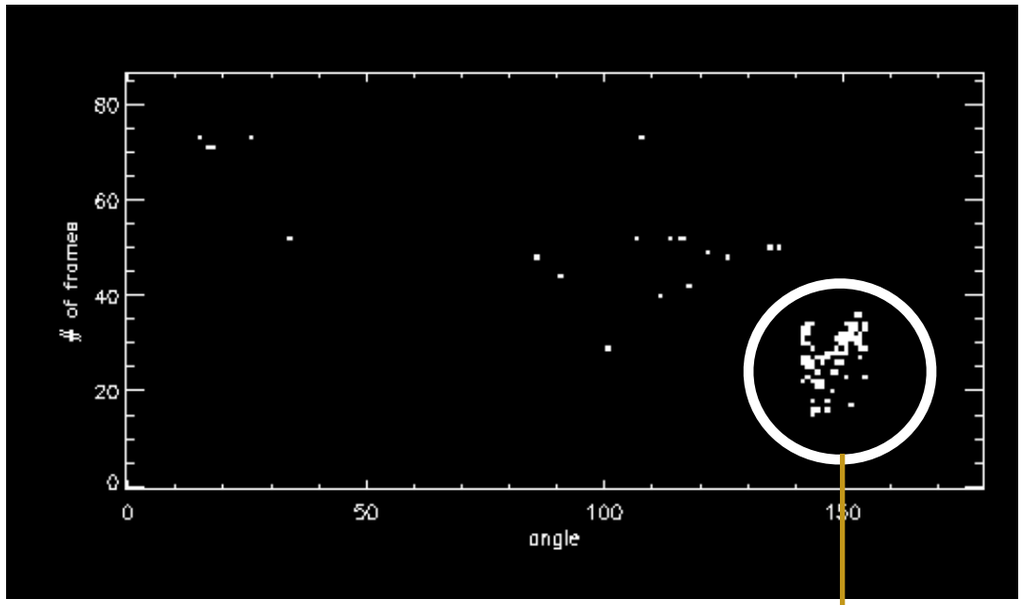
Time distance maps

Before making time distance maps, noise is removed by median filtering (three images at a time)



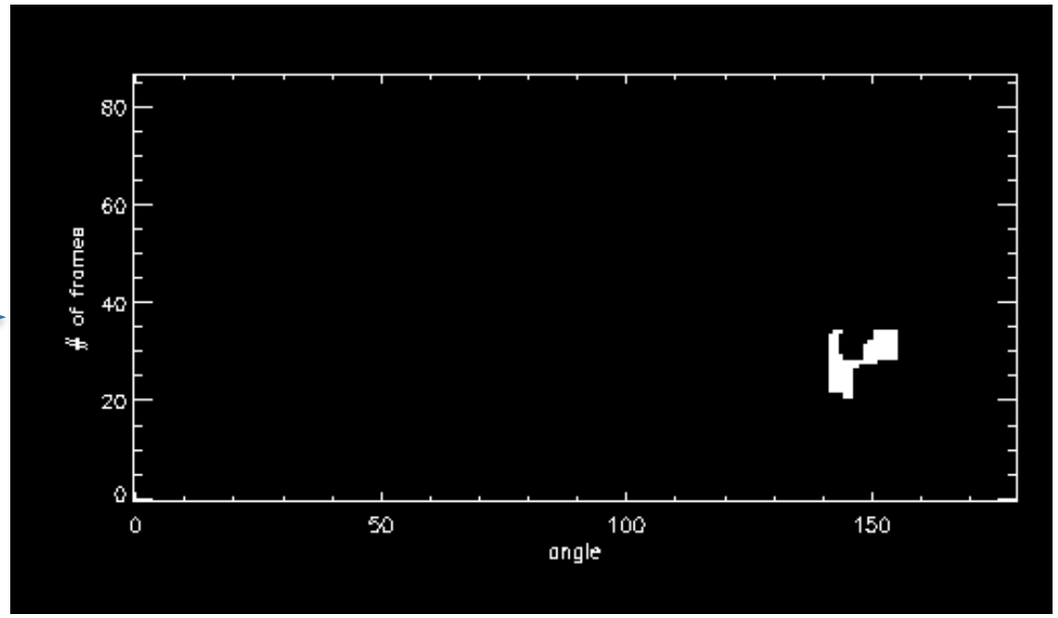
- Trajectory of CME is curved which indicated acceleration or deceleration
- Difficult to apply CACTus since it detects straight line
- Unlike white-light images of coronagraph, in EUV images the contrast enhancement in difference images is poor thus less signal to noise.
- Hough transform is applied to detect ridges

After the application of Hough transform at all angles, we get a point for a detected ridge.

