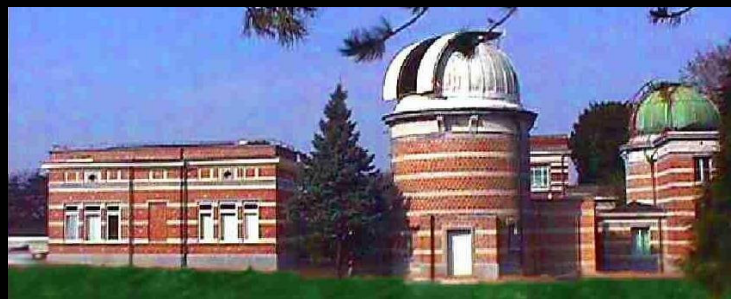


CACTus

Computer Aided CME Tracking

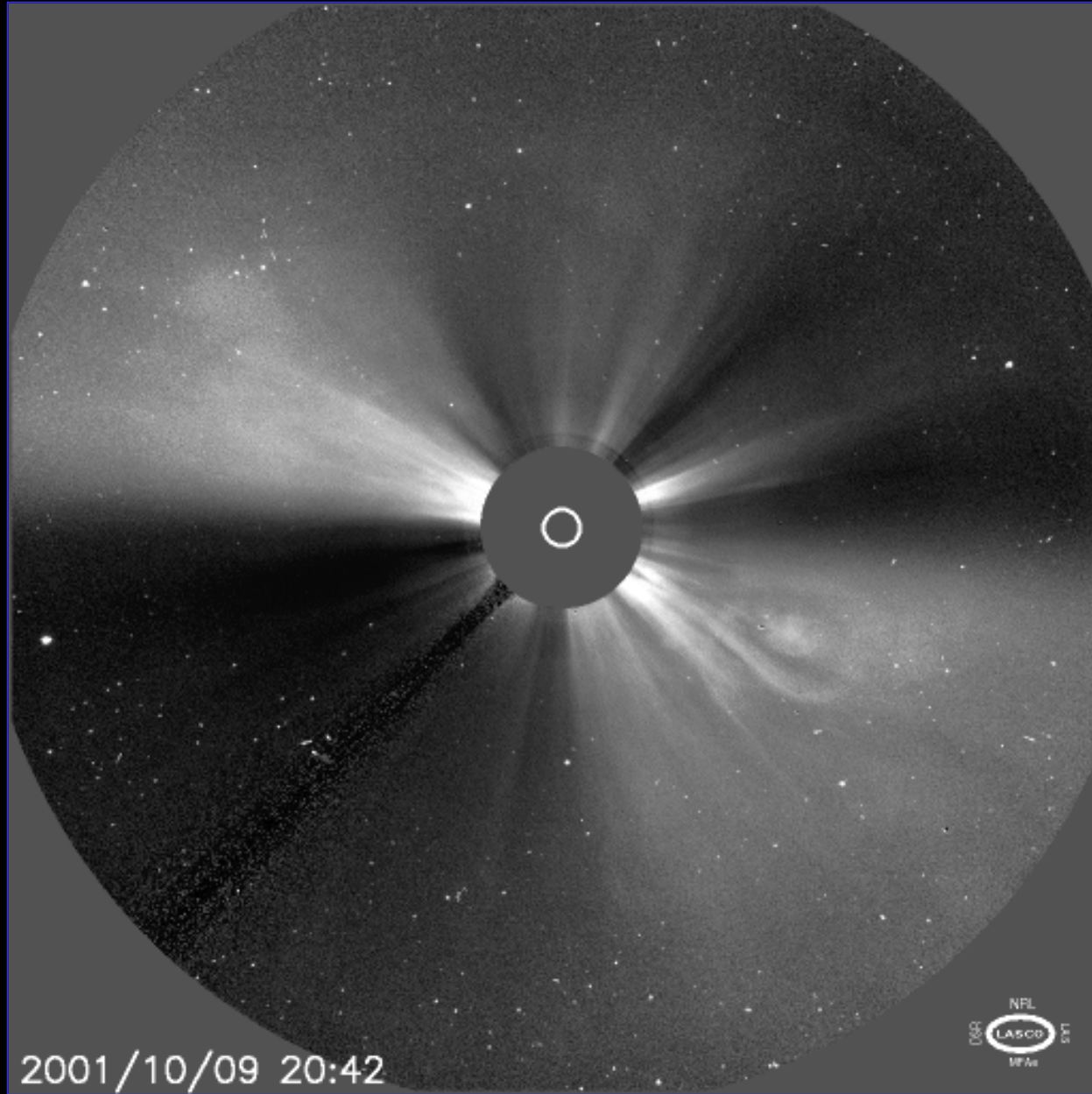
Eva Robbrecht
David Berghmans
Royal Observatory of Belgium



Why Automated CME Detection?

- Space weather applications need real-time halo CME alerts
- Future missions produce higher data rate and thus require fast processing
- Science applications want objective catalogues

Why not?

