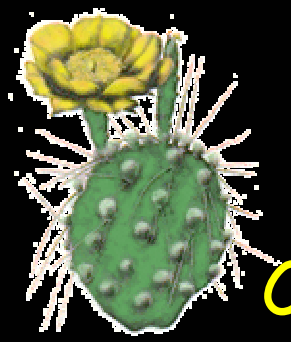

CACTus

Computer Aided CME Tracking

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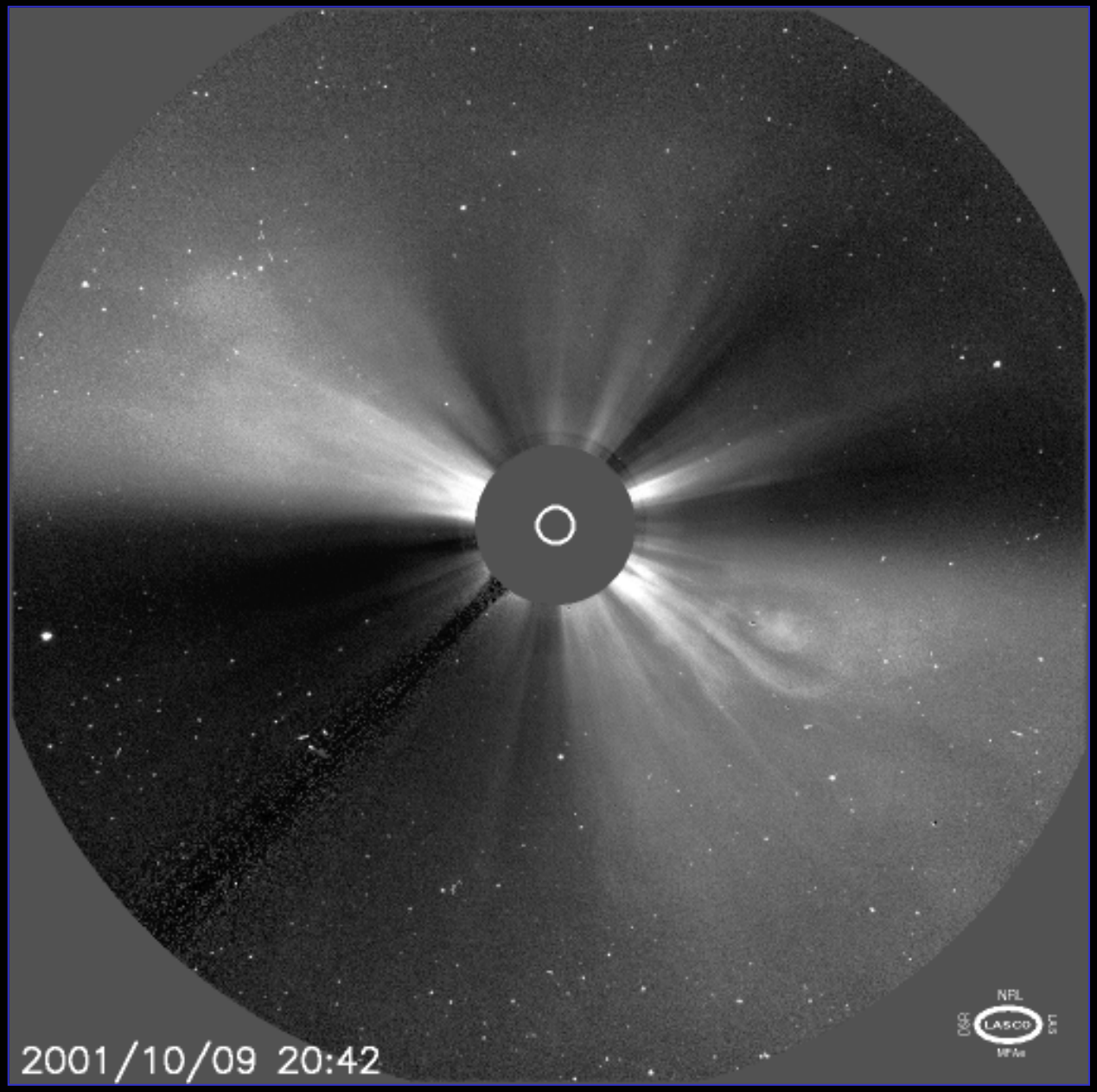
David Berghmans
Royal Observatory of Belgium

