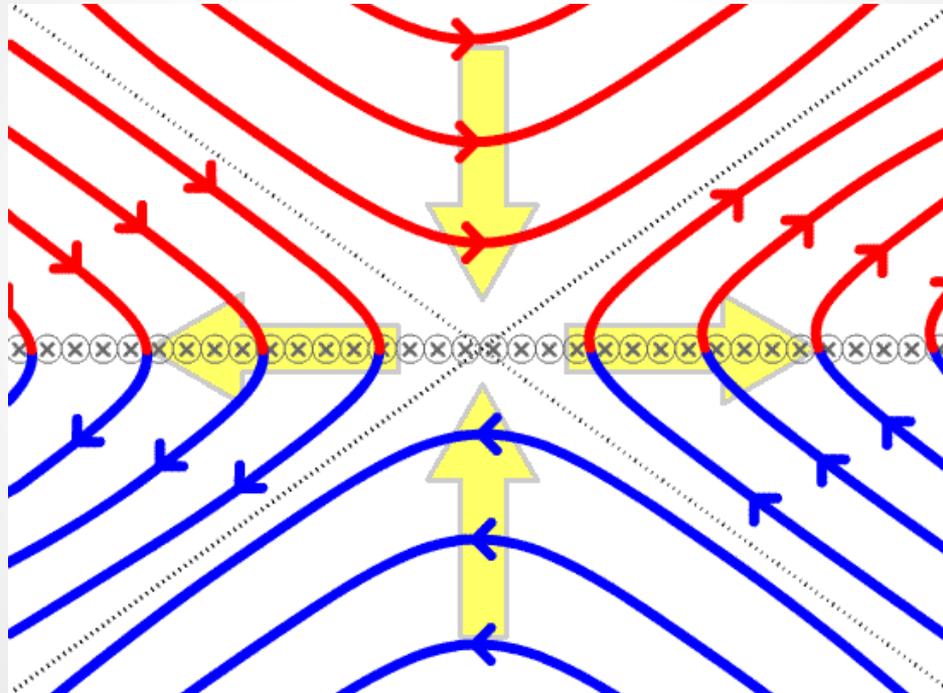


Measurements of Magnetic Reconnection to/from Emerging Active Regions

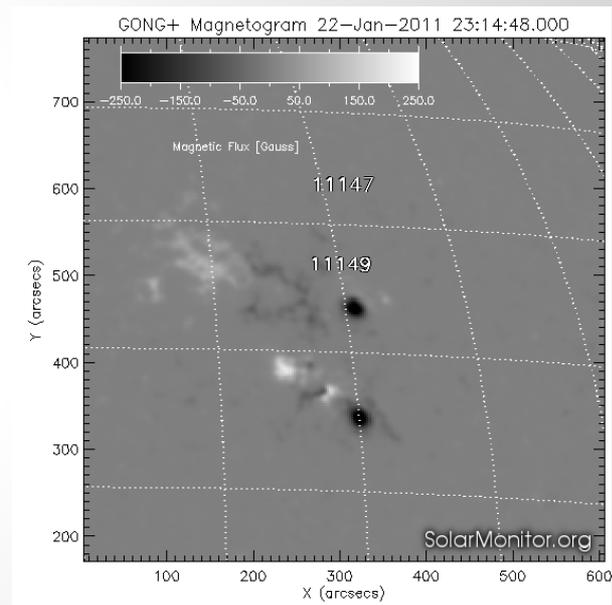
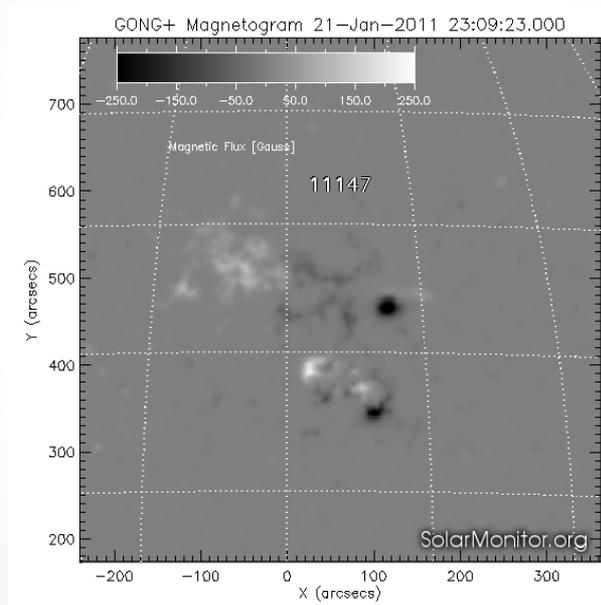
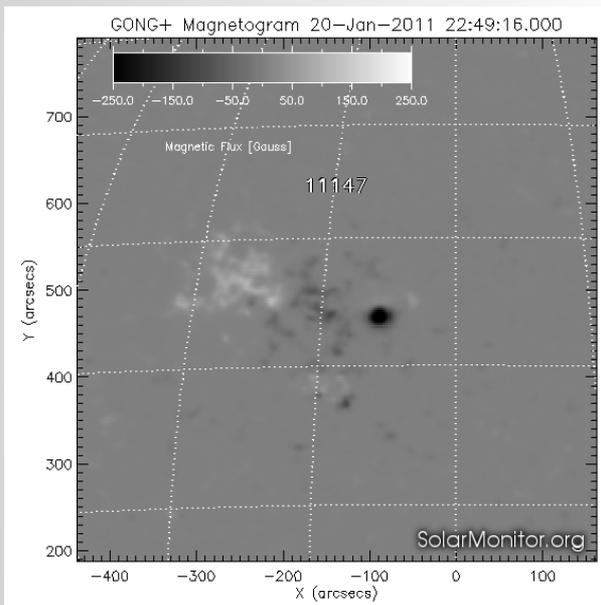
Marika McCarthy