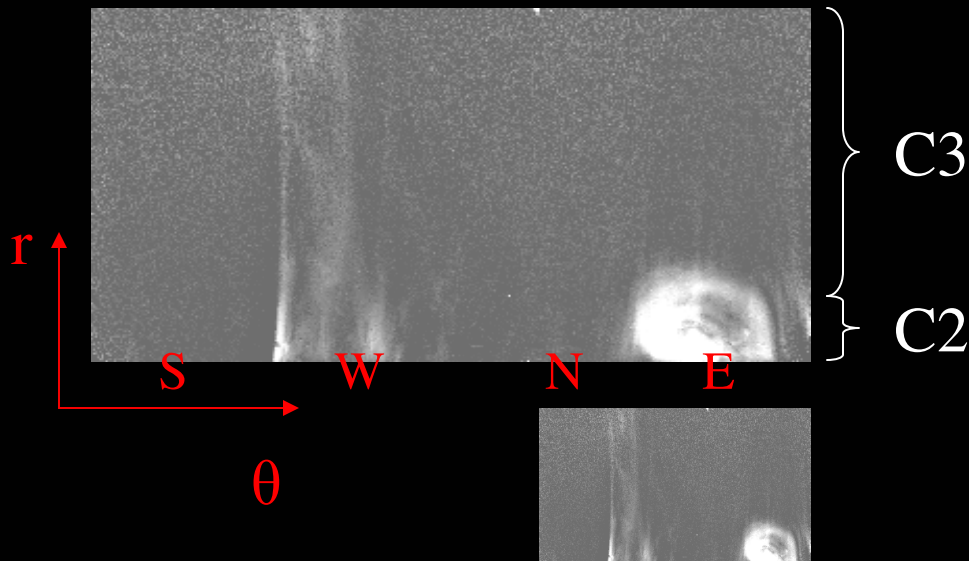


CME signal is only very scarcely present in large amount of data.

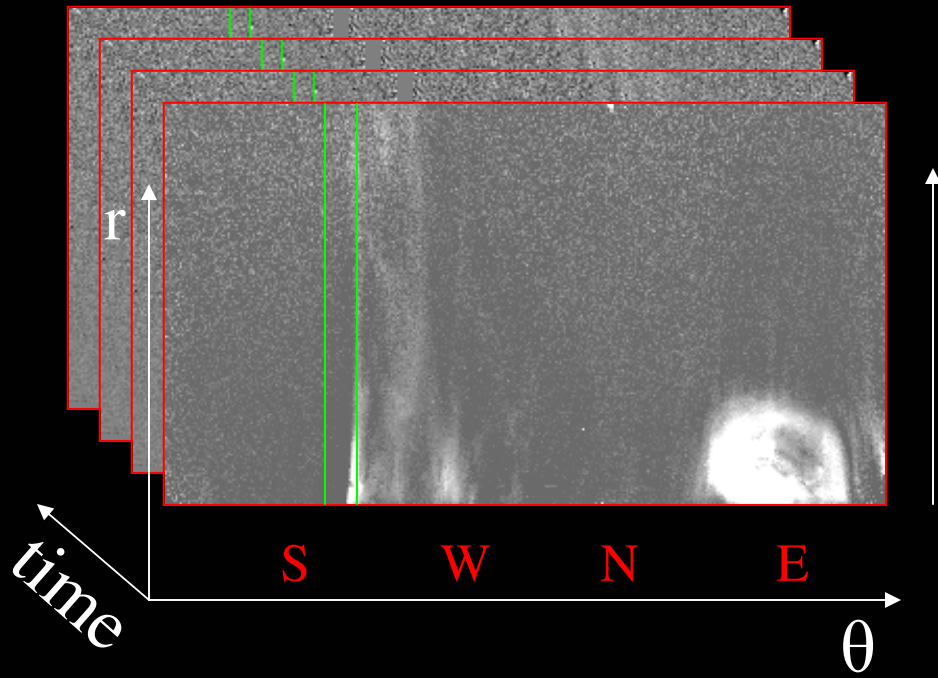
Preprocessing

1. removal of small features
2. polar transformation
3. C2 & C3 combined
4. Difference image
5. rebinning