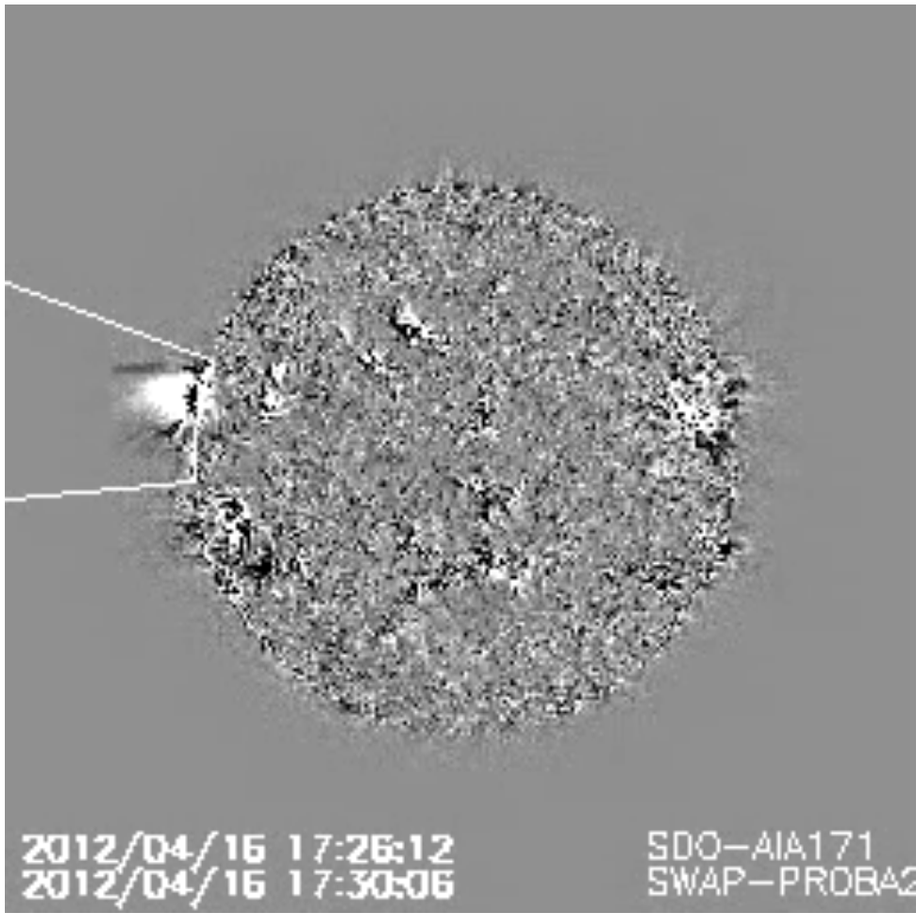


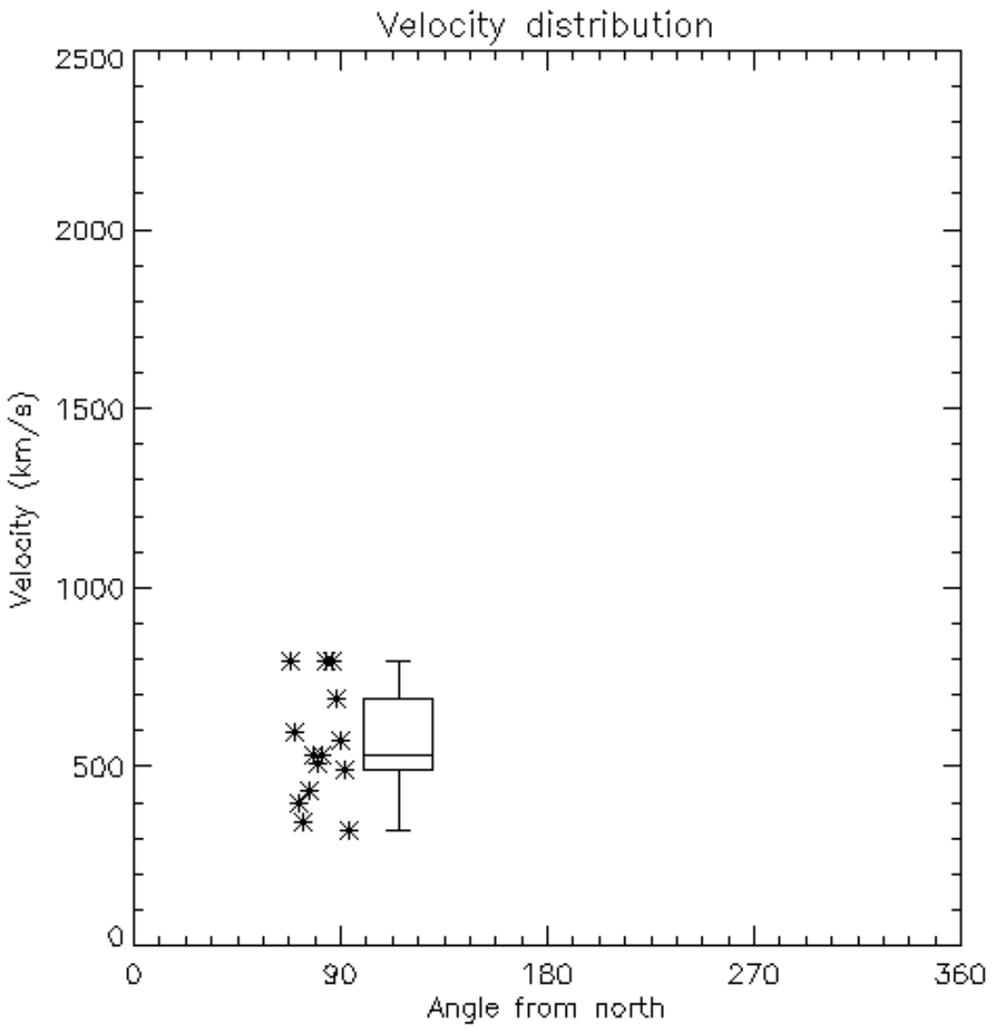
Dense cluster of points represents many outward moving features densely packed in a small region -> CME

