PROBAII GI

Spiros Patsourakos
University of Ioannina, Greece
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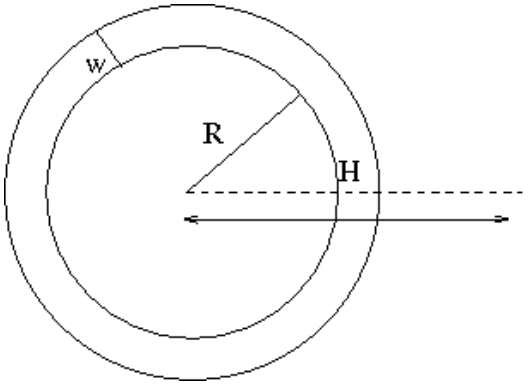
Objective of GI

Observe EUV CMEs and waves above 0.5 Rs usin PROBA-II off-points

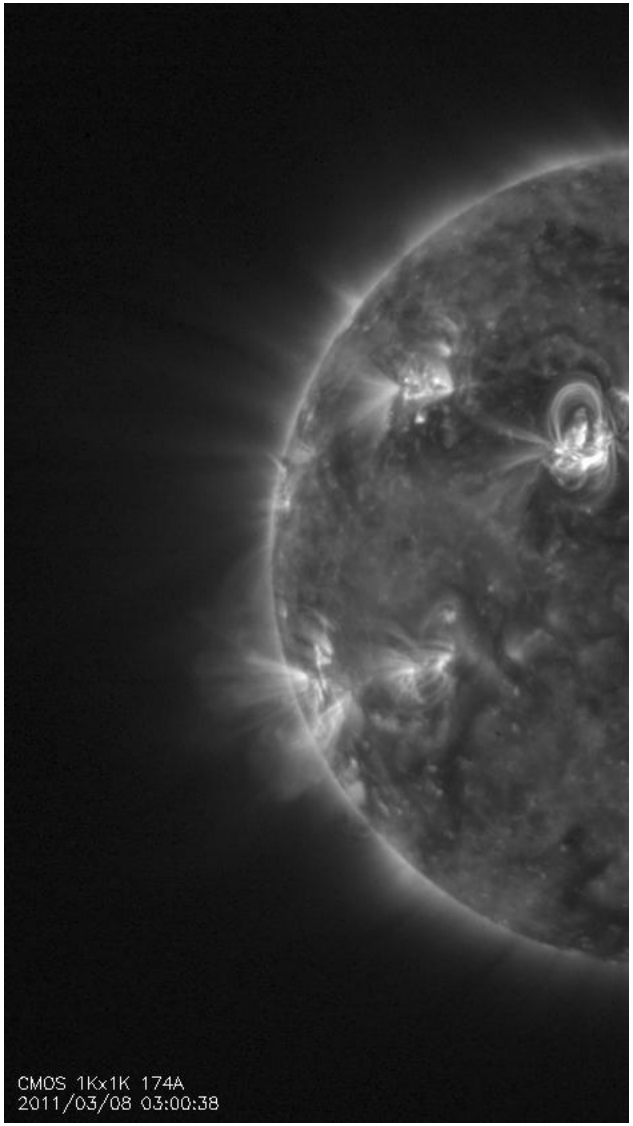
EUV CME off-limb signal

•How far can we observe an EUV CME?
•Let a spherical shell with radius(~height) *R* and thickness *w : R ~H*