2001/10/09 20:42

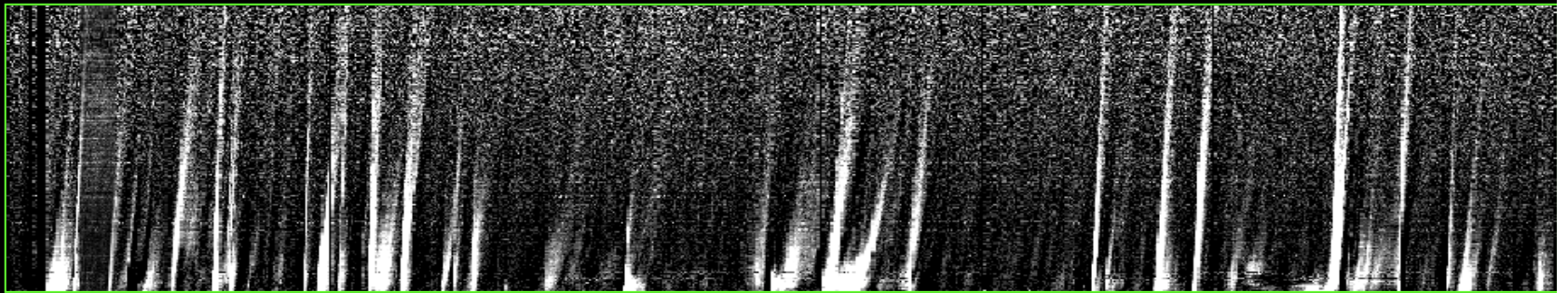


The trigger



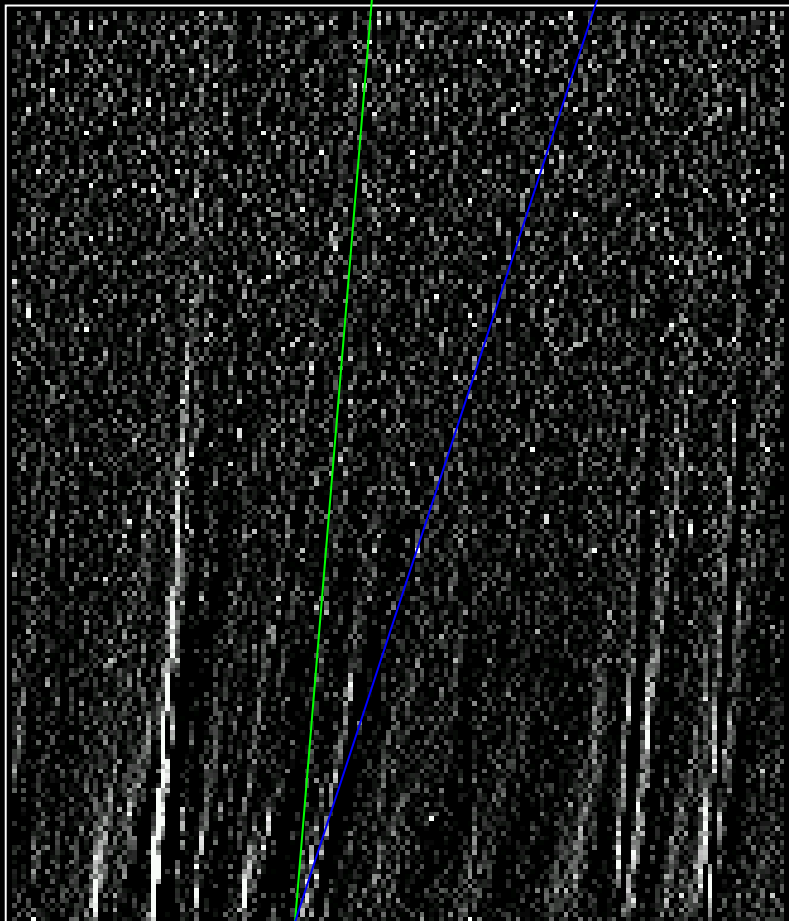
distance
from Sun

distance
from Sun



time

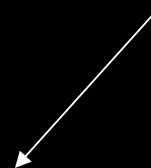
Distance from Sun



$$y = a_1(t - t_0) \rightarrow (t_0, a_1)$$

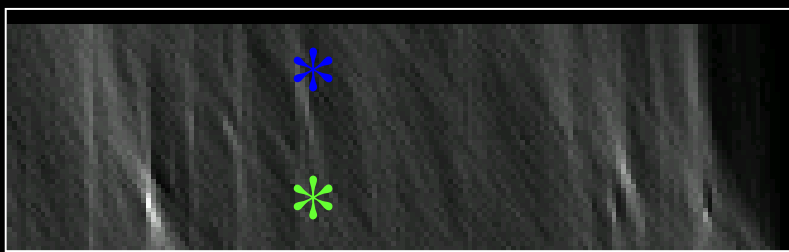
$$y = a_2(t - t_0) \rightarrow (t_0, a_2)$$