Morphol-ogical closing

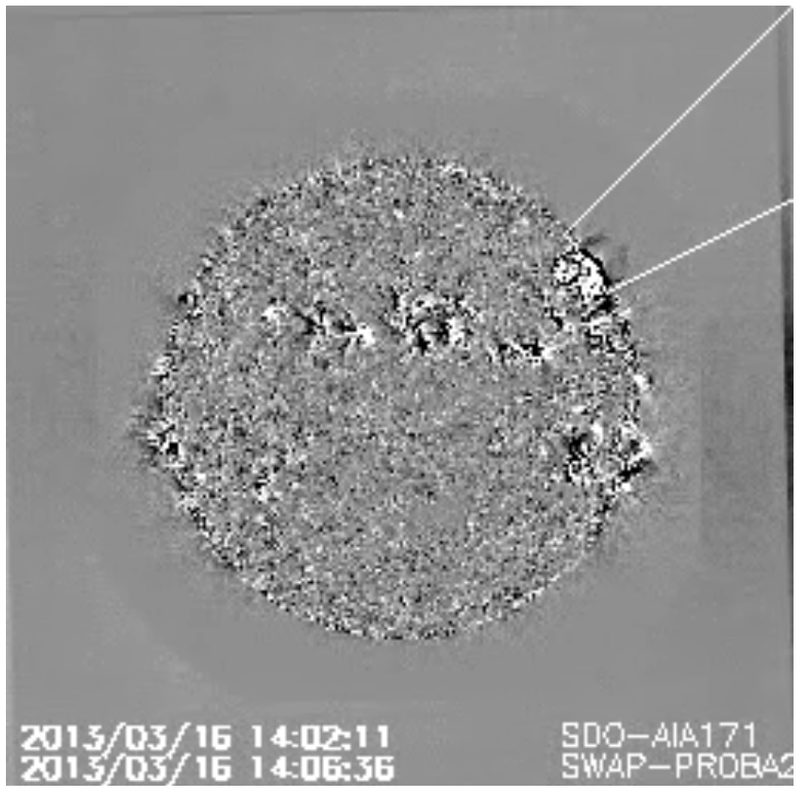


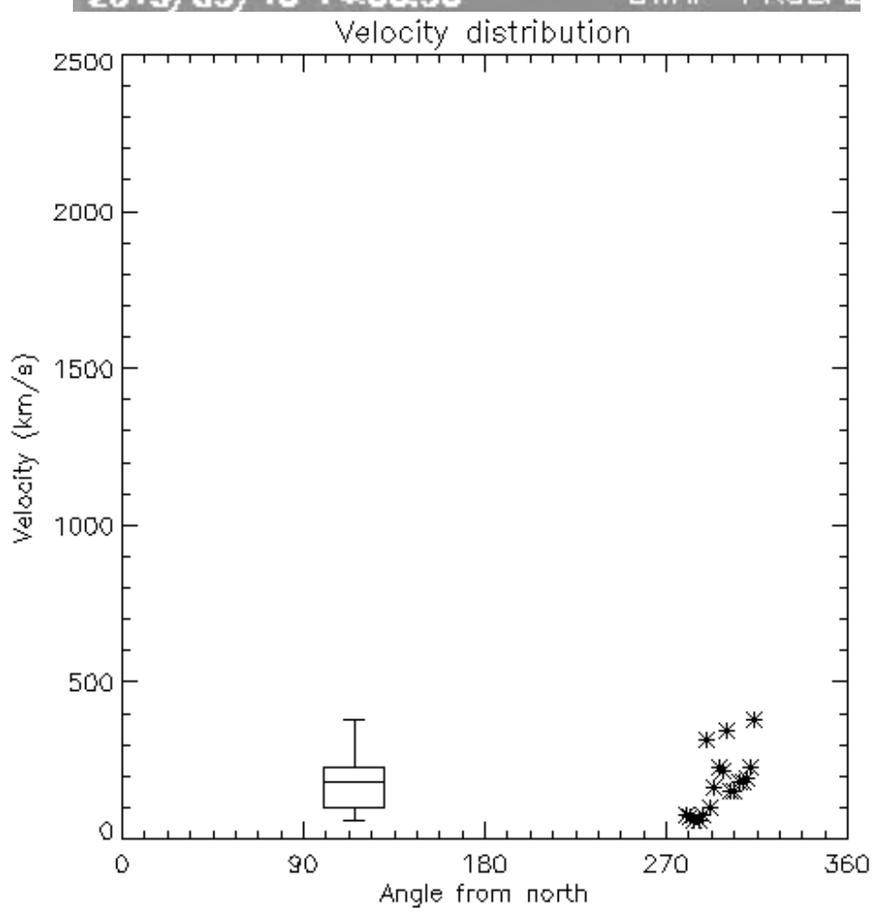
- Isolated points are removed but only the cluster of points are identified
- Extent of cluster in x direction represents the angular width
- Lower boundary of cluster represents the starting time

