Preflare physical conditions inferred from *Hinode*

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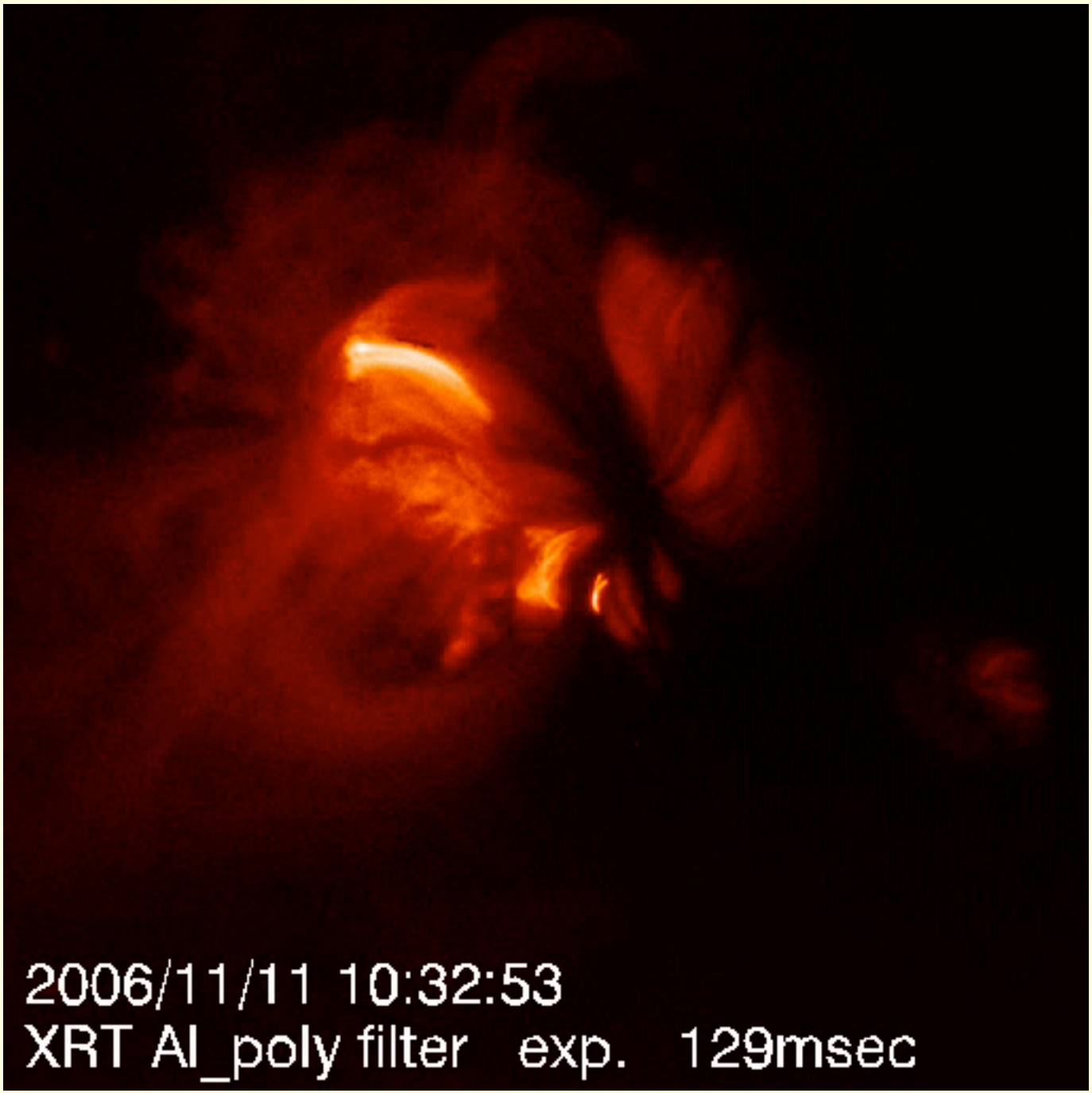
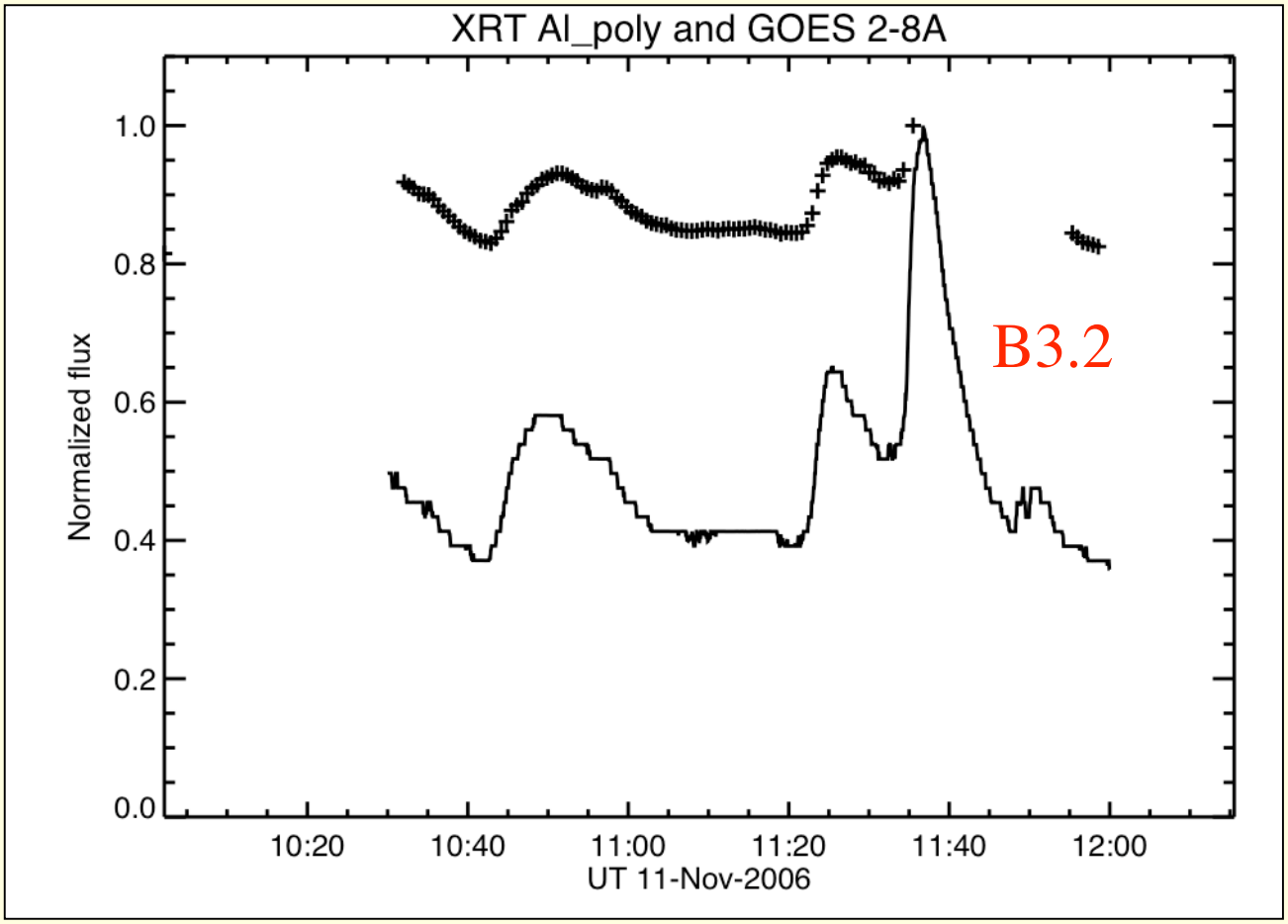