$$\int I[t, a(t - t_0)] dt$$



Time

1/a

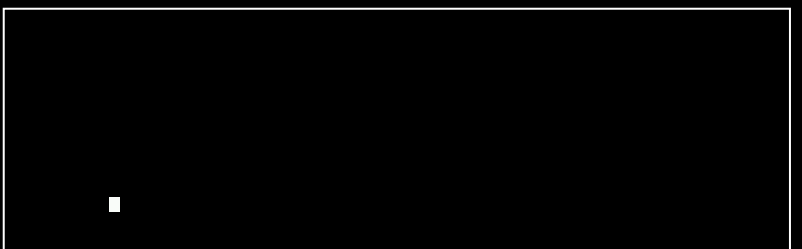
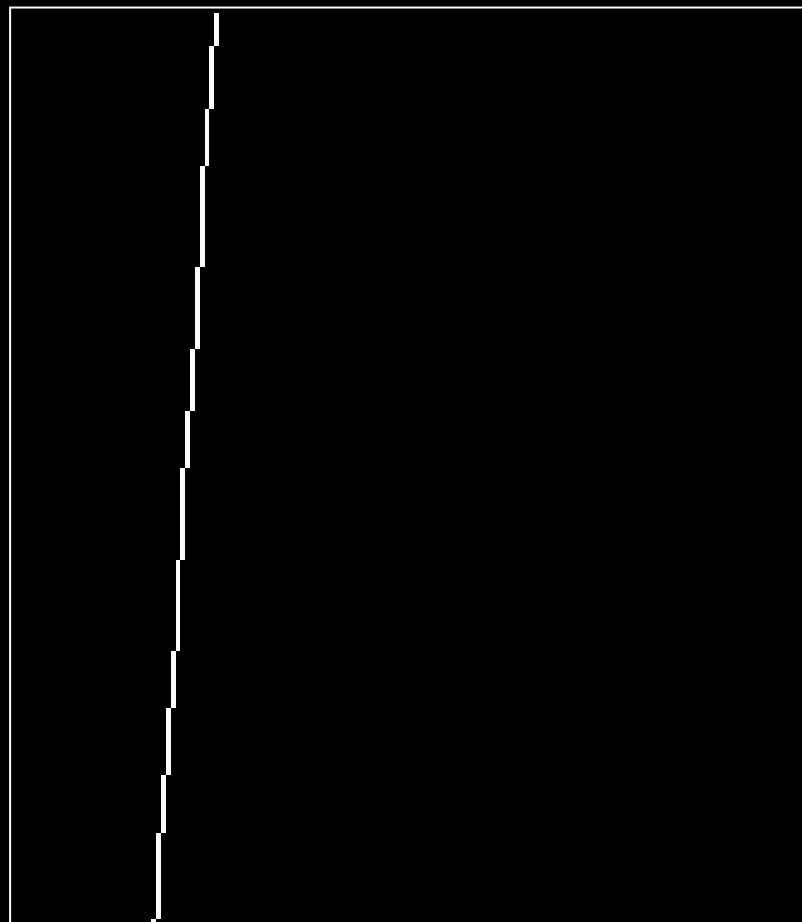
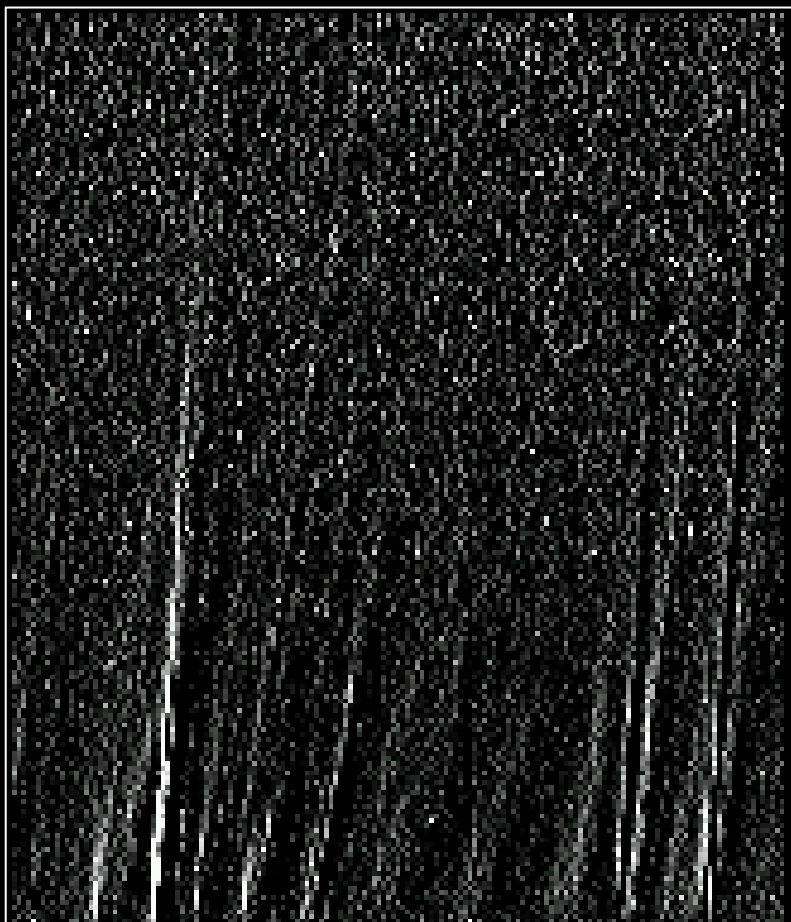


t₀

Hough transform:

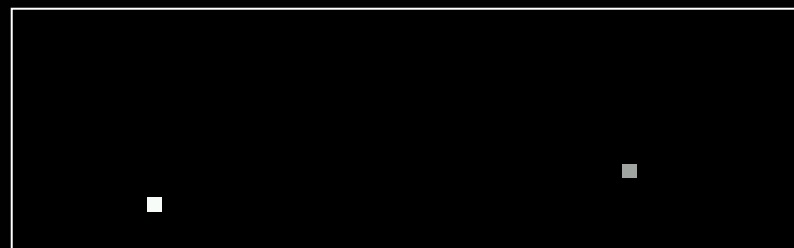
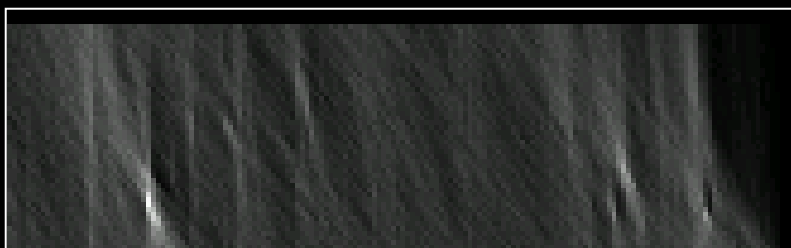
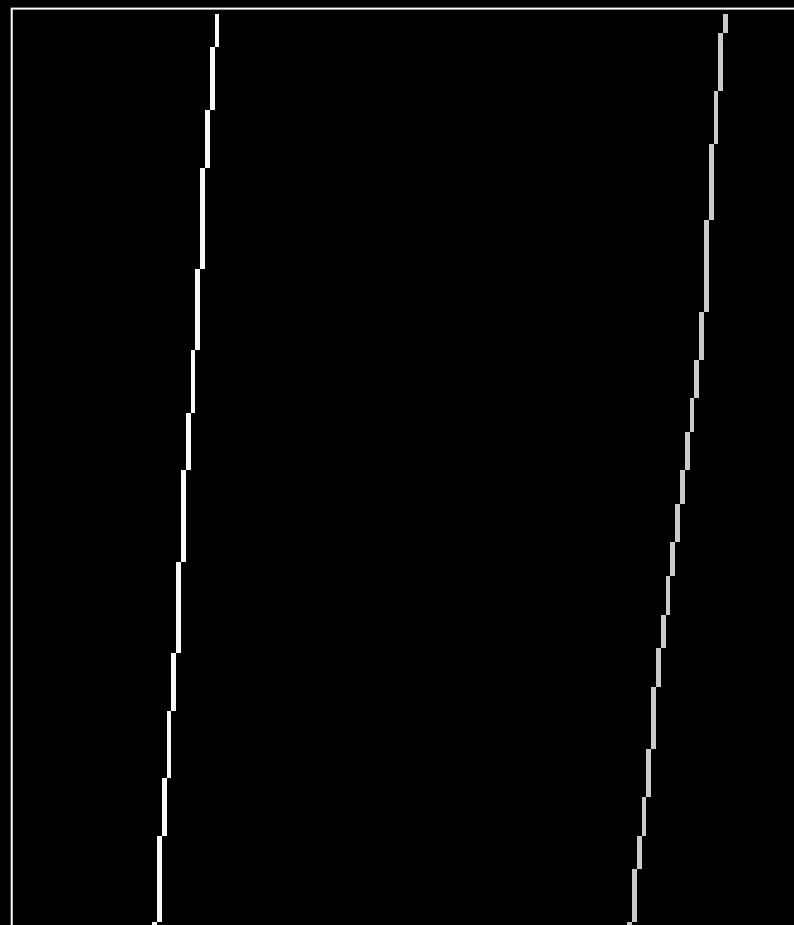
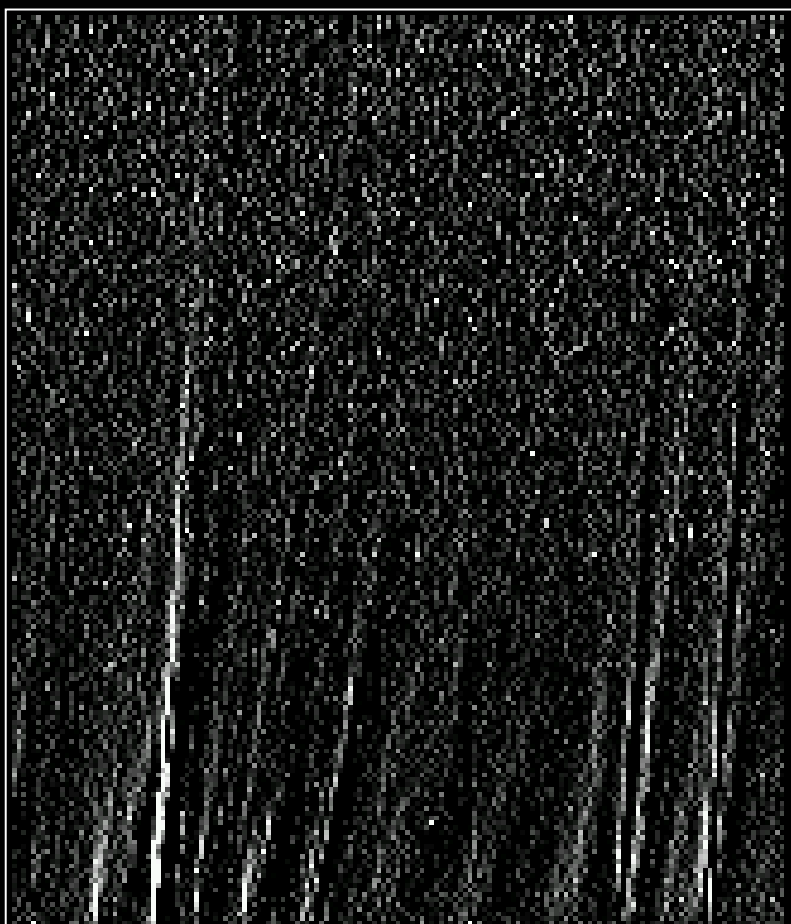
Ridges are peaks in accumulator space