Advised by Dr. David McKenzie

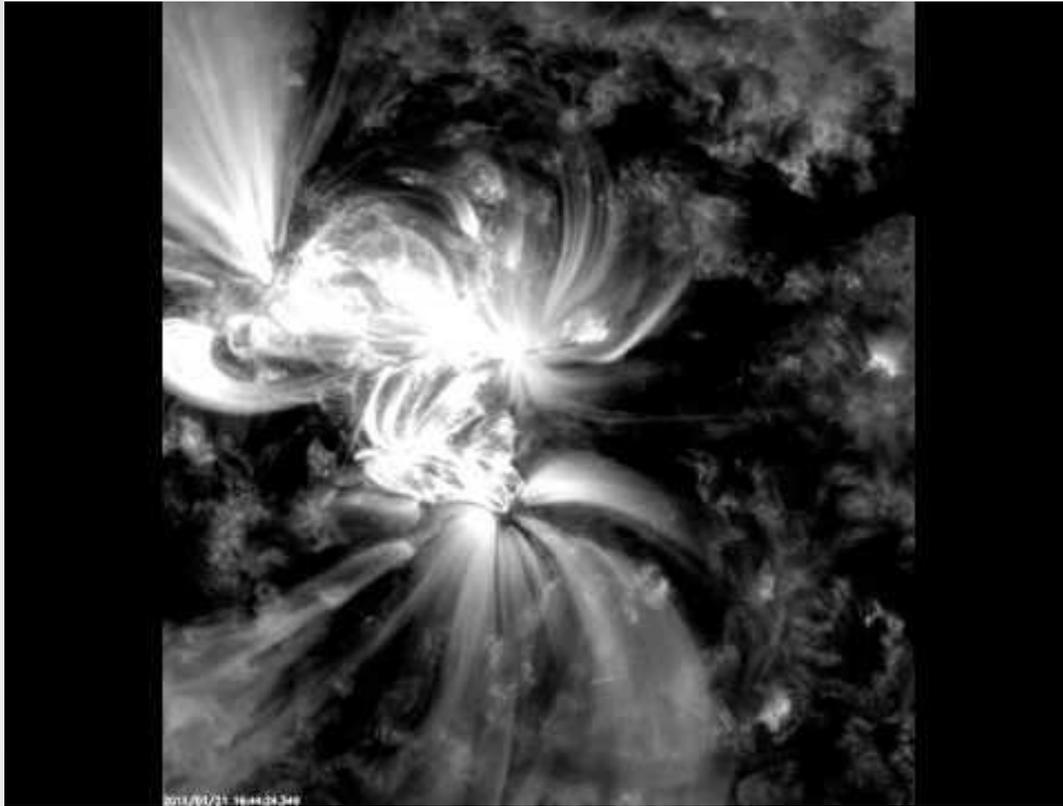
Magnetic Reconnection...