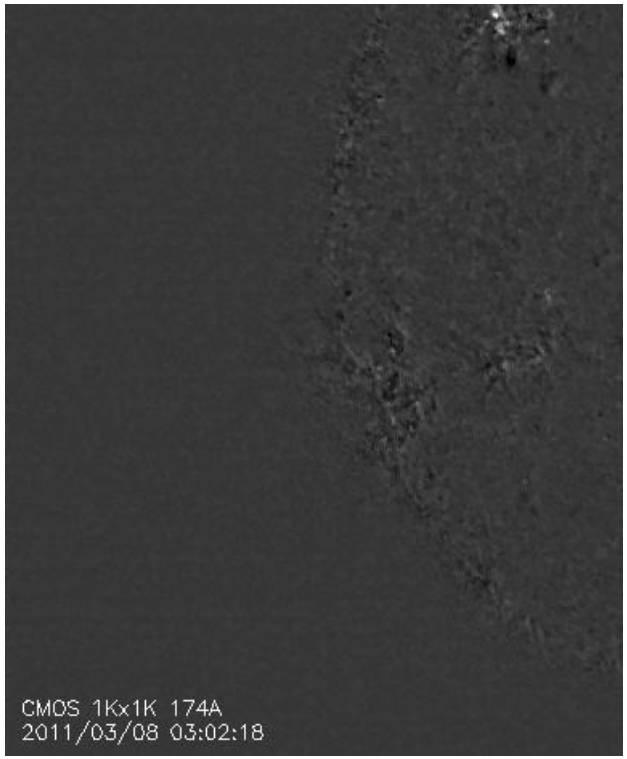


•Assume constant shell mass (*nV*=const; *nwR*^2) ; temperature~ const
•*I_EUV~n^2*w*
• R/w=const; self-similar expansion --- *Rw*=const; pile-up
•***I_EUV ~ R^(-5)—R^(-3)*** *;* obs more consistent w/ *shallower fall-off*
•*R*→0.2-0.6 Rs *I_EUV* would fall by a factor ~ 27 at minimum