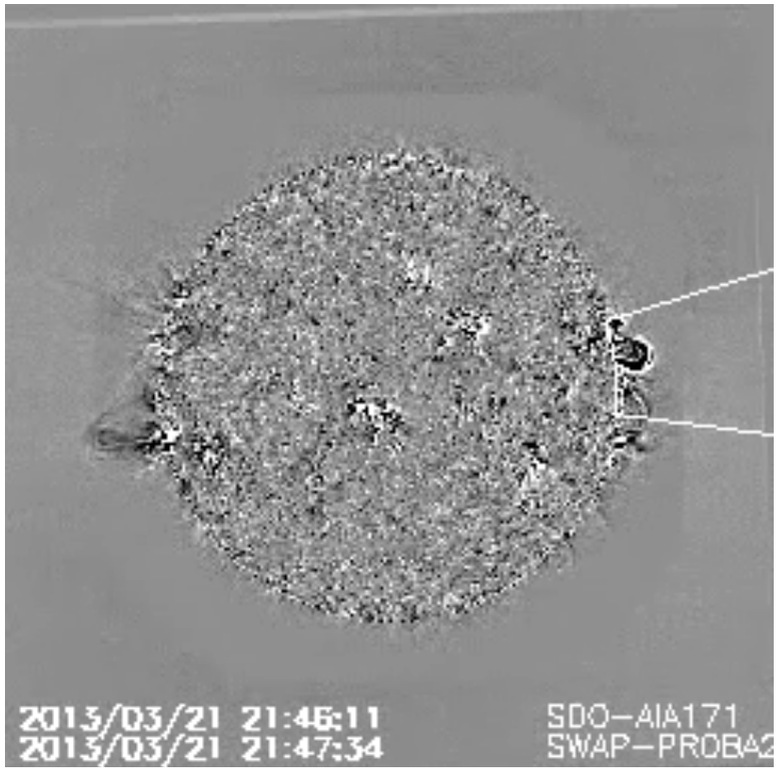

2012/04/16 17:26:12
2012/04/16 17:30:06
SDO-AIA171
SWAP-PROBA2

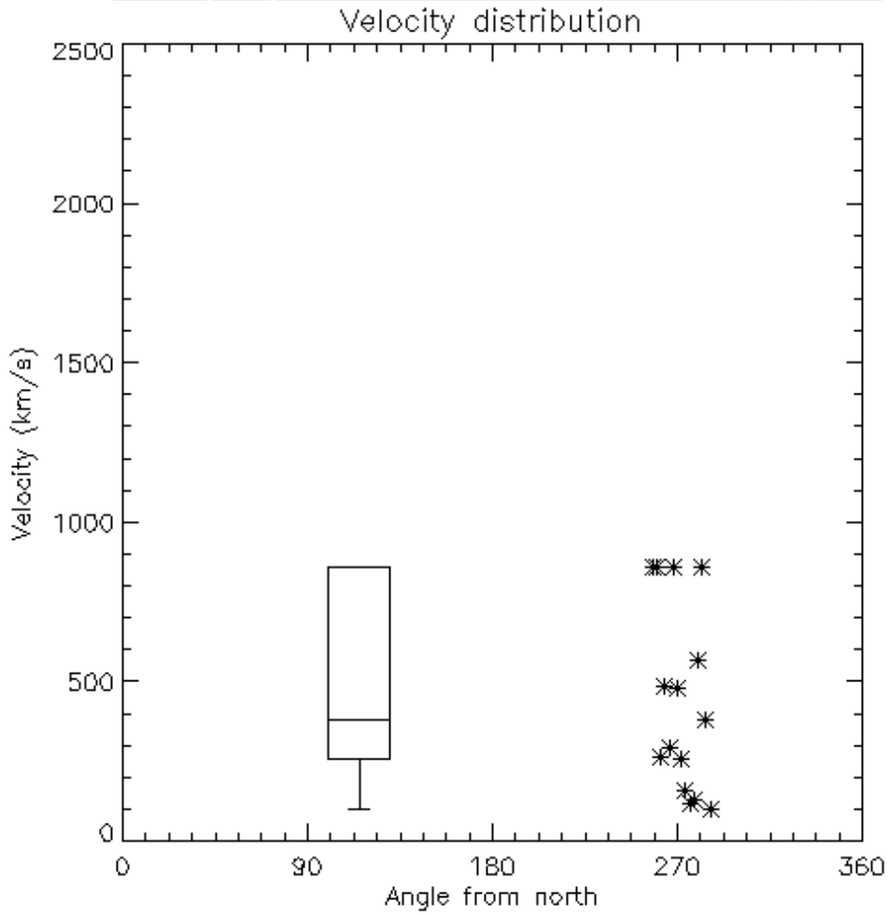

Velocity distribution
Velocity (km/s)
2500
2000
1500
1000
500
0
0
90
180
270
360
Angle from north