... to and from emerging active regions



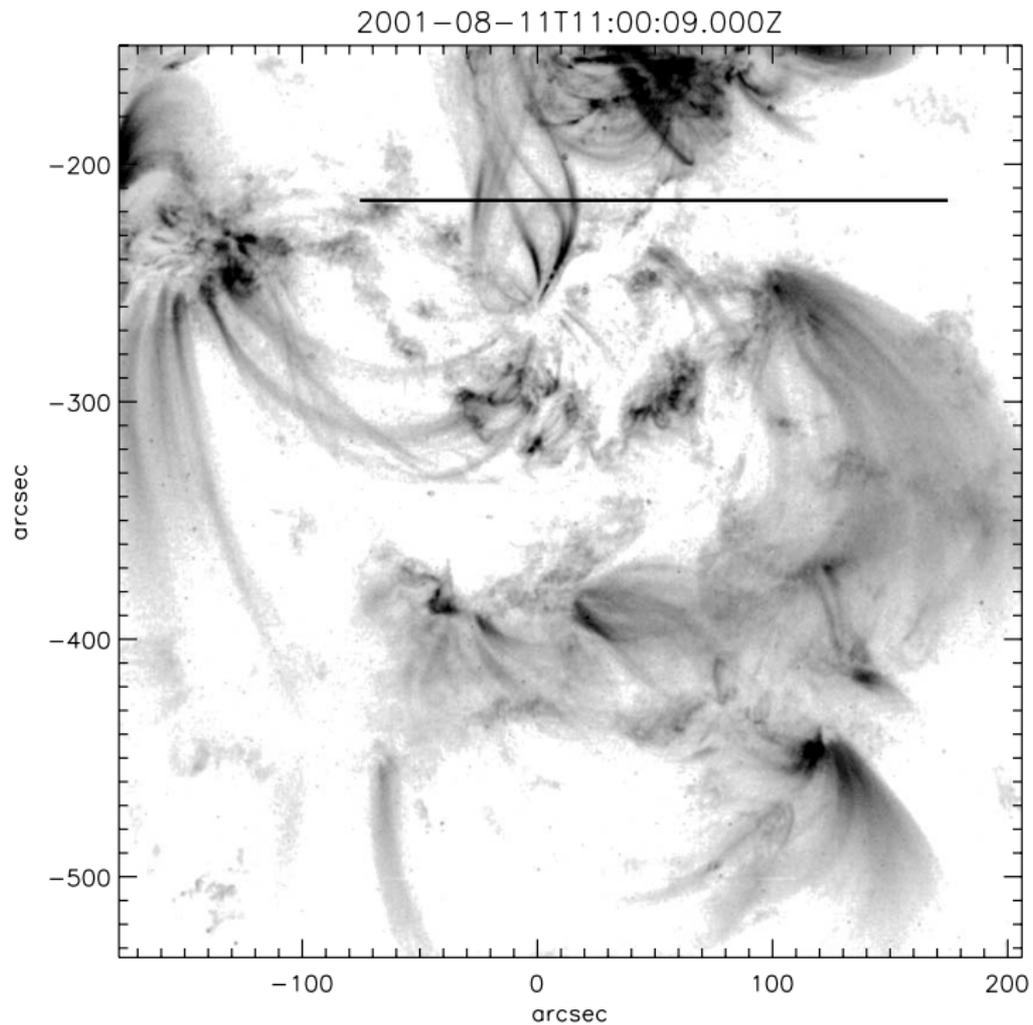
Magnetograms for one of our reconnection events



Video via Imsal cutout service http://www.imsal.com/solarsoft/archive/sdo/media/ssw/ssw_client/data/ssw_service_150609_133538_69278/www/ssw_cutout_2011_0121_090001_AIA_171_20110121_090000_j.html

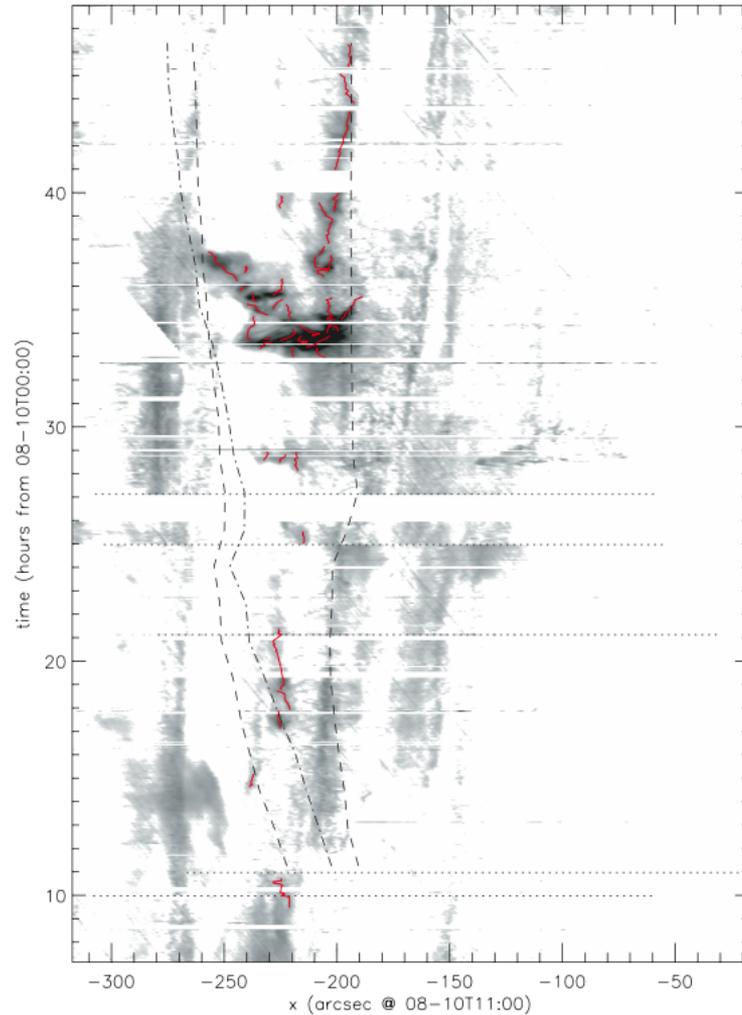
What is motivating this?