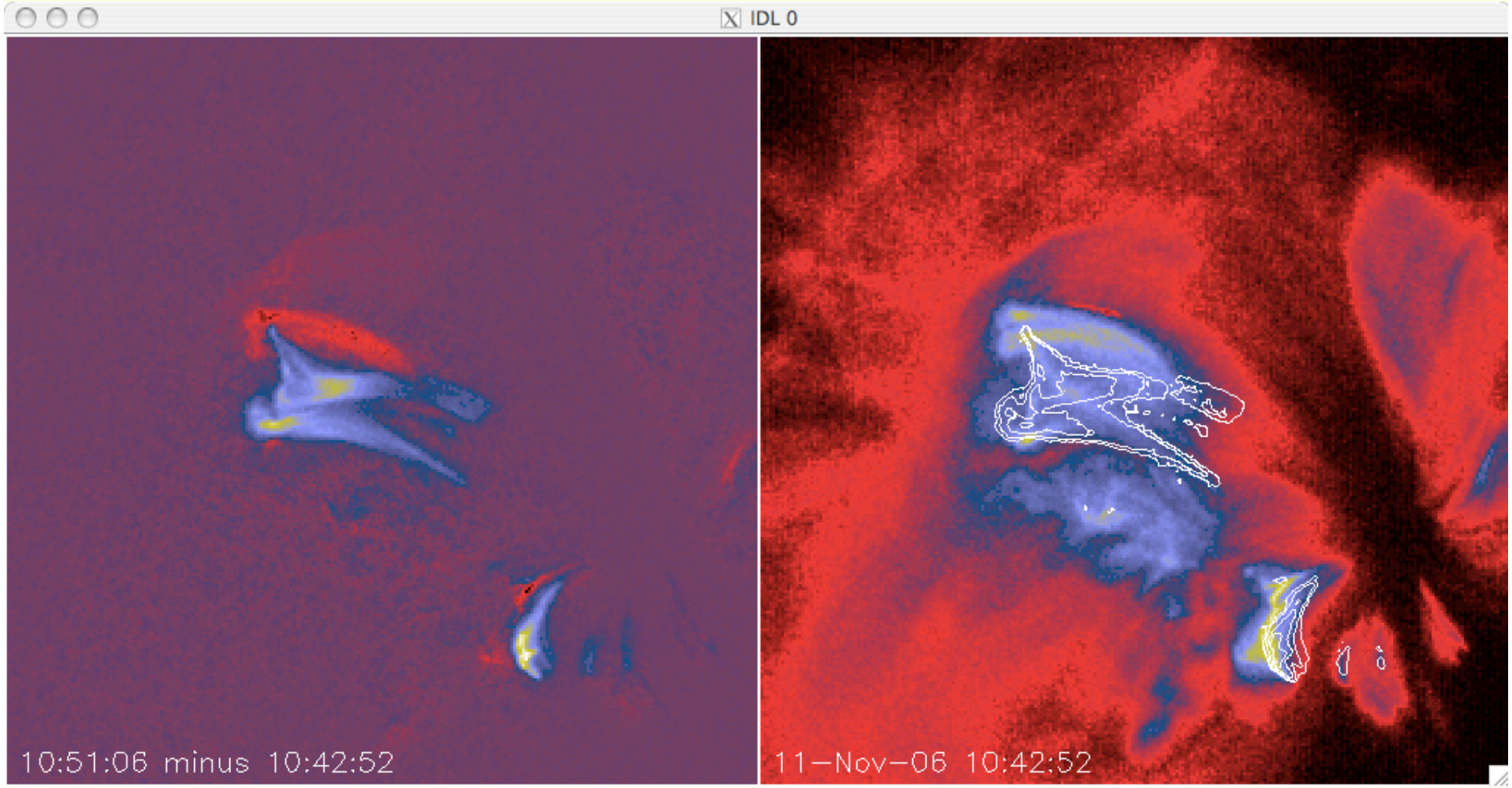
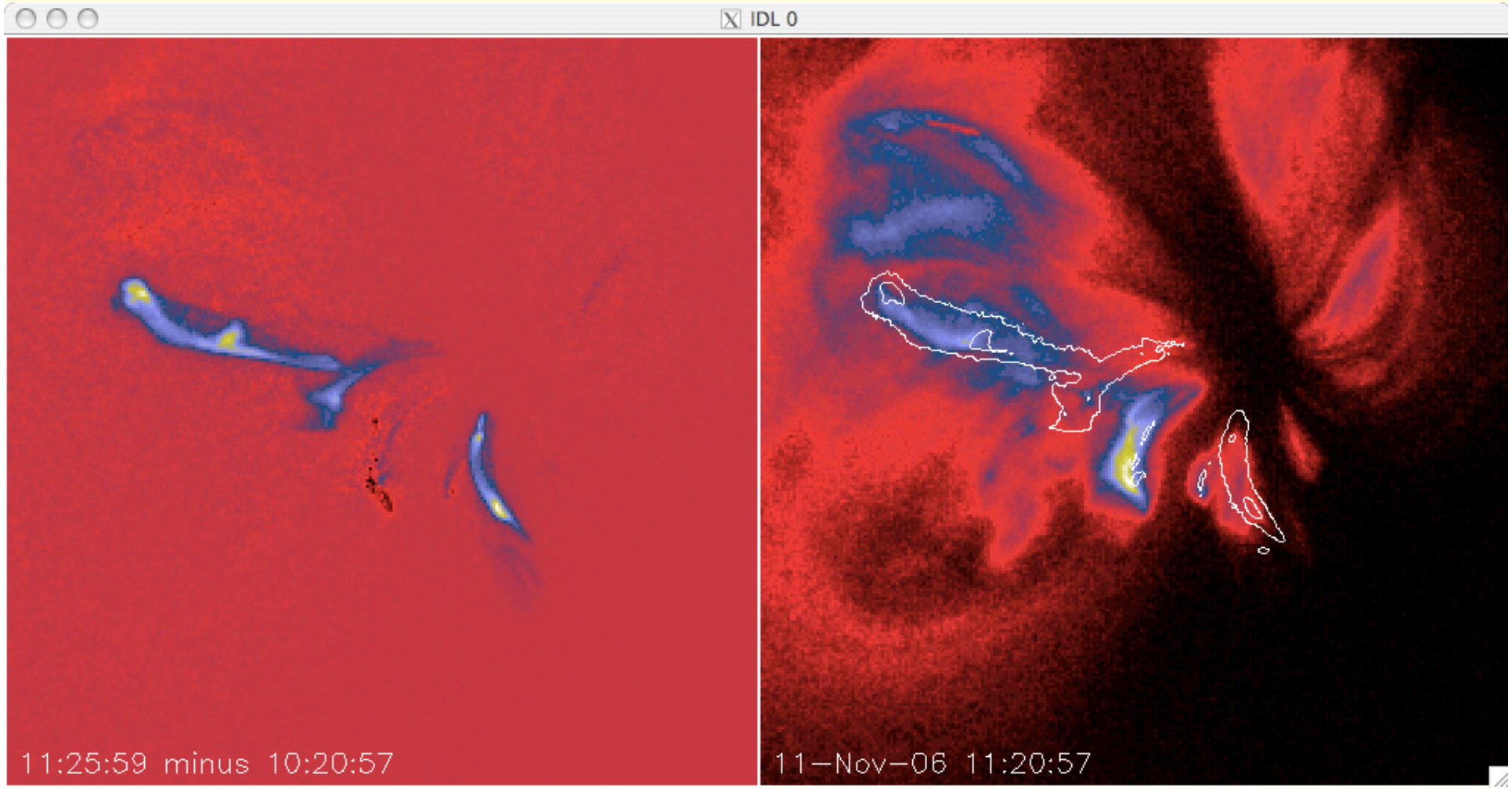
Comments