Distance from Sun



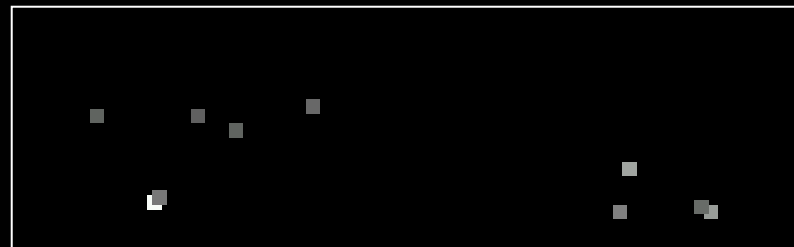
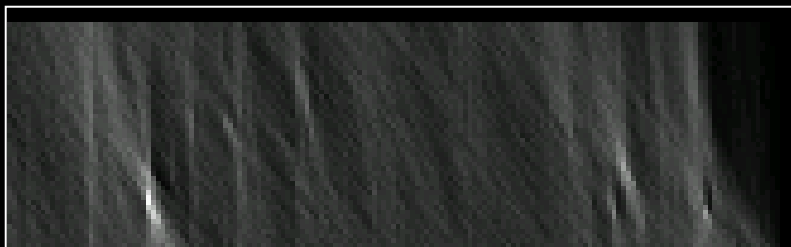
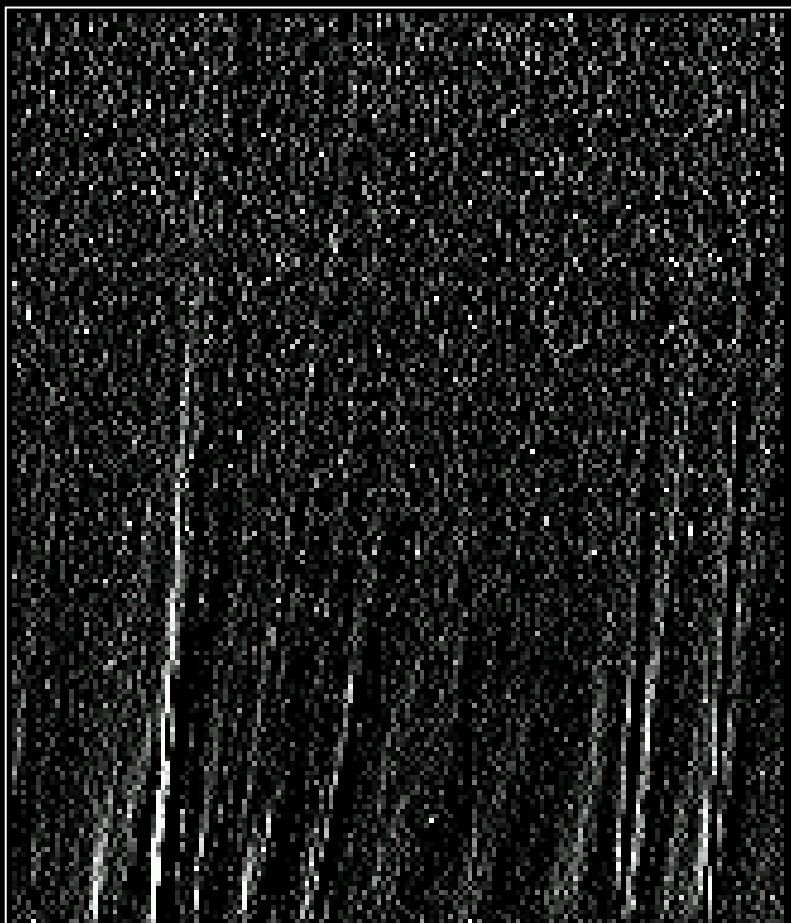
Time