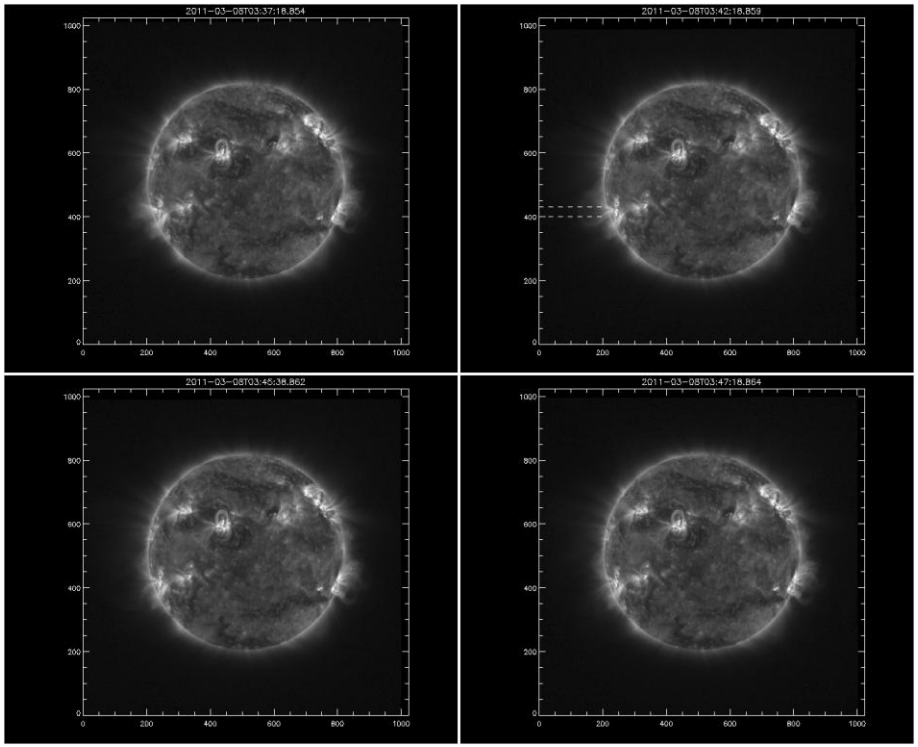
SWAP CME off-limb signal



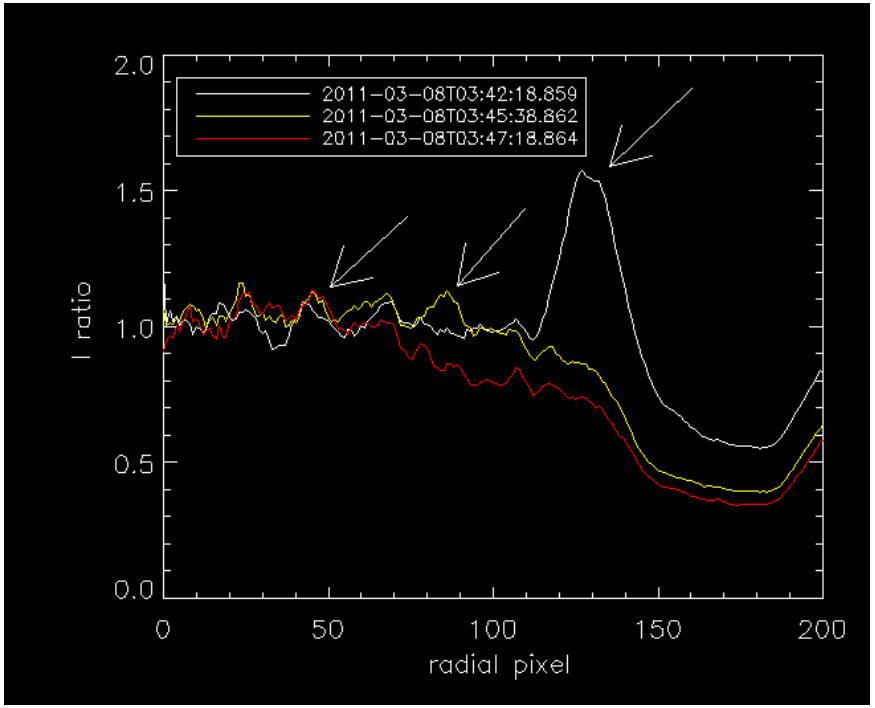
- 8 March-2011; M1.5 flare @ 03:37
- Bubble, EUV wave & deflections
- CME @ 800 km/s