ROB

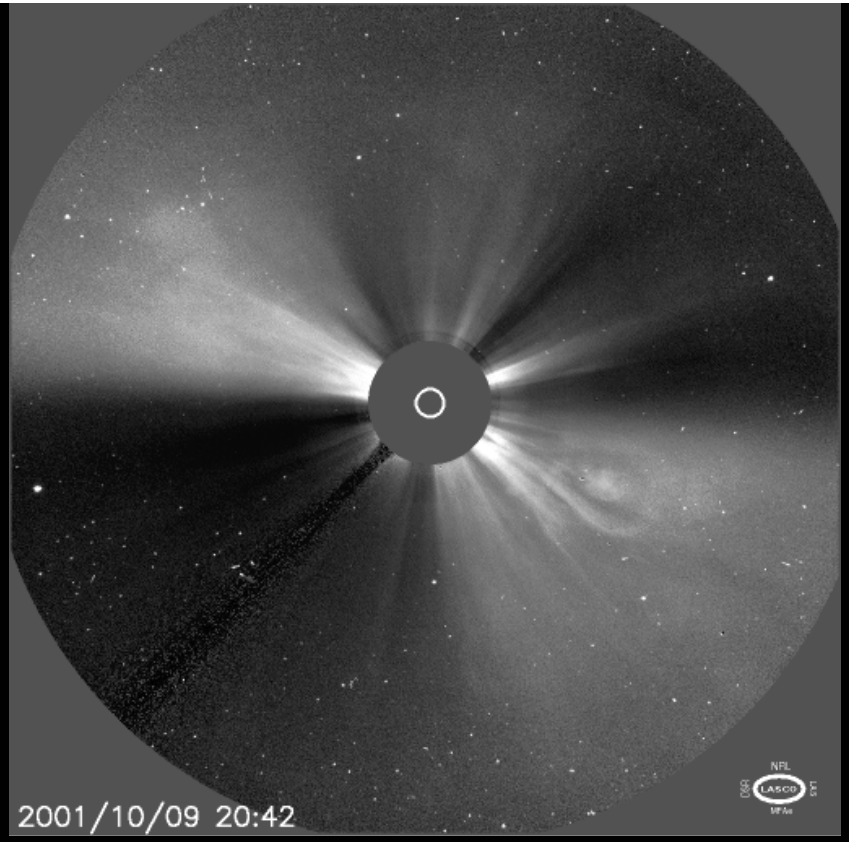
Why Automated CME Detection?

- 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



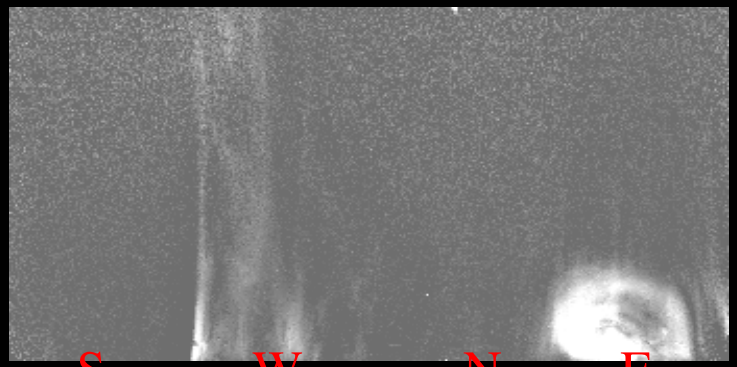
Why not?