Distance from Sun



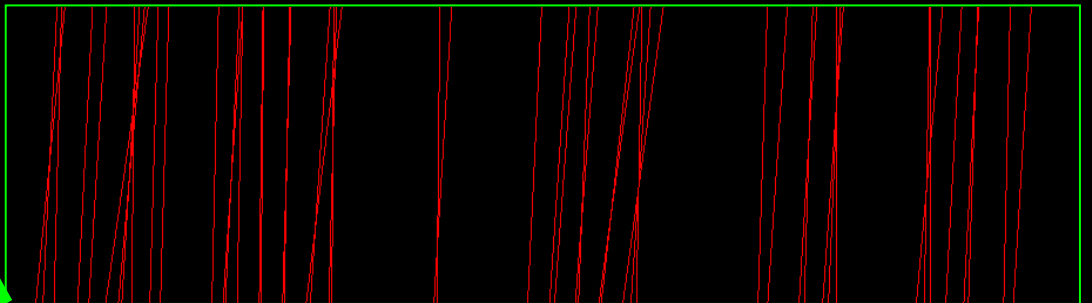
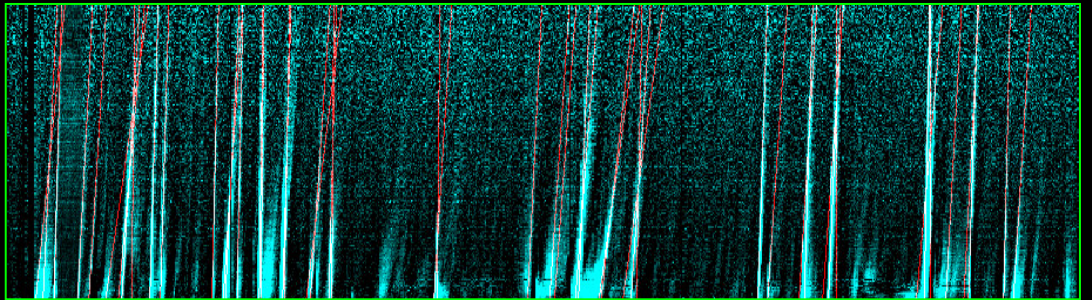
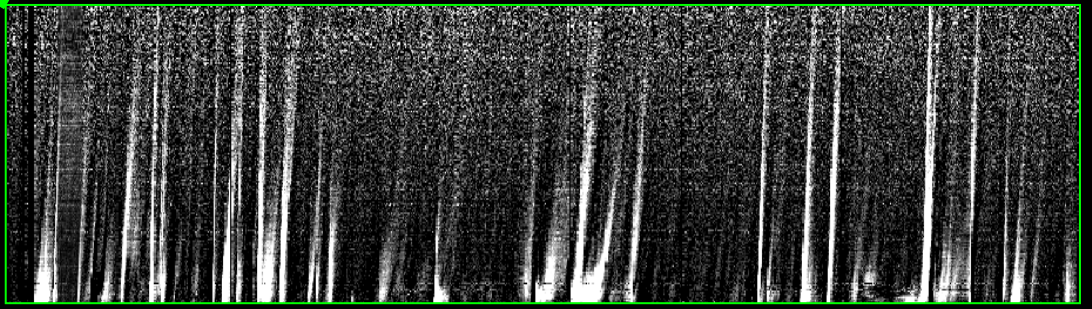
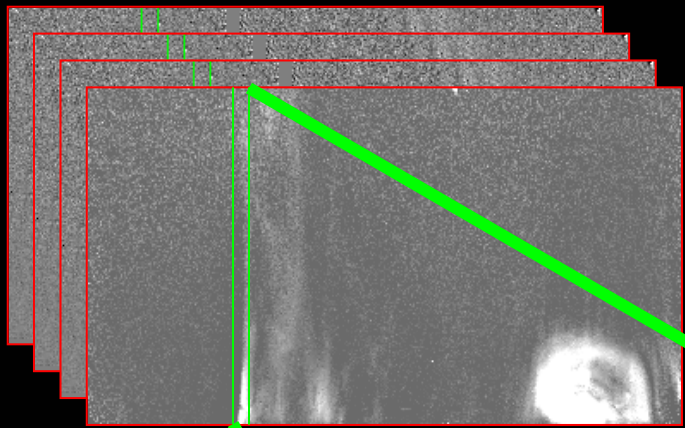
Time

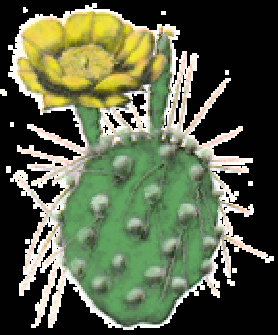
Distance from Sun



Time







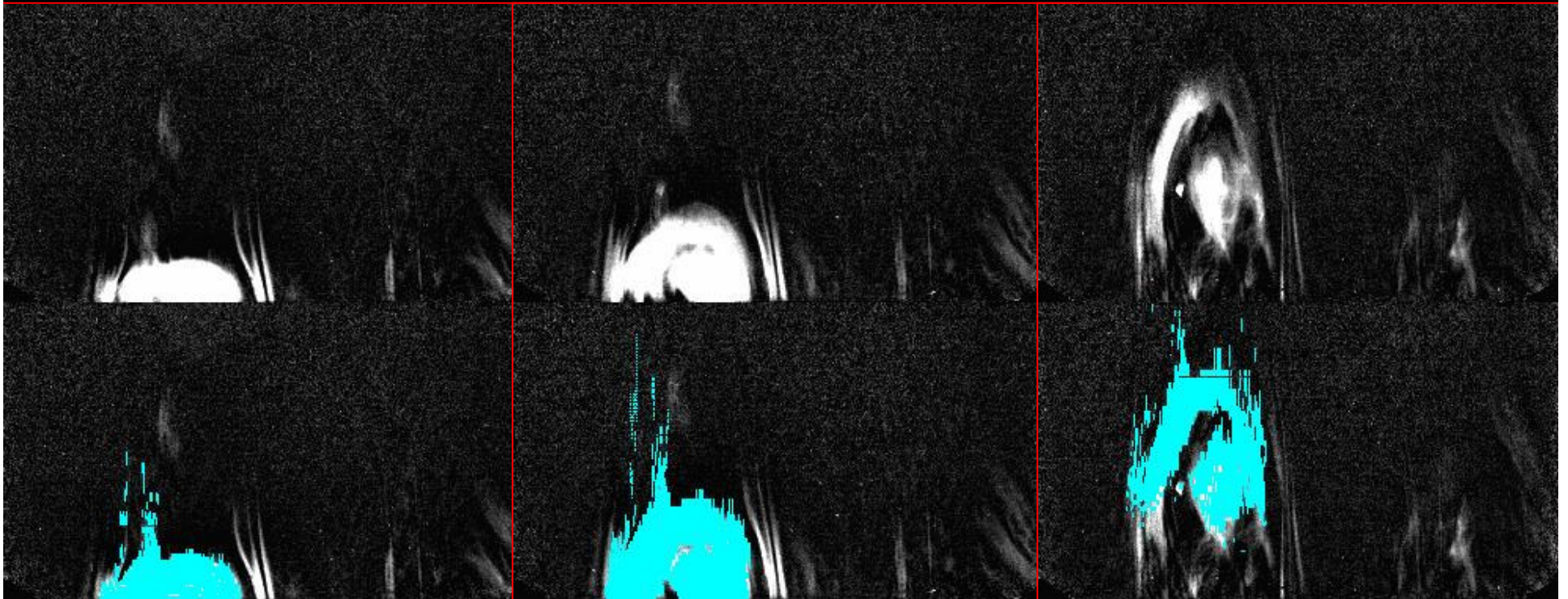
CACTus:

Computer Aided CME Tracking

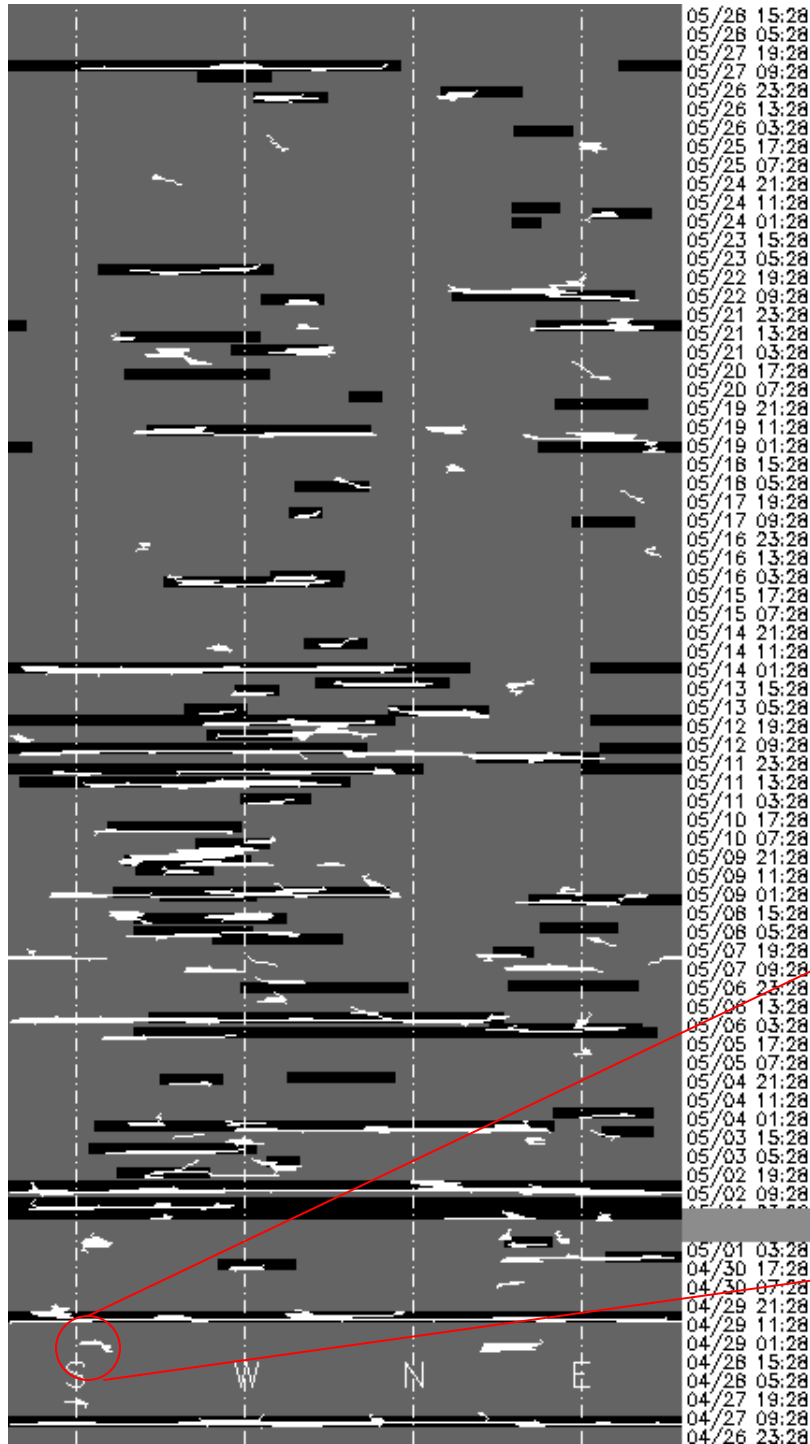
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10h00

15h00



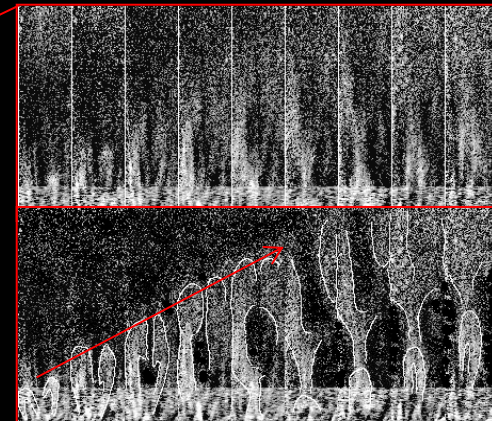
2002/09/01



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 04/26 23:28

Test-case May '98:
 75% of catalogue CMEs
 are recovered

Unreported 'CMEs'



**Real-time CME detection:
(test phase)**

<http://homepage.oma.be/david/cactus>

Conclusions

- Automated detection of CME occurrence is possible in near real time.
- We recover about 75% of the catalog CMEs. Improvements are under development.