SWAP CME off-limb signal



cuts across the CME bubble

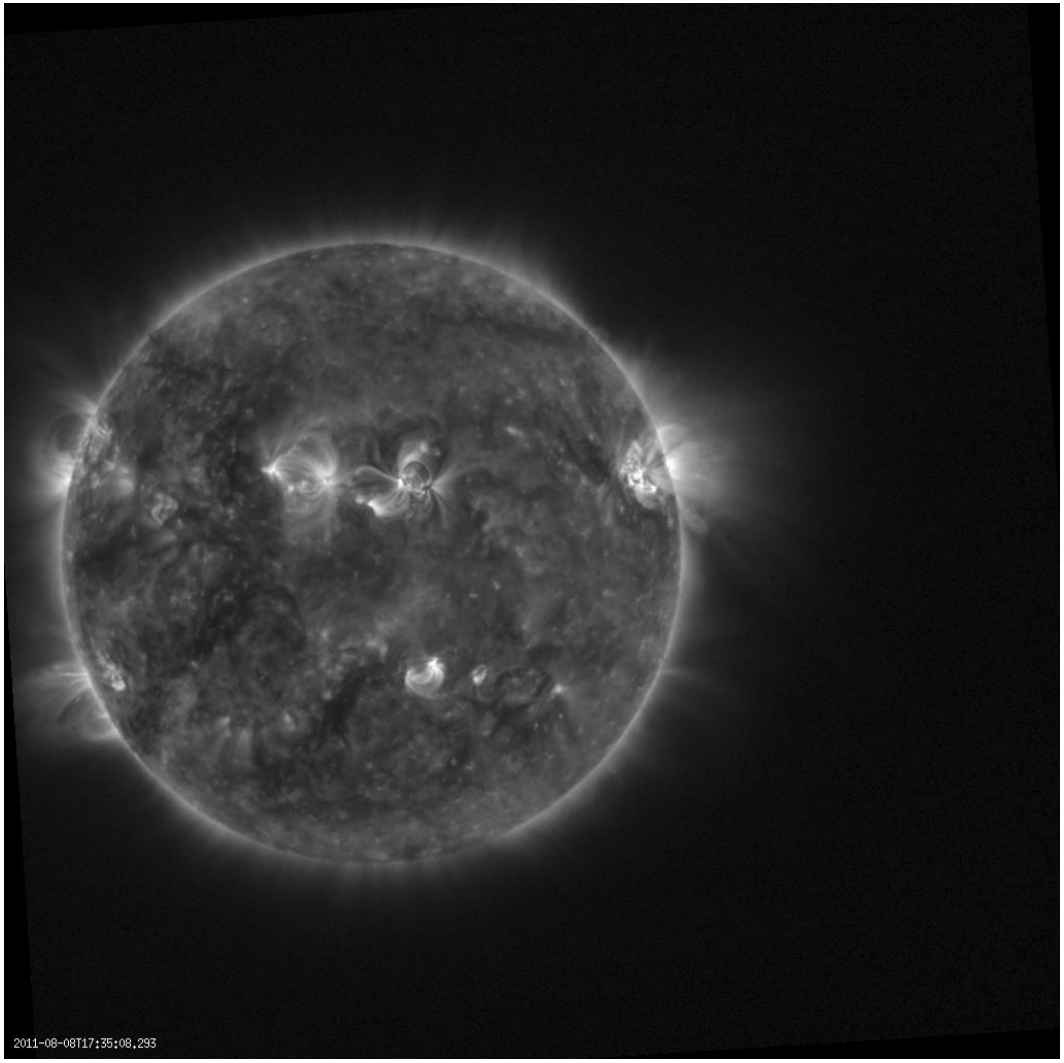


Bubble can be indirectly traced until the edge of the nominal FOV (propagating dimming); point&click problematic towards the FOV edge!

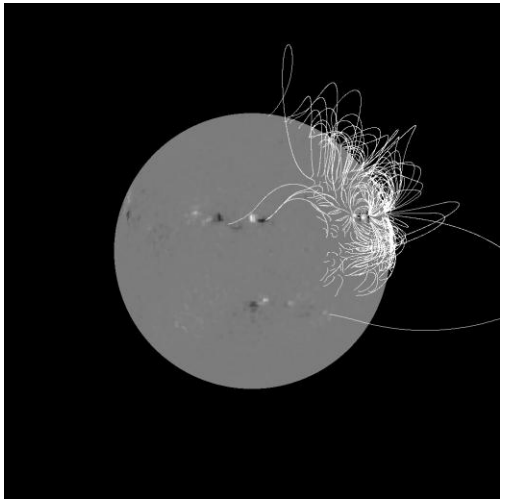
Combine H-t from AIA & SWAP

AIA bubble exits very soon from the AIA FOV (left);
SWAP adds 2-3 H-T measurements; important to compare the trailing flux rope in AIA 131 (middle) with the 171/174 bubble (=cavity)

August 8 2011 off-point

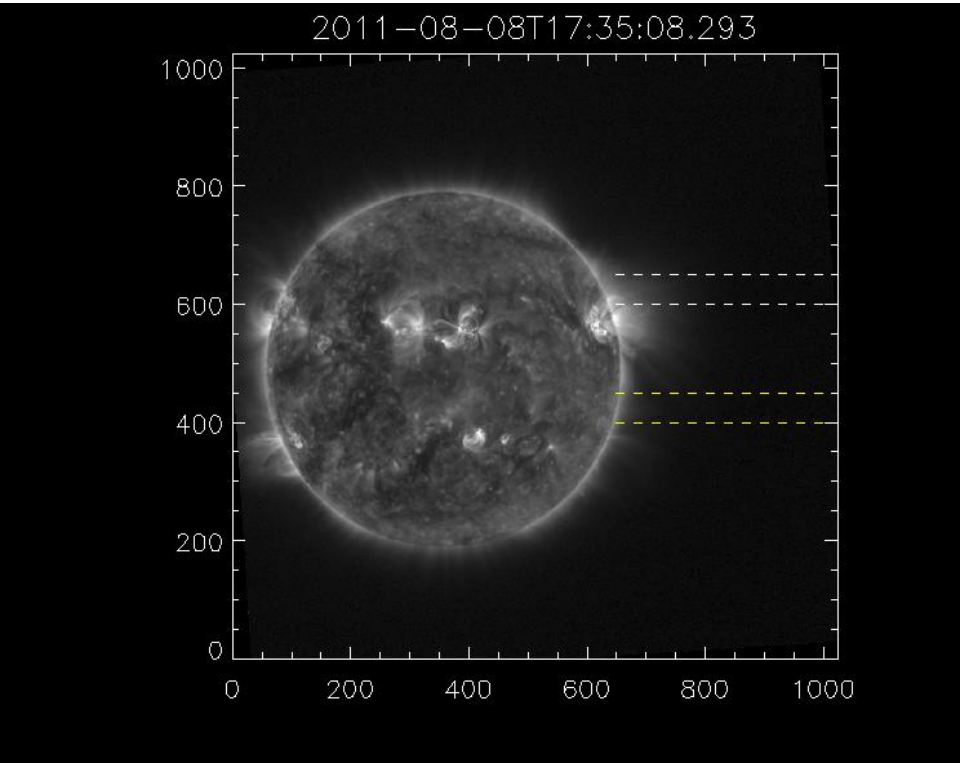


M-class flare
CME ~ 1000 km/s
EUV wave
EUV CME signature poor
See mostly its **impact** (EUV wave & deflections)