- Theorists want to know what conditions prevail when a flare happens
- *Hinode* has the best resolution ever
- We reconnoiter the XRT data
- EIS data are in principle much more powerful for this purpose


2006/11/11 10:32:53
XRT Al_poly filter exp. 129msec


XRT Al_poly and GOES 2-8A
Normalized flux
1.0
0.8
0.6
0.4
0.2
0.0
10:20
10:40
11:00
11:20
11:40
12:00
UT 11-Nov-2006
B3.2


IDL 0
10:51:06 minus 10:42:52
11-Nov-06 10:42:52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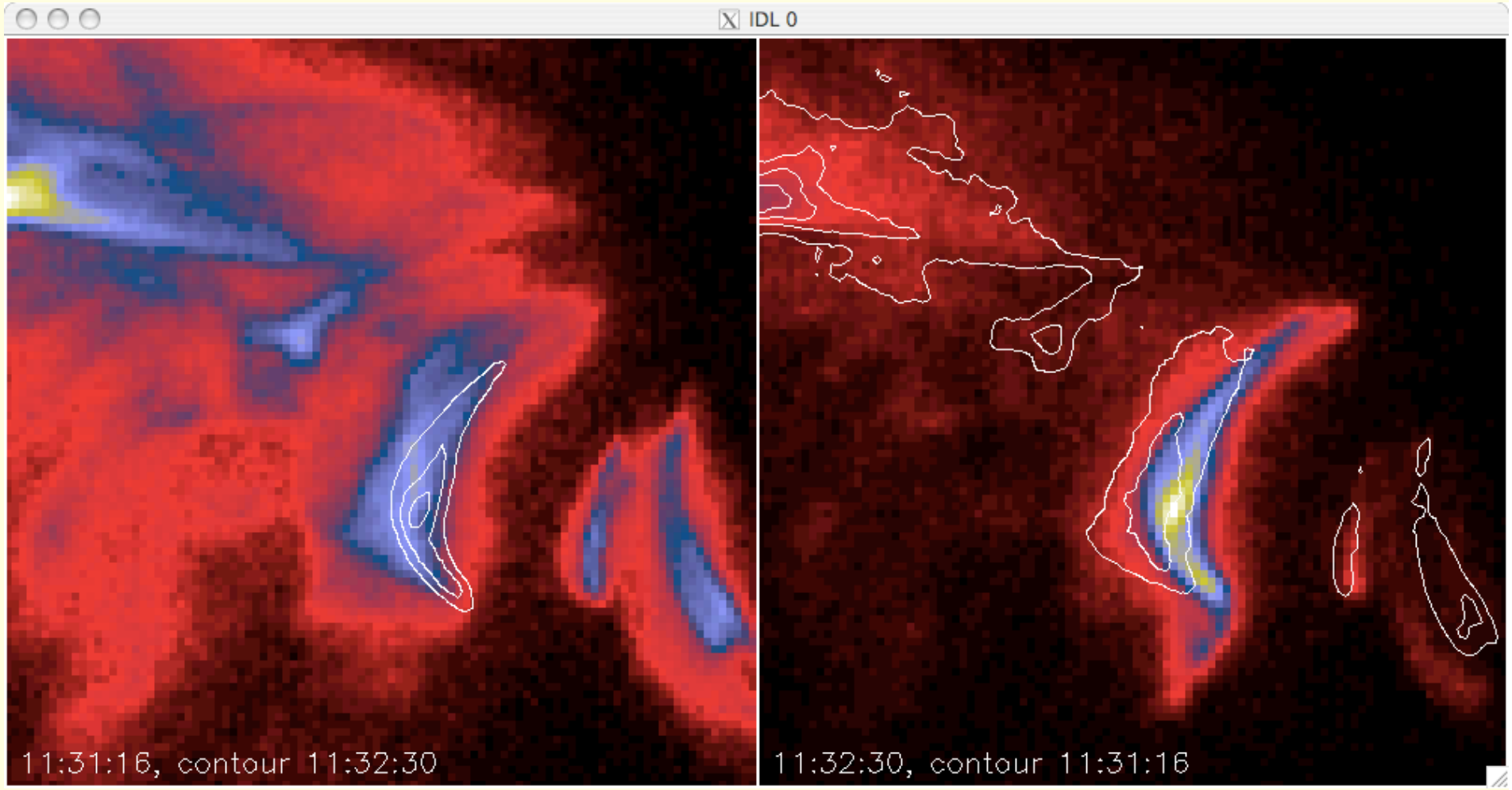
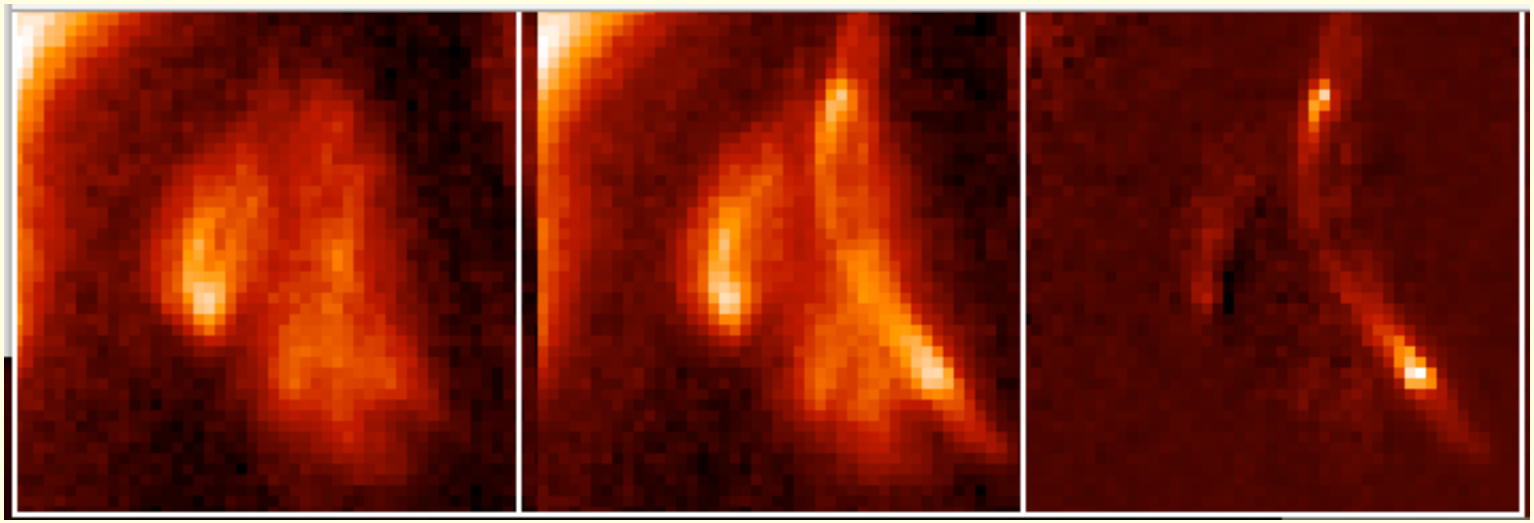
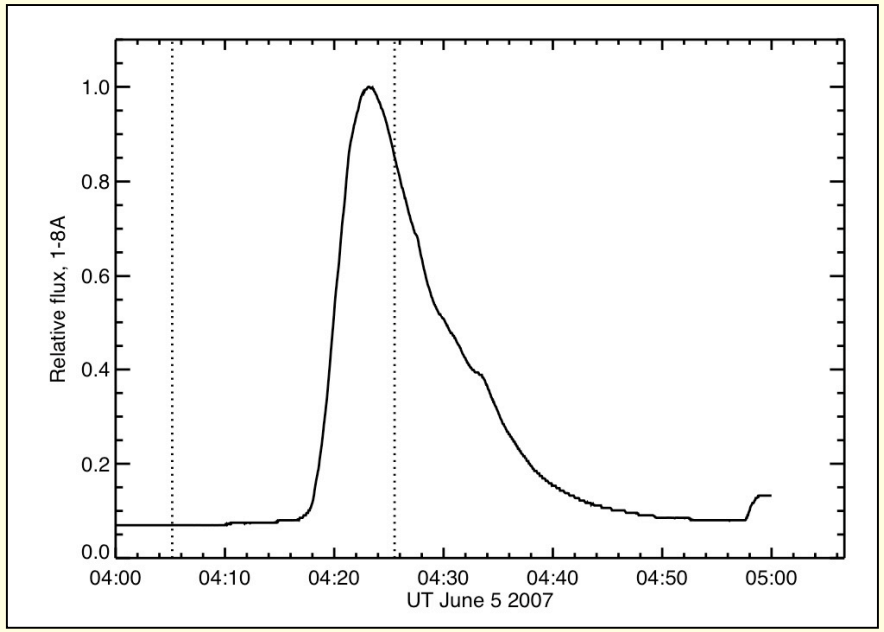
11-Nov-06 11:20:57