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



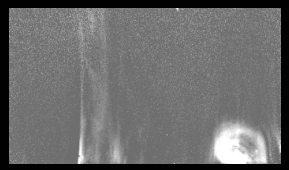
C3

C2

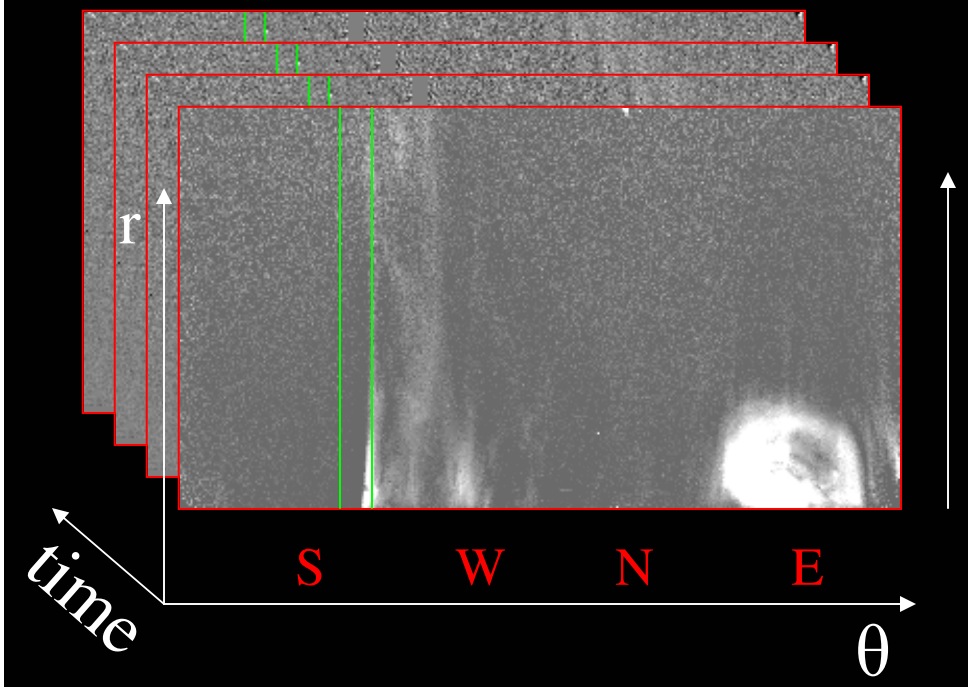