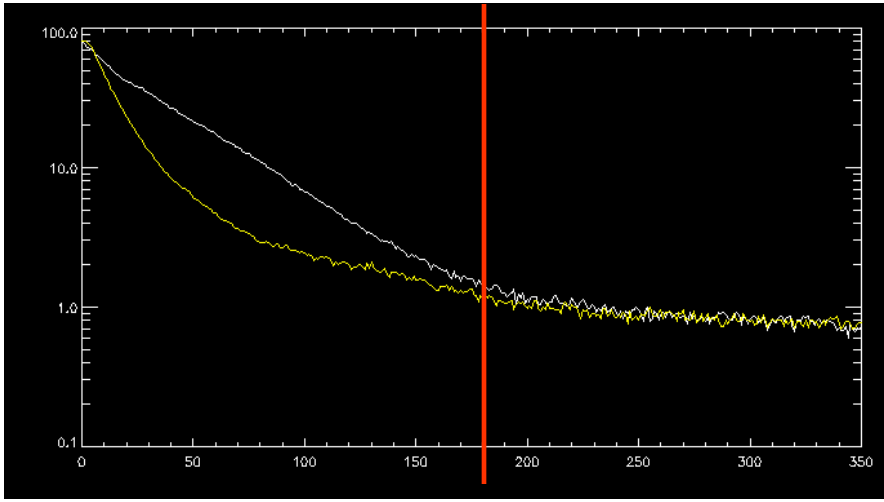
PFSS shows some long connections

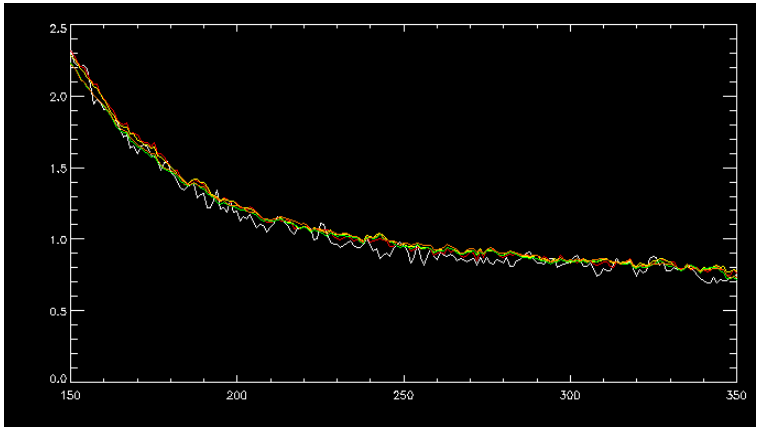
Off-point Signal



Cuts at two latitudes; AR (white) & QS (yellow)