171 Å from TRACE

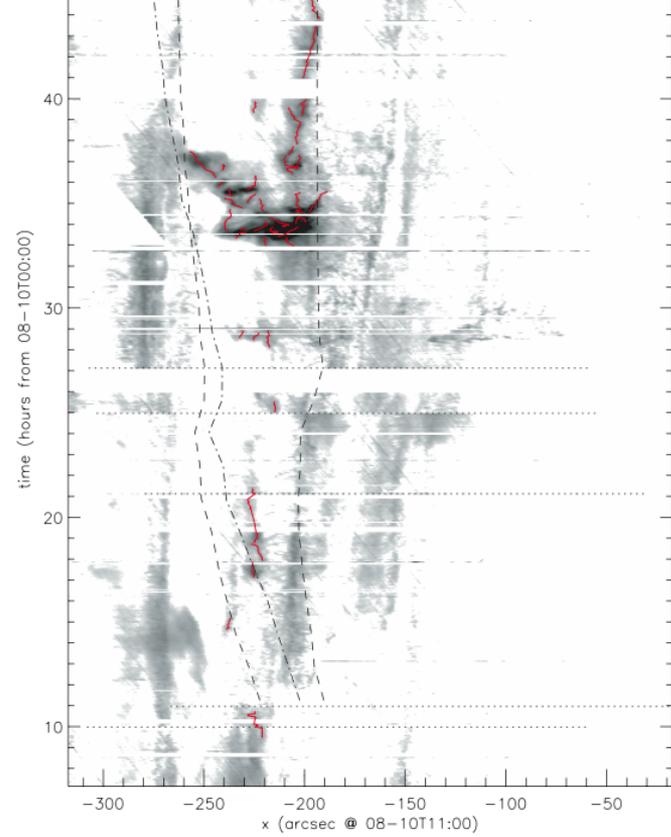


Longcope, et. al.
"Observations of
separator
reconnection to an
emerging active
region." 2005

Stack plot using 171 Å
TRACE images



Longcope, et. al.
"Observations of
separator
reconnection to an
emerging active
region." 2005



Primary motivation: Only one case of this in literature

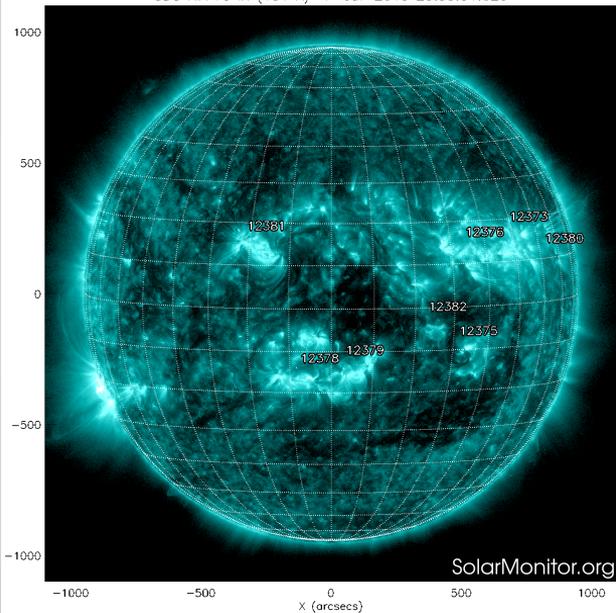
Table of events proposed for analysis (via “Using EUV image sequences to quantify magnetic reconnection in the solar corona” proposal)

#	date y-m-d	ARs old/new	helio. loc.	ang. sep.	flares C/M	#	date y-m-d	ARs old/new	helio. loc.	ang. sep.	flares C/M/X
1	2011-01-20	1147/1149	N17W04	6.3°	11/1	9	2012-01-14	1395/1398	N18E04	8.2°	3/0
2	2011-02-17	1161/1162	N17W05	7.2°	20/4	10	2012-04-18	1458/1460	N18E17	9.0°	5/0
3	2011-05-15	1214/1217	S18E36	5.1°	0/0	11	2013-01-10	1649/1655	S22W02	5.1°	0/0
4	2011-08-29	1277/1282	N23E01	6.1°	0/0	12	2013-02-19	1671/1678	N09W26	9.8°	10/0
5	2011-10-12	1313/1320	S19W22	8.1°	7/0	13	2013-10-13	1865/1870	S13W05	9.2°	18/3
6	2011-10-29	1334/1335	N15E40	8.6°	7/0	14	2013-11-11	1893/1900	S15E15	9.2°	31/4/1
7	2011-12-05	1367/1370	S29E25	8.0°	18/0	15	2013-12-03	1908/1914	S18W19	7.6°	0/0
8	2011-12-18	1381/1382	S18E36	6.0°	11/0	16	2014-04-14	2036/2037	S10E29	9.4°	31/1