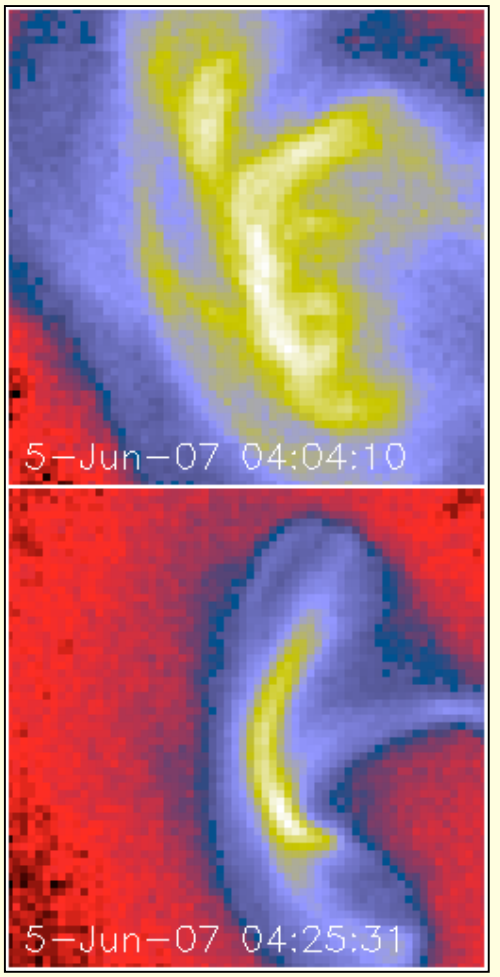

IDL 0
11:31:16, contour 11:32:30
11:32:30, contour 11:31:16

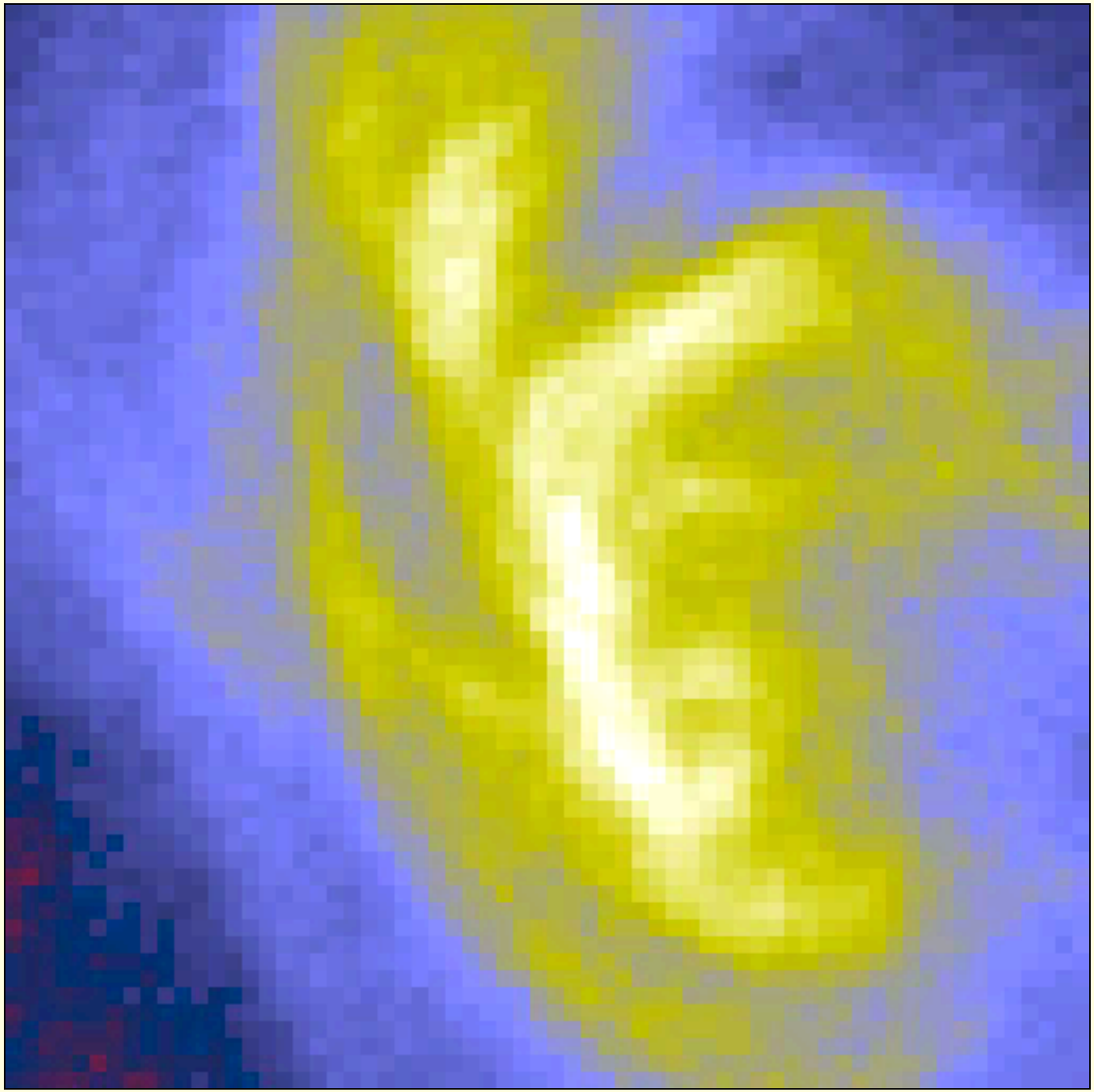


Preflare (log) Flare (log) Difference

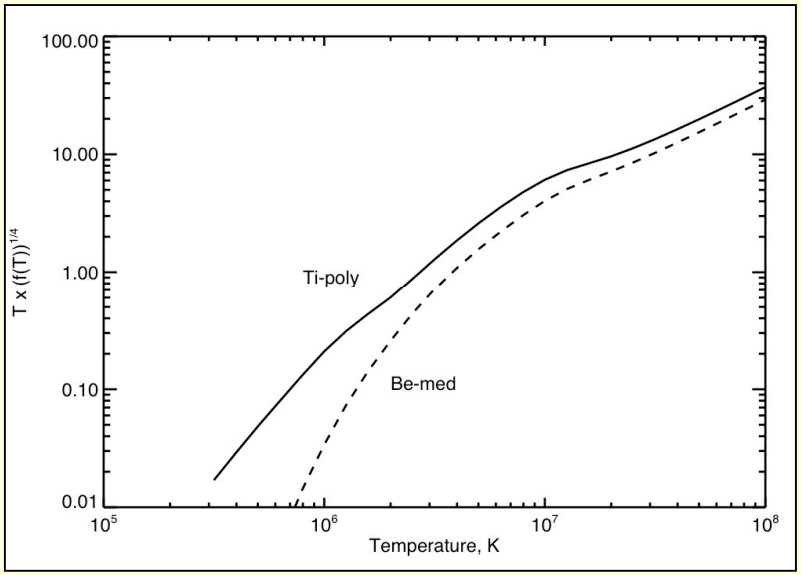
C-class flare of 2007 June 5