edge of nominal FOV

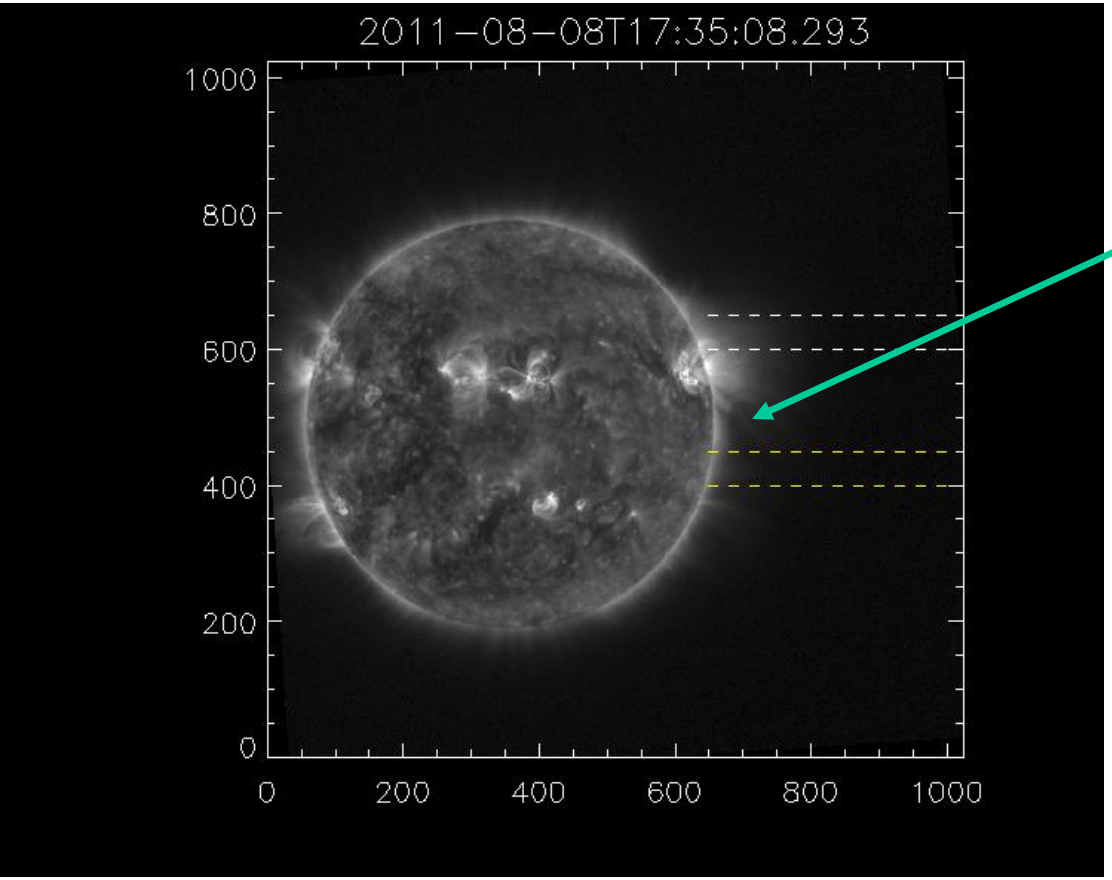




Averaging 10-s exposures does not change the far-FOV intensity slope

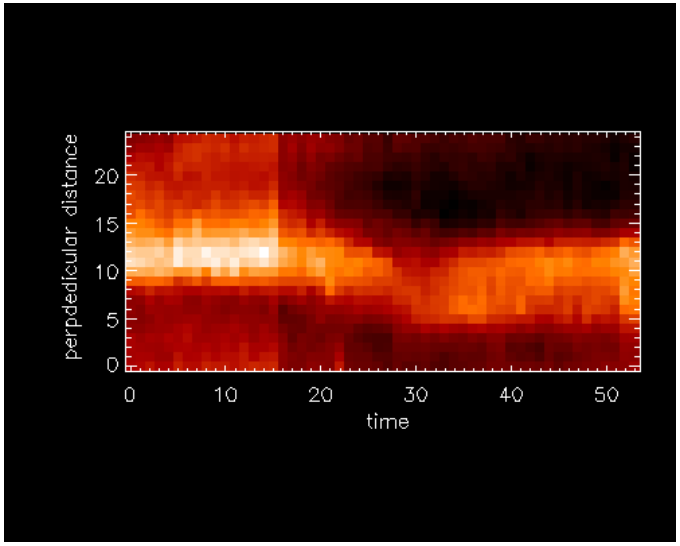
Off-limb Deflections

- “ Smoking-gun” of wave disturbances in the corona
- Estimate on the height of the disturbances (for standing waves)
- Coronal seismology → B-field