r

S W N E

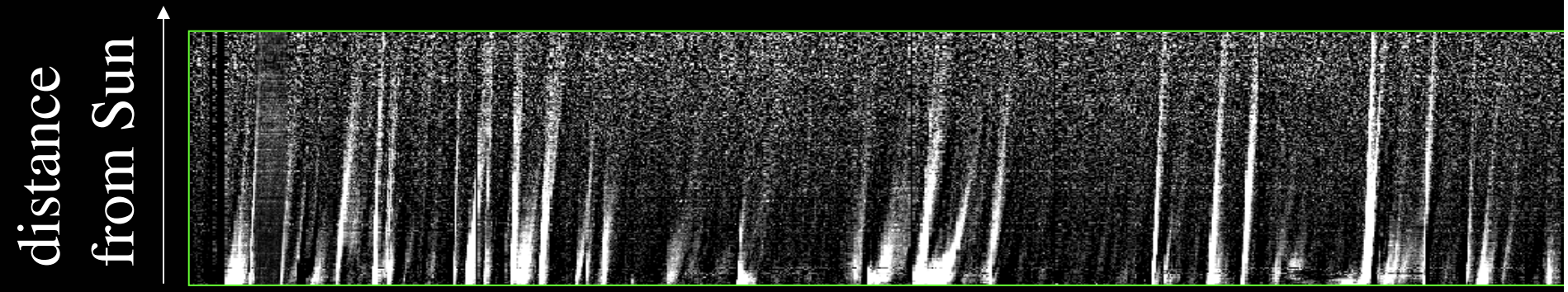
θ

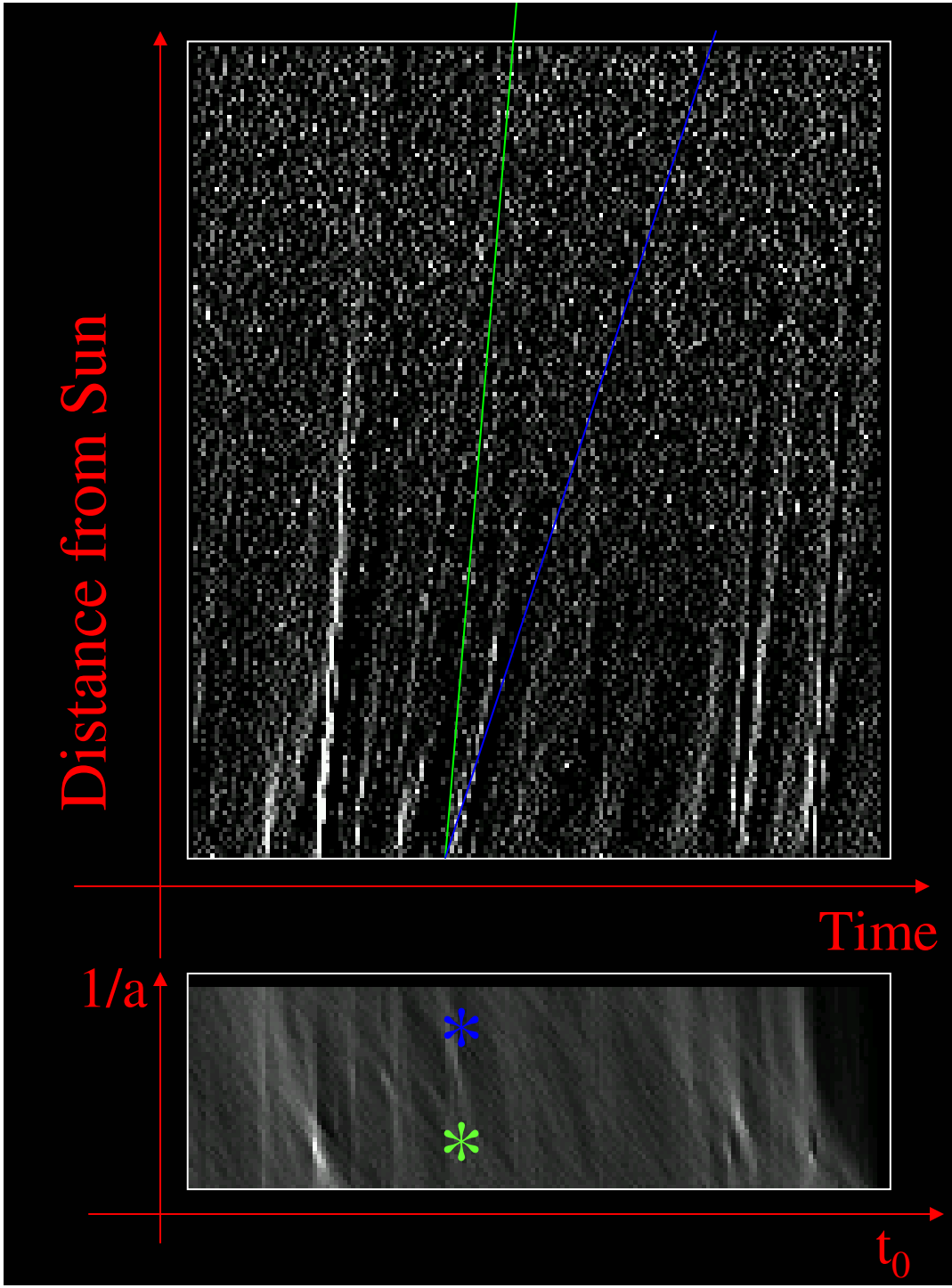


The trigger



distance
from Sun