Analysis for preflare (T, n)



$S = n^2 f(T) DV$ *XRT response*

$T \sim (pL)^{1/3}$ *RTV law*

$\Rightarrow S \sim T^4 f(T)$

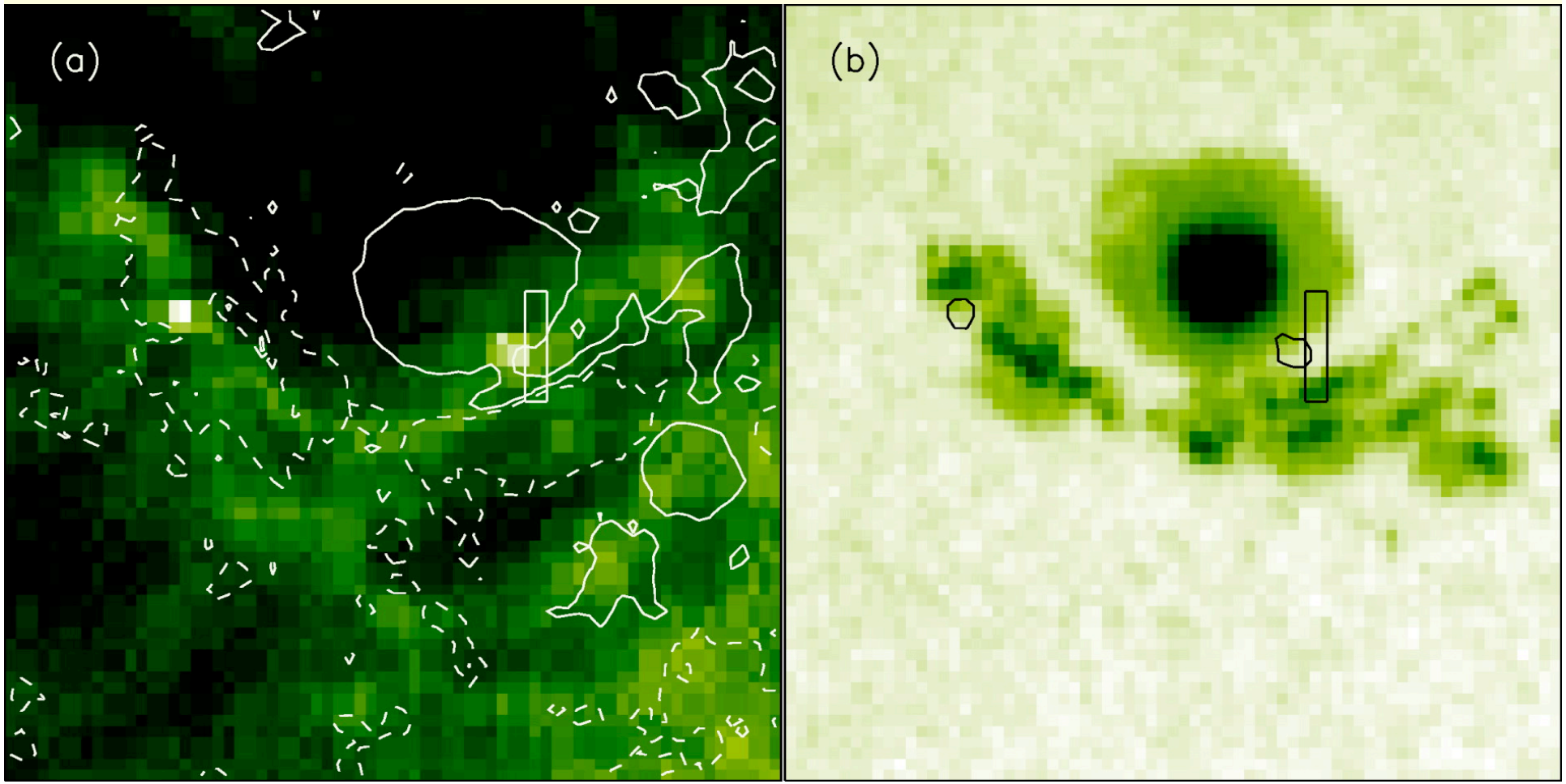
$T f(T)^{1/4} = T_{ref} f(T_{ref})^{1/4} * (S/S_{ref})^{1/4}$