- Goals are to make quantitative measurements of magnetic reconnection to better understand this phenomena -- especially the delay

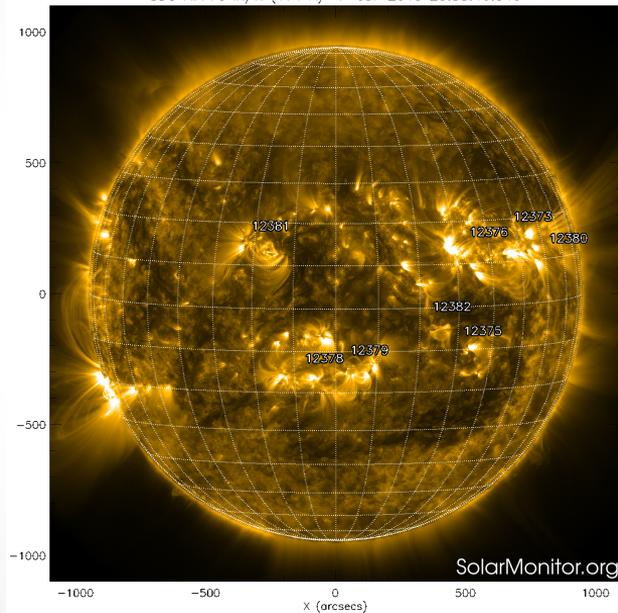
AIA

SDO AIA Fe IX (131 Å) 7-Jul-2015 23:33:31.620



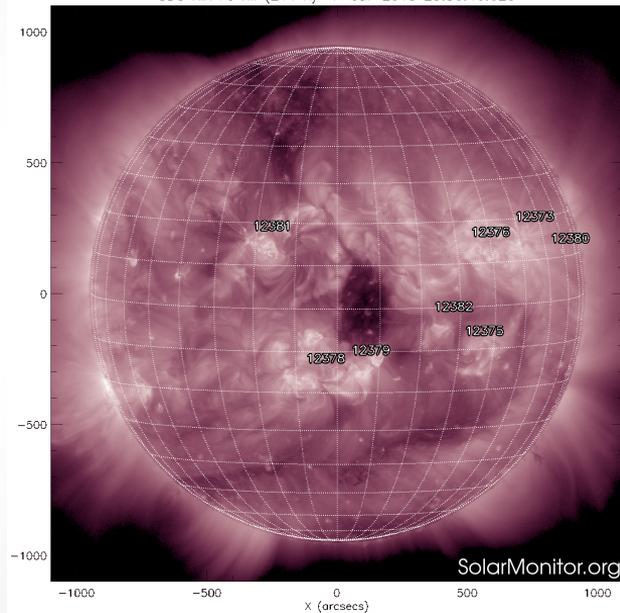
131 Å 10 MK