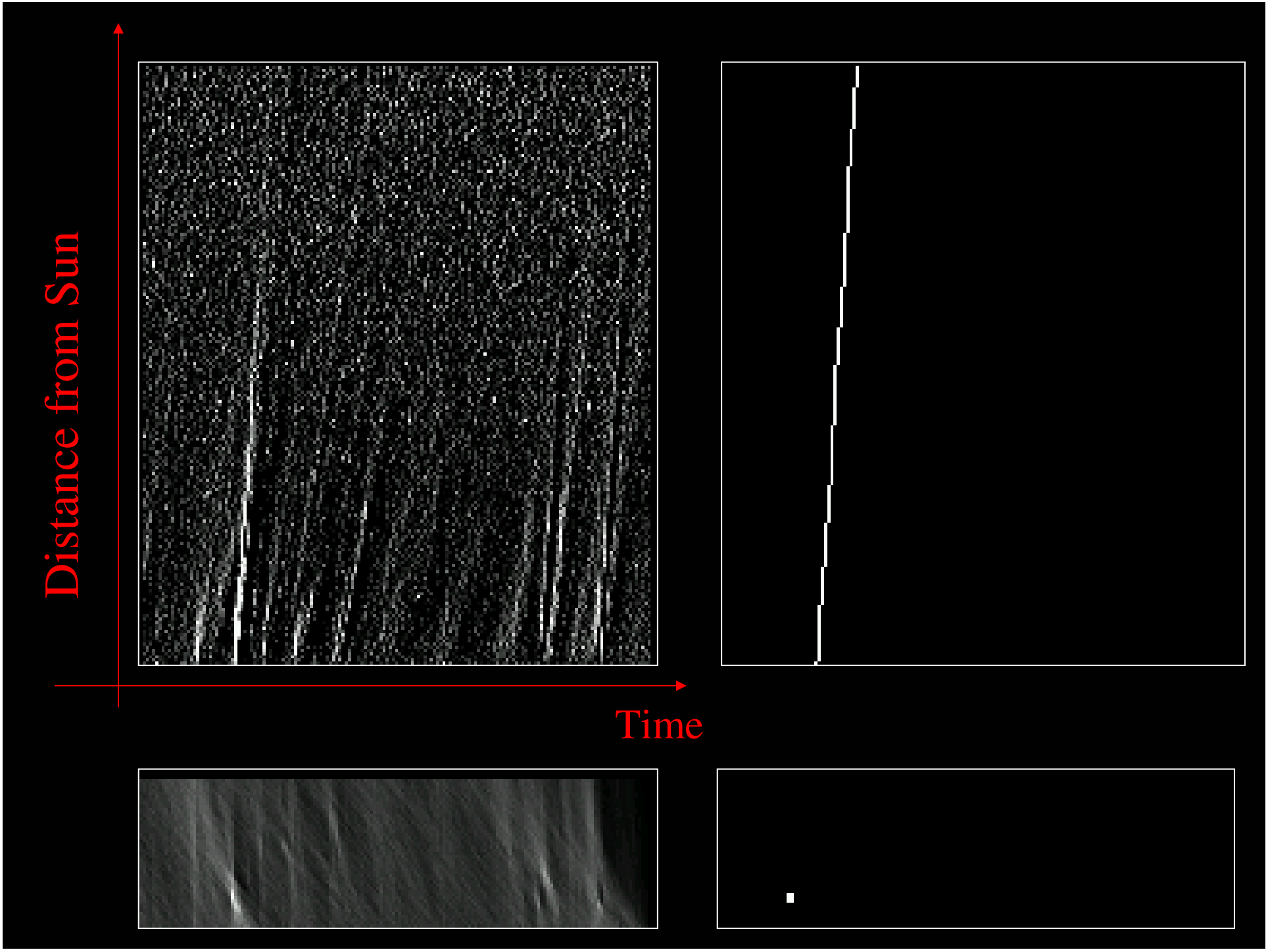
$y=a_1(t-t_0) \rightarrow (t_0,a_1)$

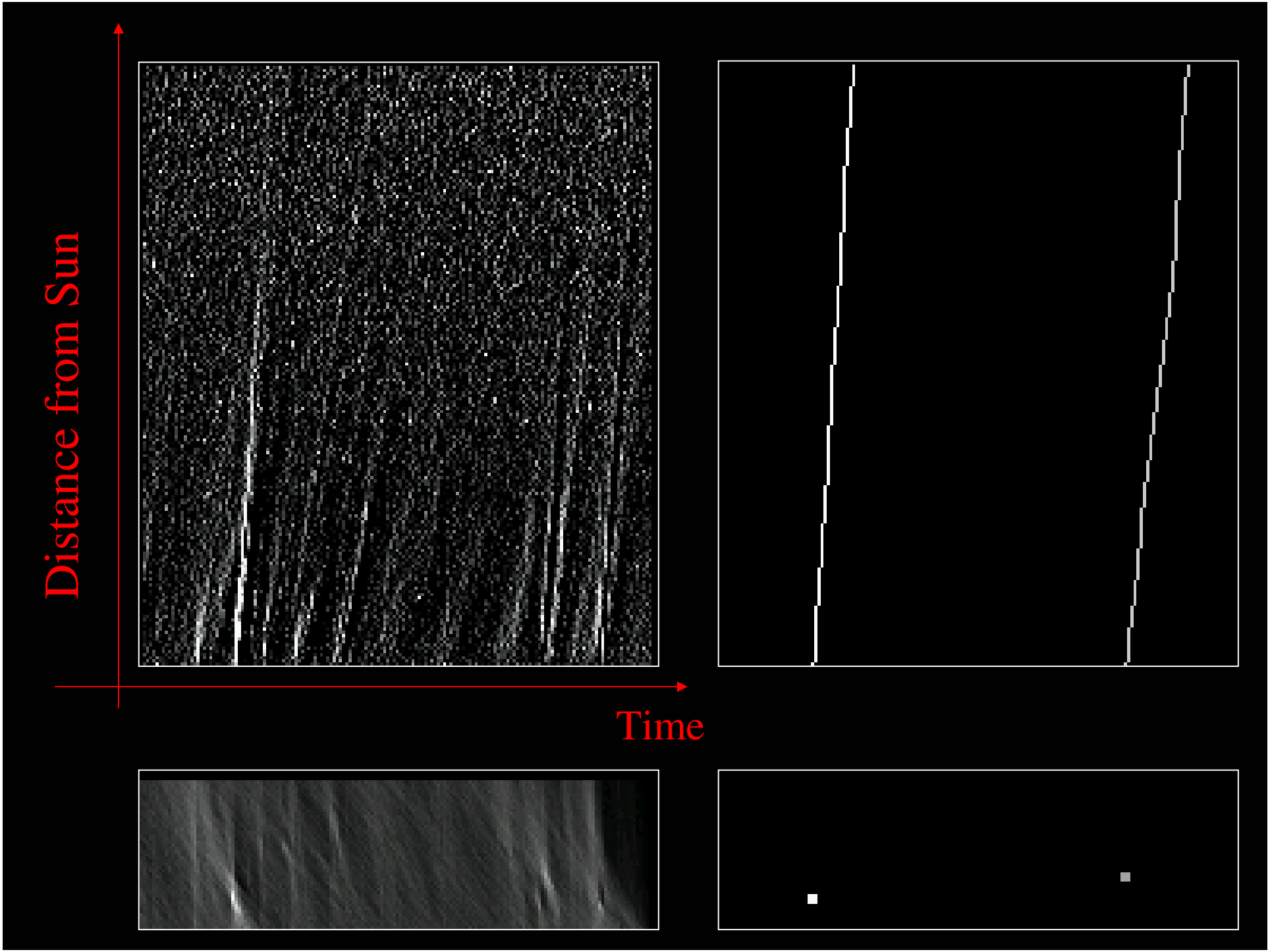
$y=a_2(t-t_0) \rightarrow (t_0,a_2)$