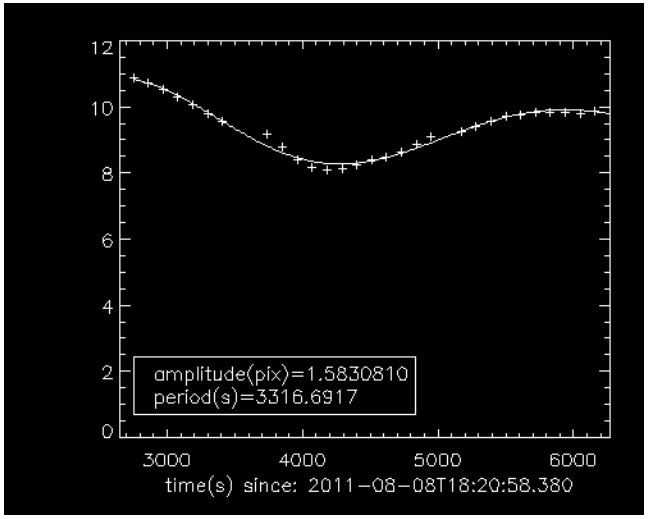


Analyzed structure;
clean background

Off-limb Deflections



•Trace an off-limb structure → make time- perpendicular distance plot & fit a Gaussian + quadratic function for each vertical cut → cendroid = amplitude of oscillation

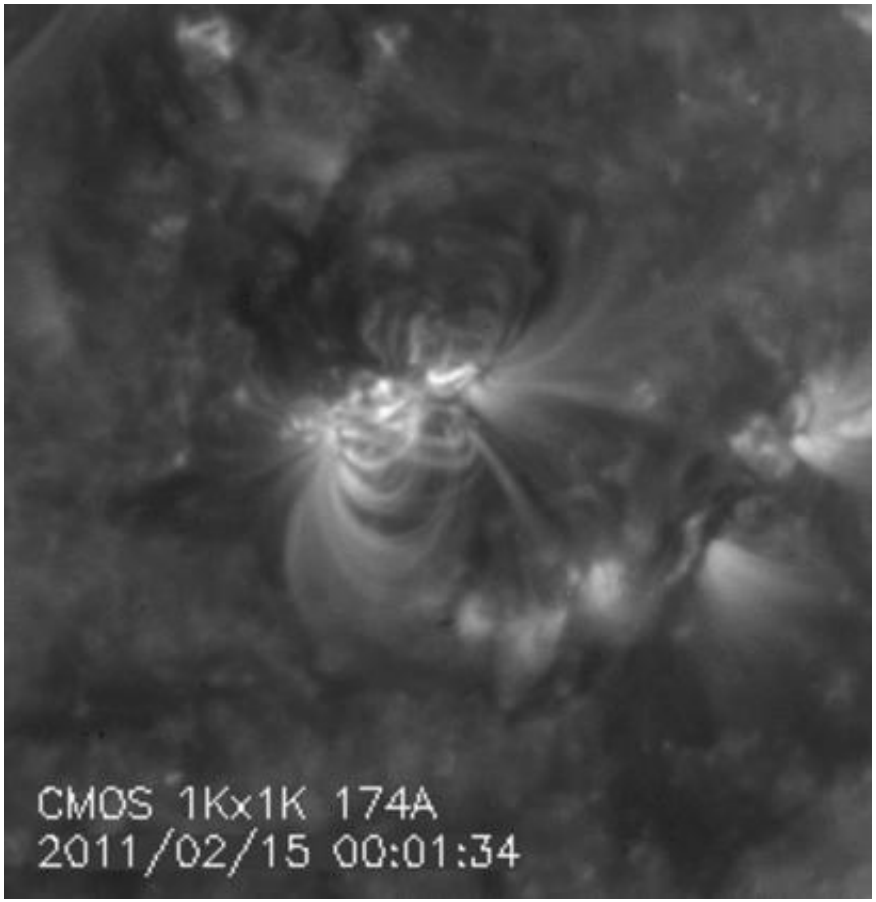


Fit a damped sine curve to time-amplitude → long period (~ 1 hr) of kink-like oscillation?

Period of kink-oscillation $P_{\text{kink}} = \frac{2L_{\text{osc}}}{c_k}$

Coronal Implosions during Flares

•SWAP does not saturate! Can observe very close to flare core



Watch for the arrowed loop in SWAP movie; this loop gets “lost” in the diffraction of AIA

Off-limb Deflections

•Difficult to apply though such analysis to other structures which in a movie-mode seem to oscillate; small constrast & other structures in the background/foreground are limiting factors