SDO AIA Fe IX/X (171 Å) 7-Jul-2015 23:33:46.340



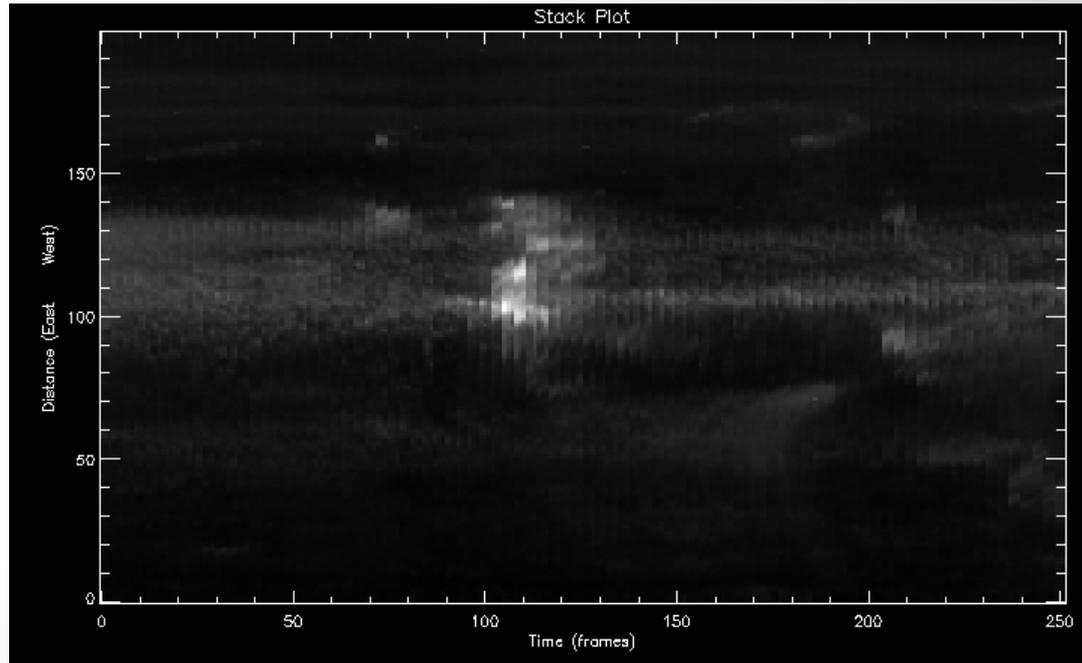
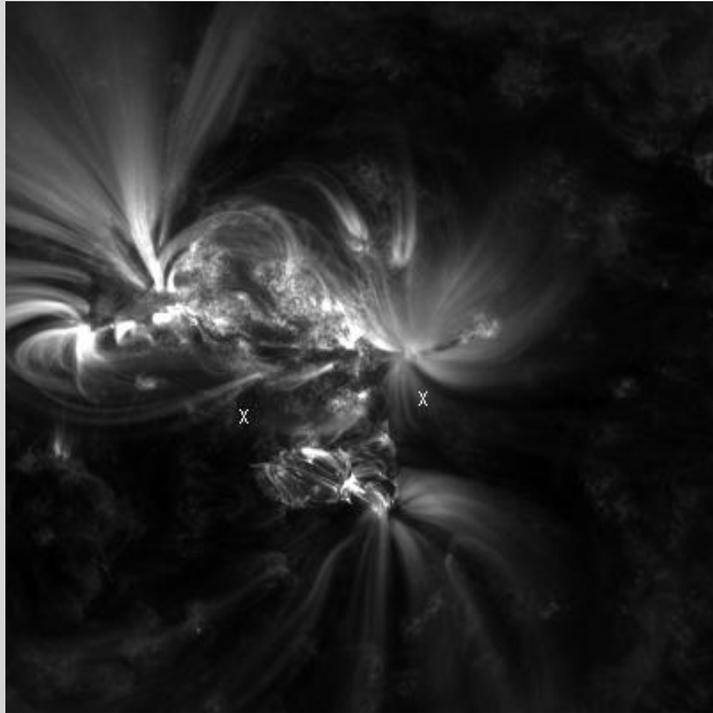
171 Å 1 MK

SDO AIA Fe XII (211 Å) 7-Jul-2015 23:36:46.620

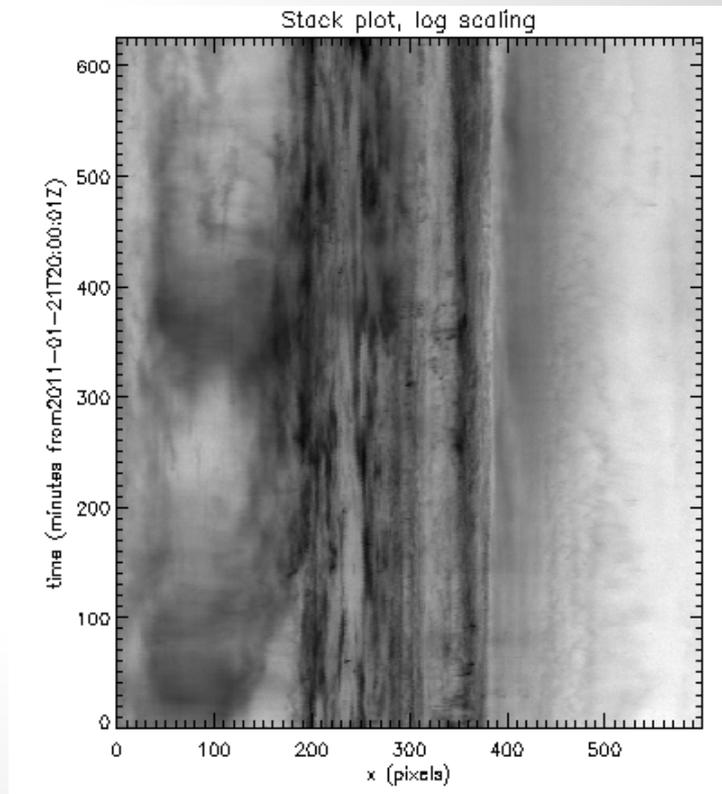
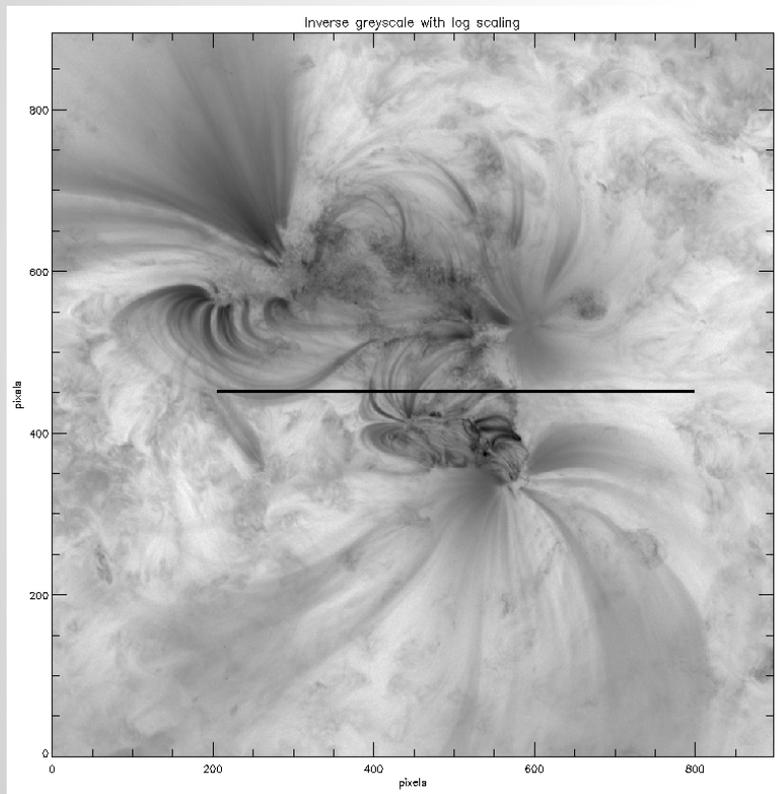