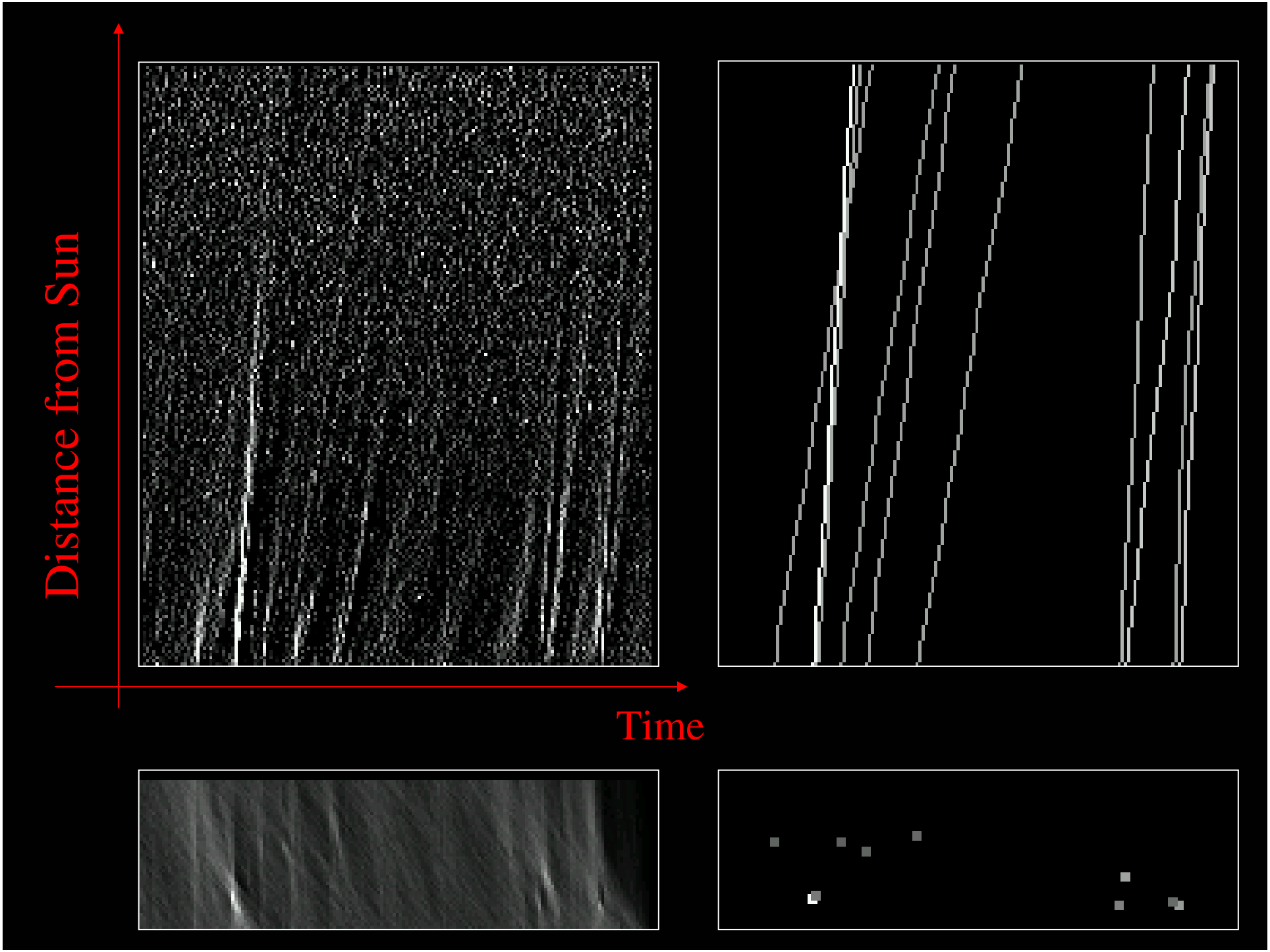
$\int I[t,a(t-t_0)]dt$

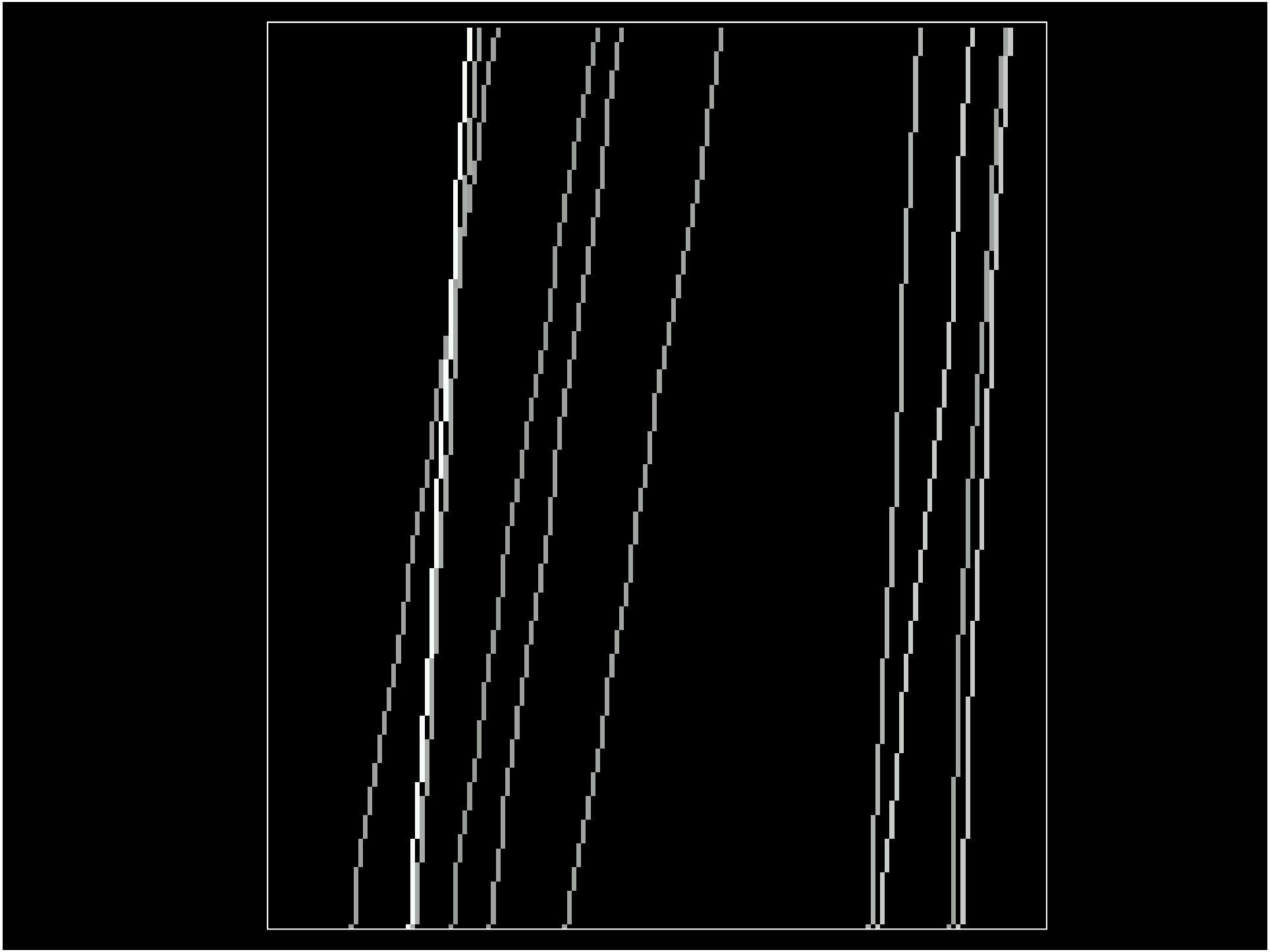
Hough transform:

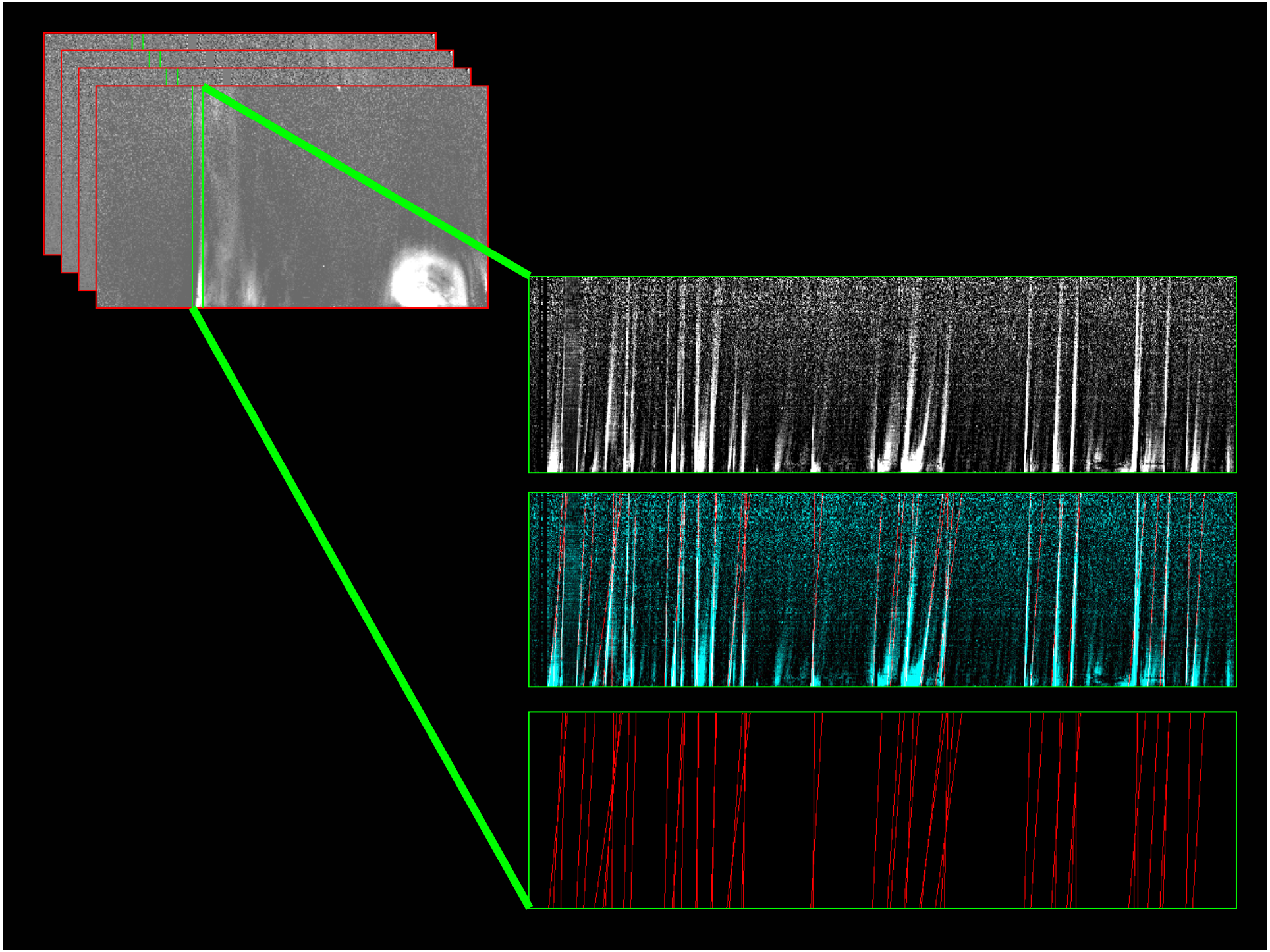
Ridges are peaks in accumulator space

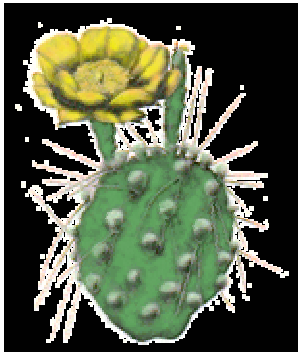

Distance from Sun
Time


Distance from Sun
Time


Distance from Sun
Time







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