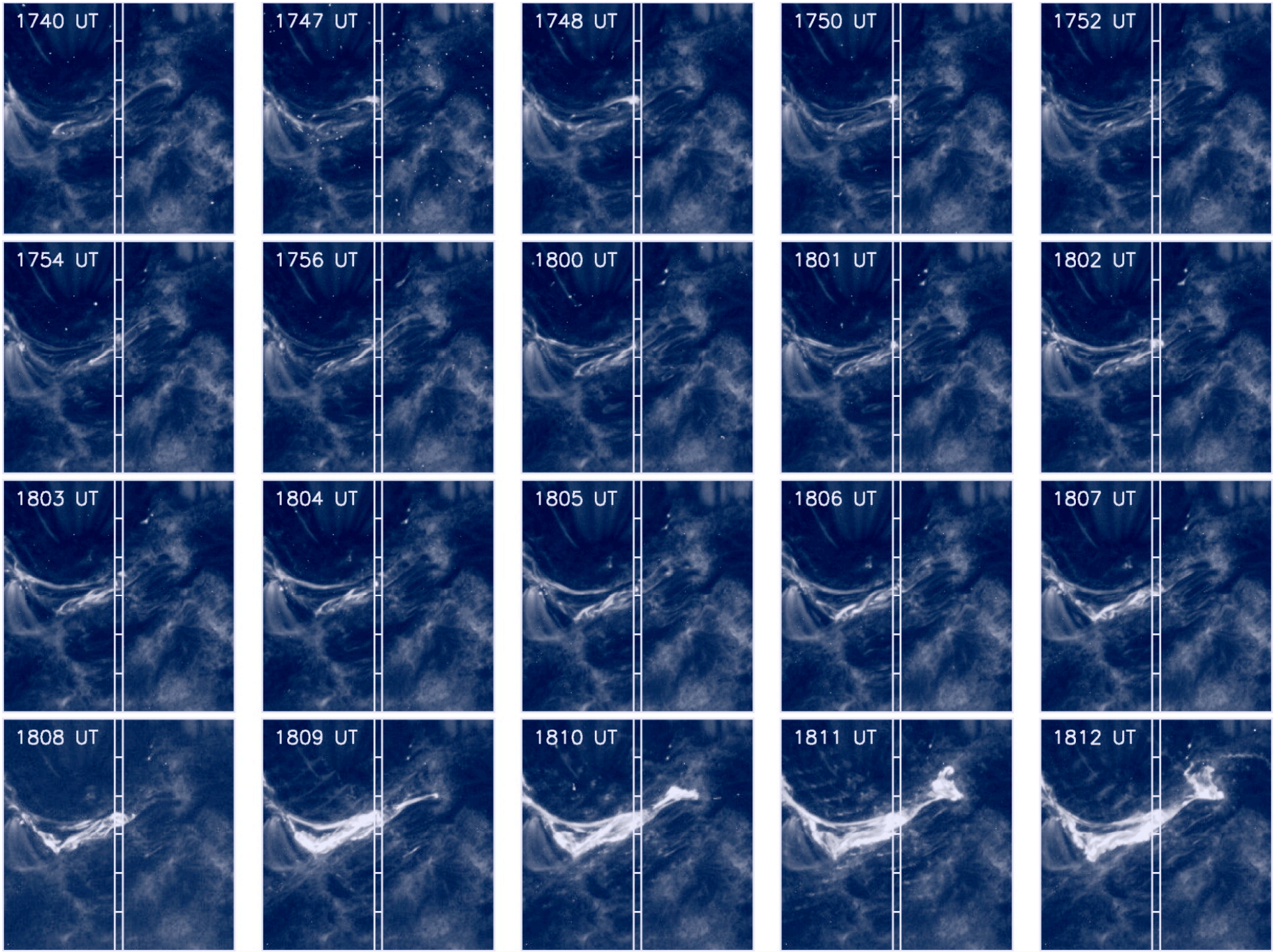
The pre-event density n follows from the RTV scaling since $n \sim T^2$ for a fixed reference geometry (nearby loop)

Results of RTV analysis

Temperature:	< 1MK
Density:	$< 1 \times 10^{8}$ cgs
Plasma beta:	$< 1 \times 10^{-4}$
Alfvén speed:	> 0.1 c

Brosius & Phillips, ApJ 613, 580 (2004): TRACE/SOHO/*Yohkoh* comparisons; a counterexample?




1740 UT
1747 UT
1748 UT
1750 UT
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1810 UT
1811 UT
1812 UT

Conclusions

- In several microflares and one C-class event, XRT sees an “empty corona” prior to the flare
- Using RTV scaling to compare with similar AR loops, we find low temperatures and densities
- These imply low pressure and plasma beta, as well as high Alfvén speeds ($> 0.1c$)