211 Å 2 MK

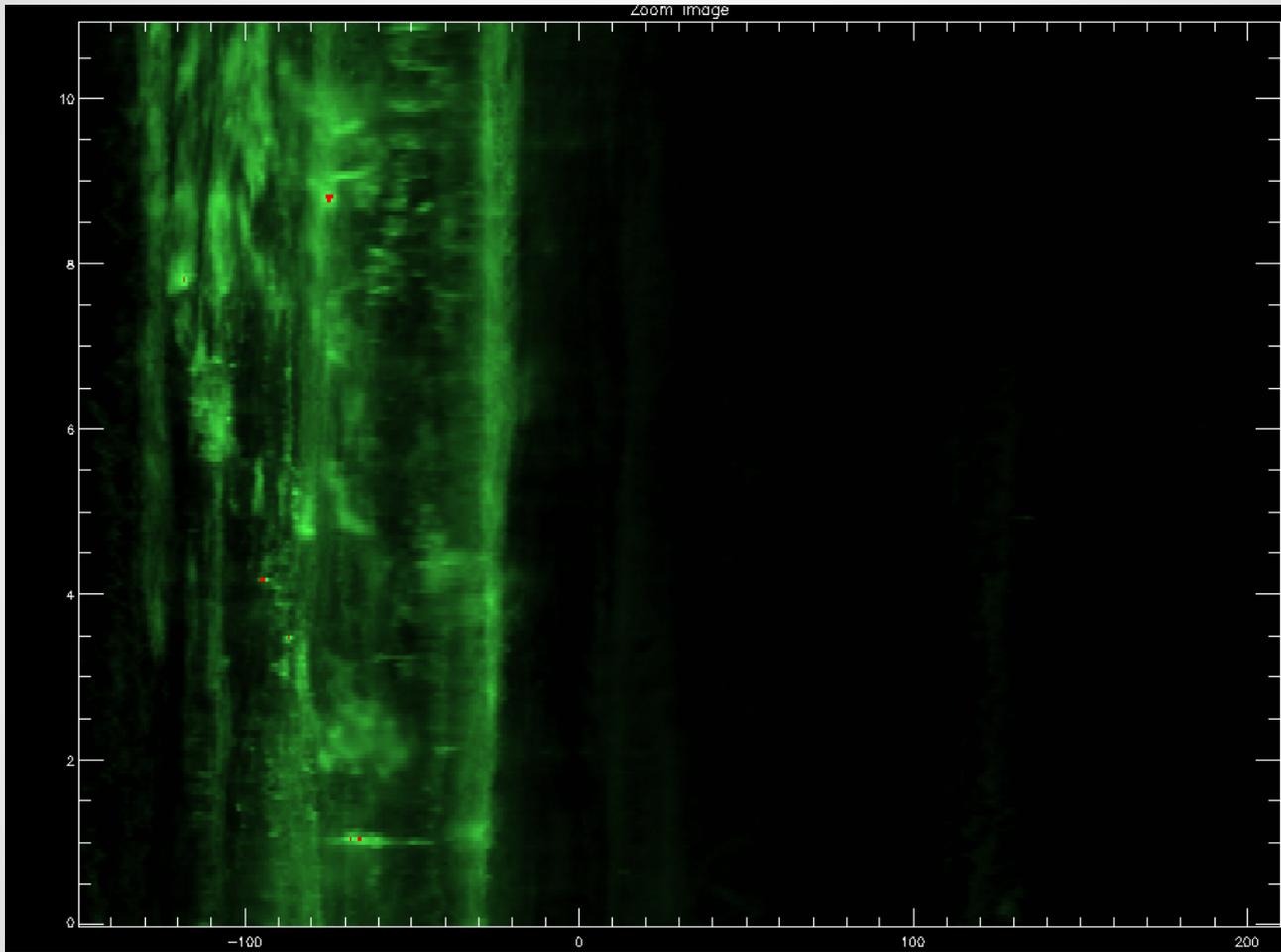
Making a stack plot

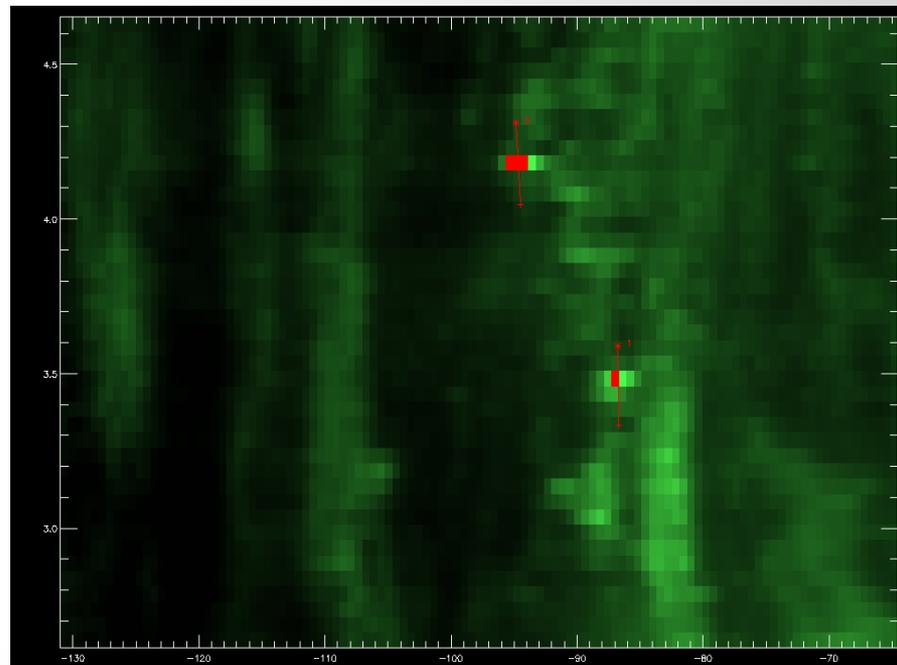