Some more detections



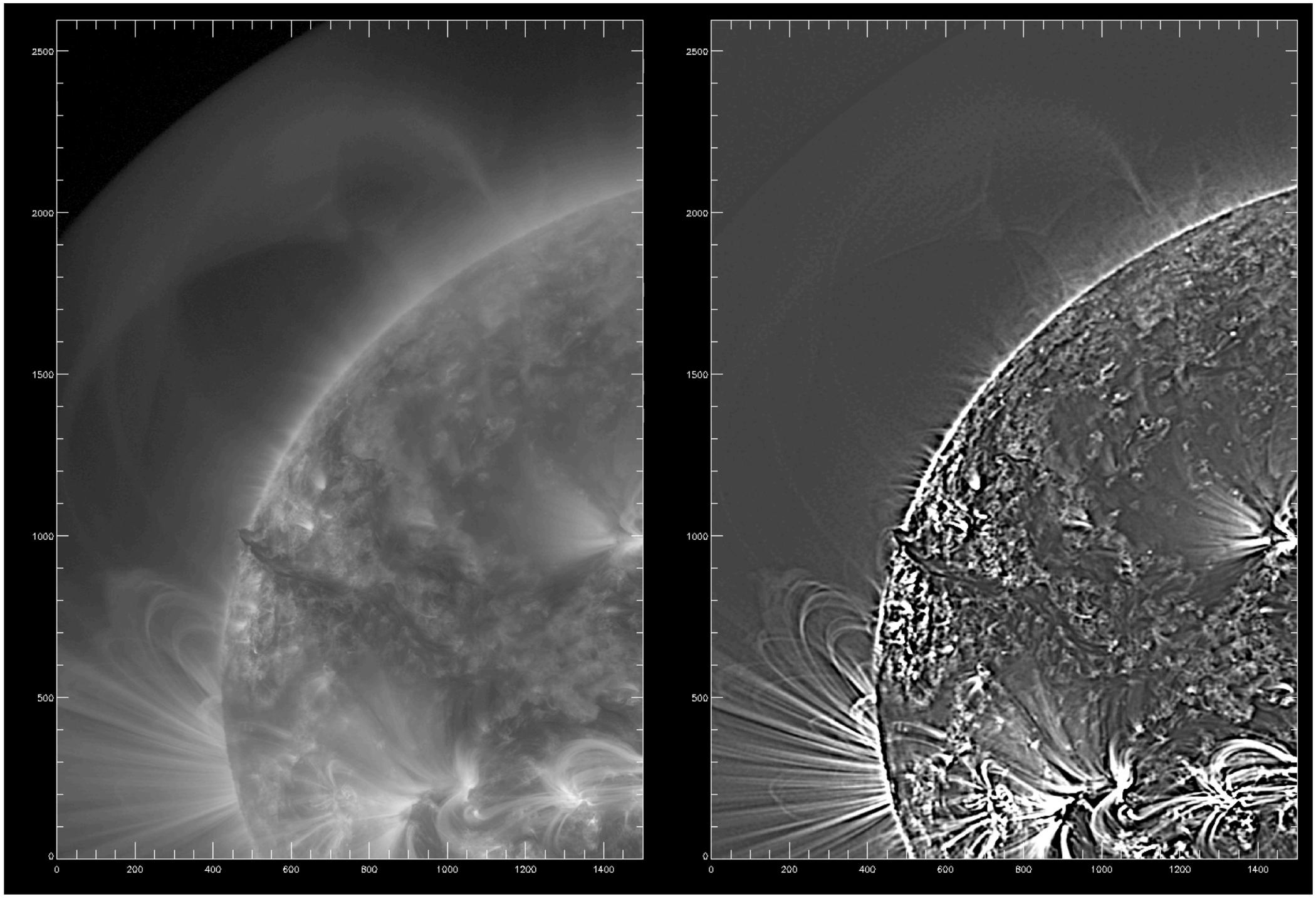




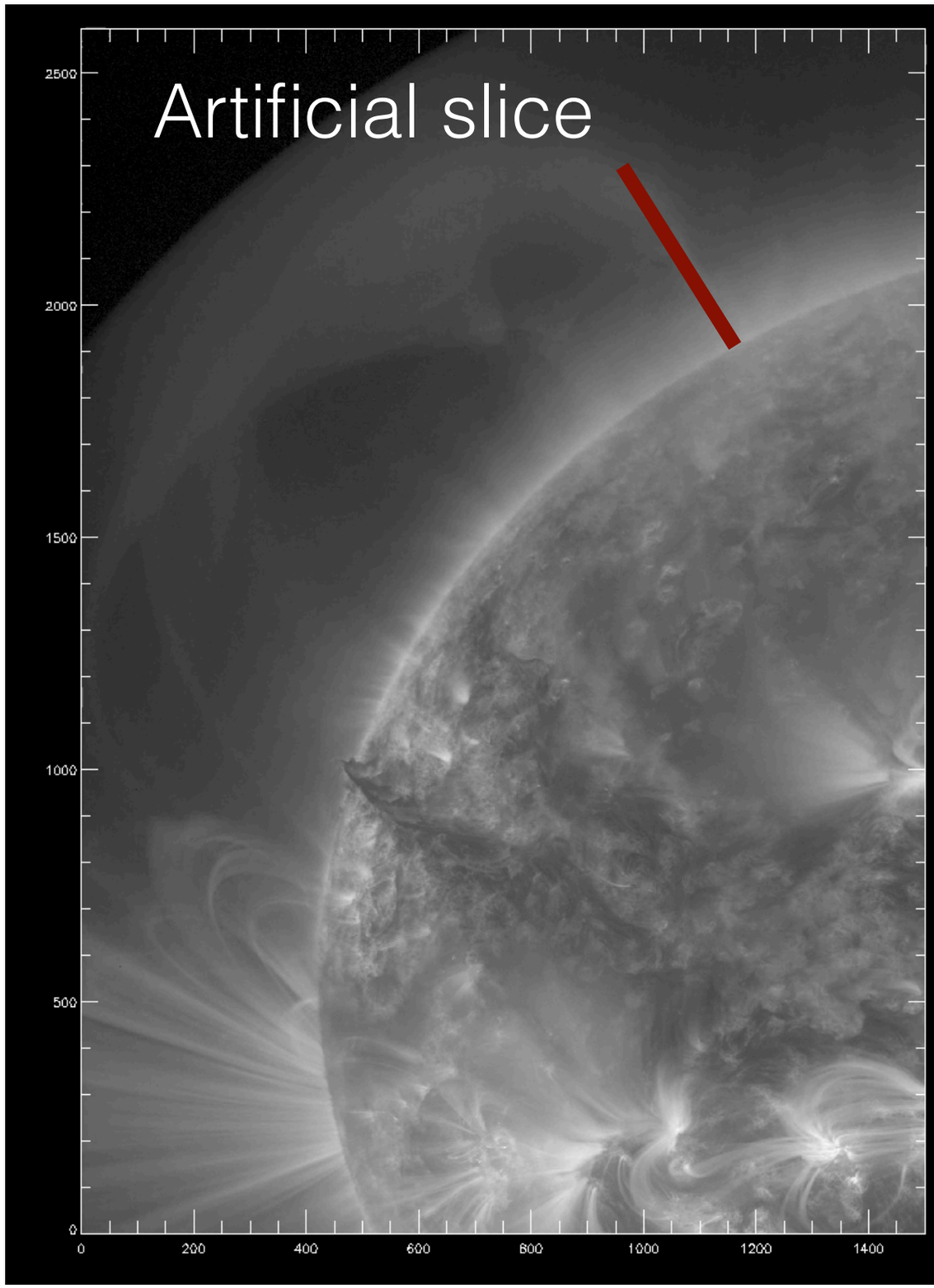


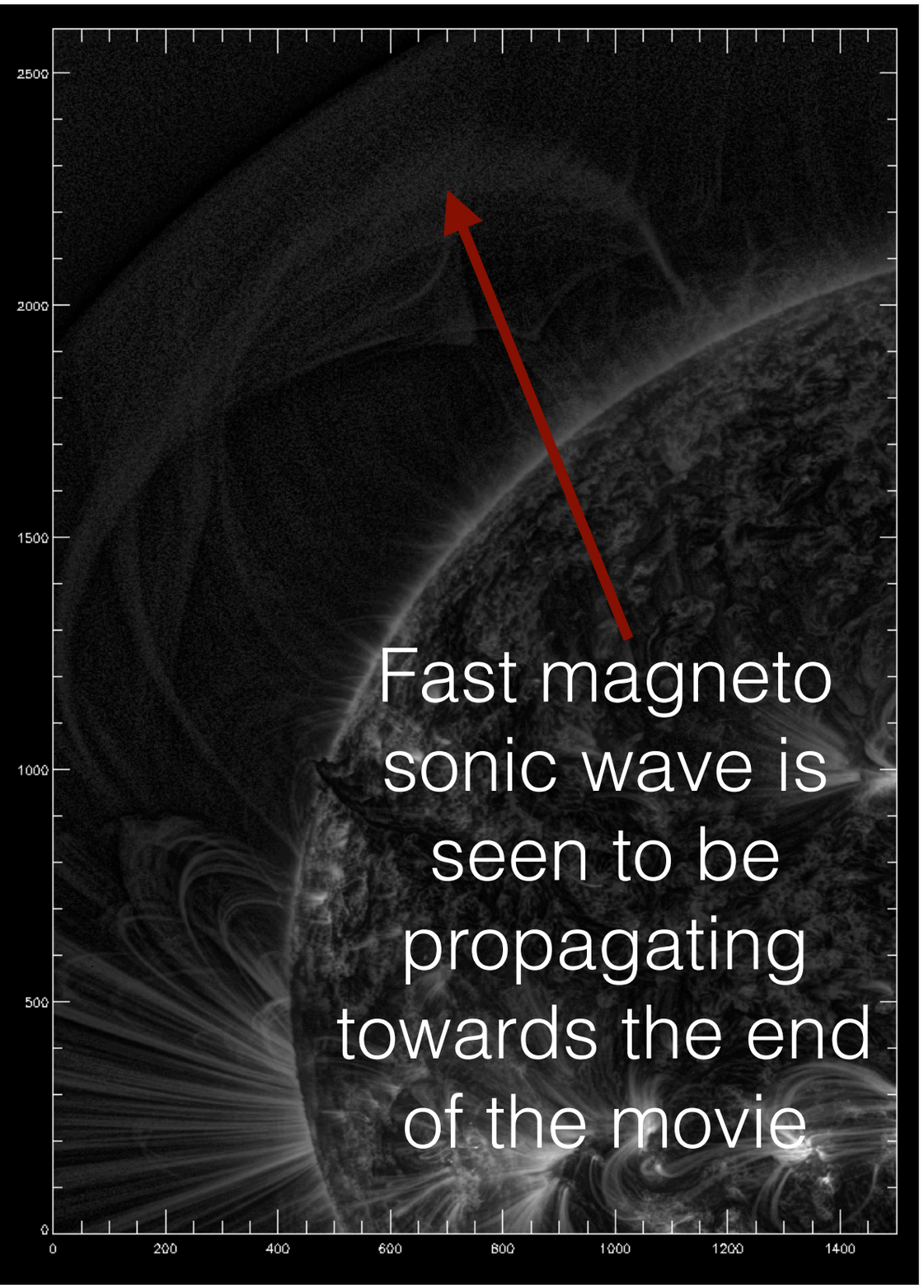
Dynamics of Coronal Funnel

Using Laplace filter

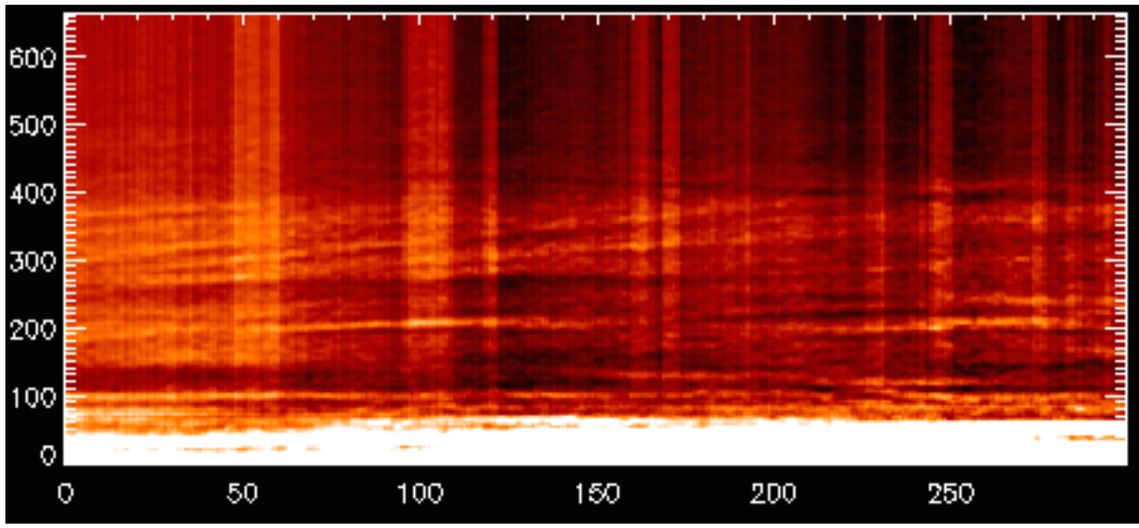


Using multistep gaussian filtering

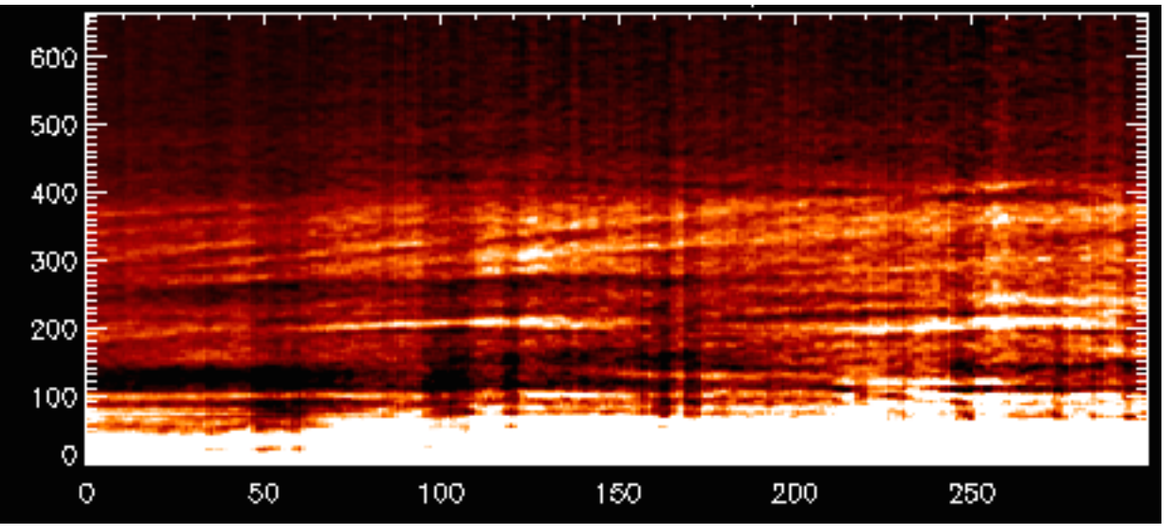




Time-distance diagrams



Original x-t map



background subtracted x-t map

- Time distance maps are created using laplacian filtered dataset
- Several inclined ridges are seen
- Slope of ridges is found to be 16 km/s which is much lower than speed of sound in AIA 171 A thus they may not be waves which are almost equal to the sound speed
- Is this material up flow (also seen in movie) in response to the change in magnetic pressure due to funnel shape topology?

- Coronal funnel consists of several fine coronal loops
- Over a period of longer time the topology of these loops changes which gives an indication of reconnections at higher heights
- We find several up flows (waves?) at the location of slit
- A fast magnetosonic wave is seen to be propagating along the coronal funnel which can be used to diagnose the plasma properties like magnetic field at those heights which will be explored in future
- As seen from SWAP movies they survive for more than 2 carrington rotations