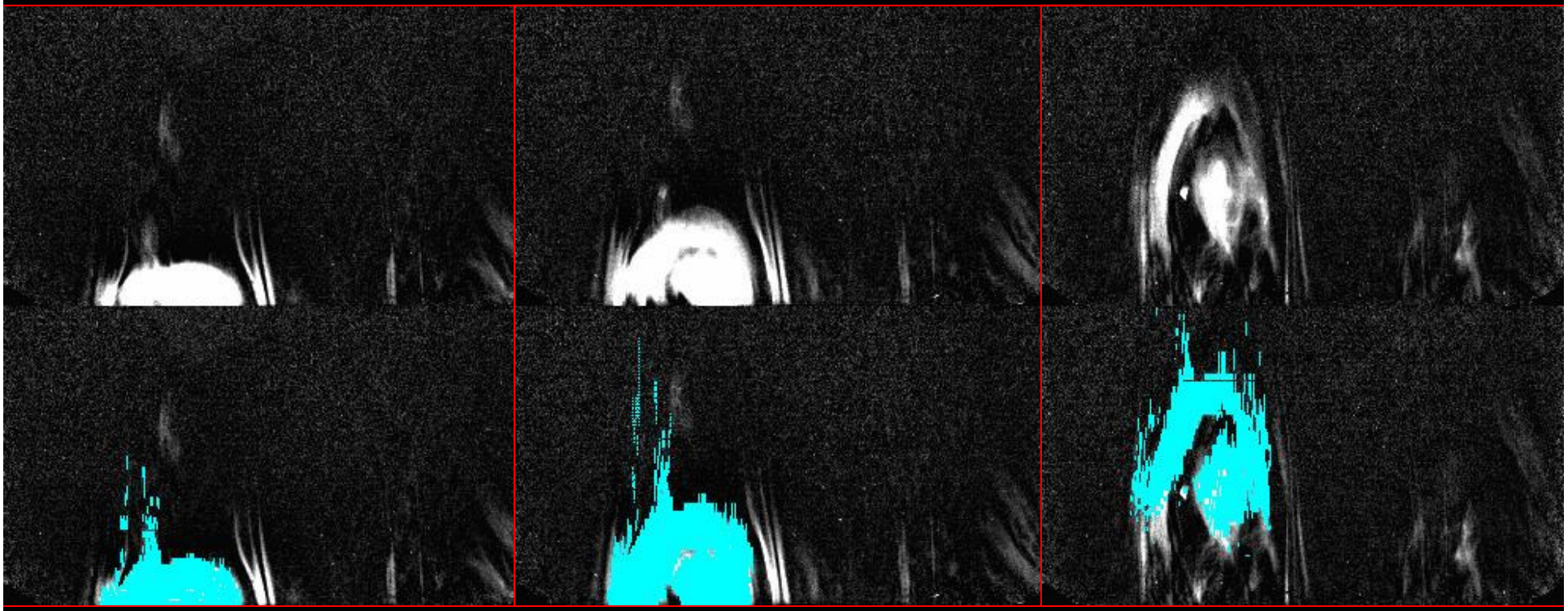
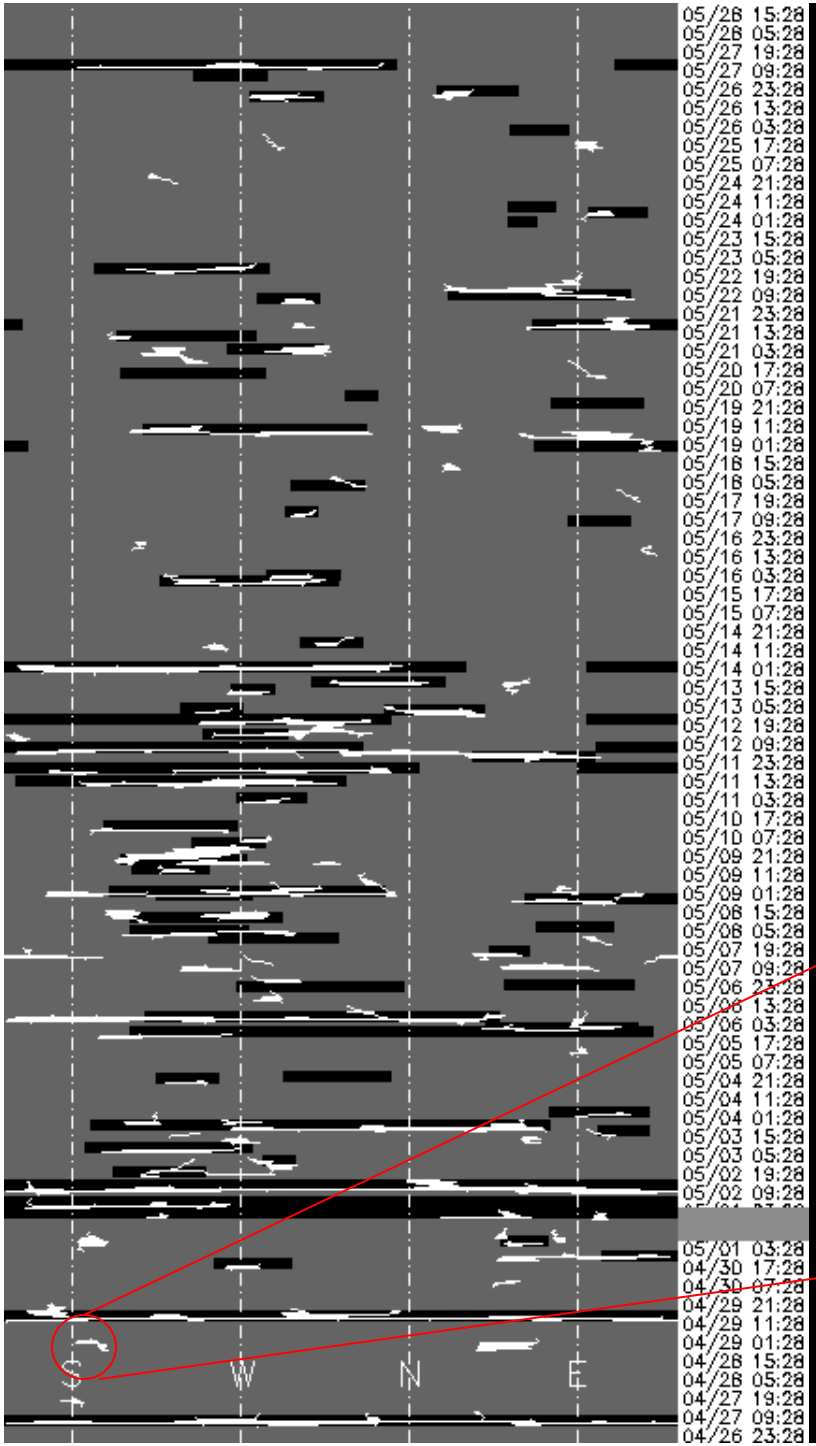
Computer Aided CME Tracking

07h45 10h00 15h00



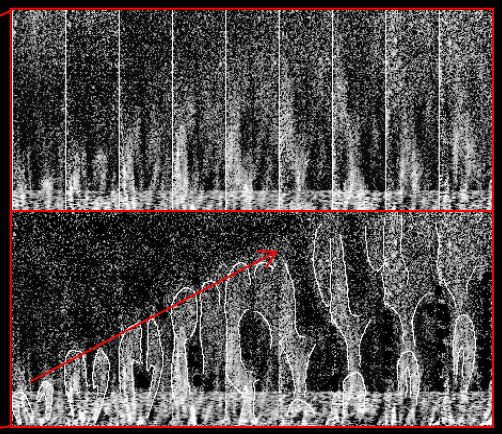
2002/09/01



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.