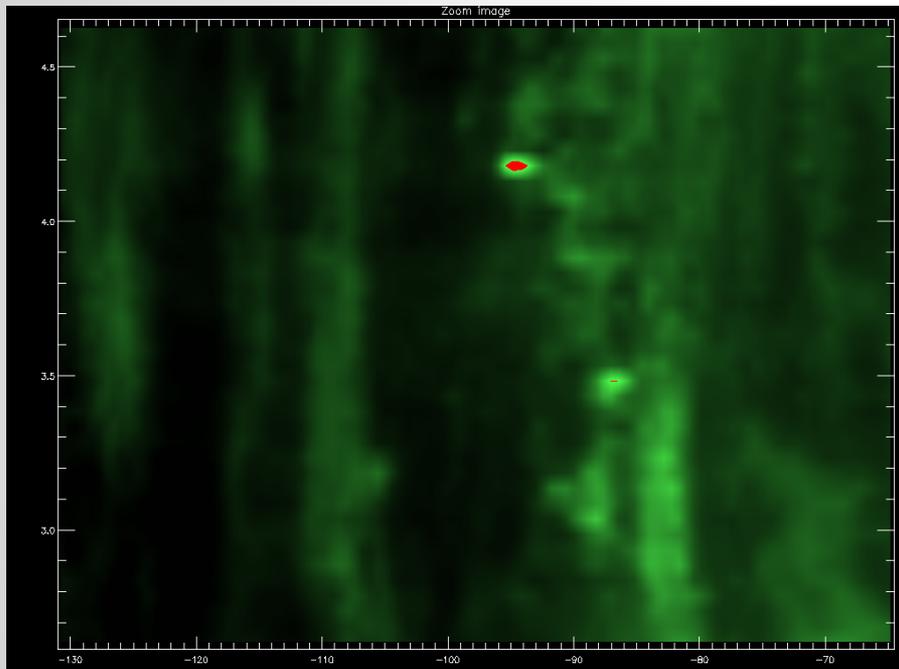


Adapting stack plot procedure to fit pipeline



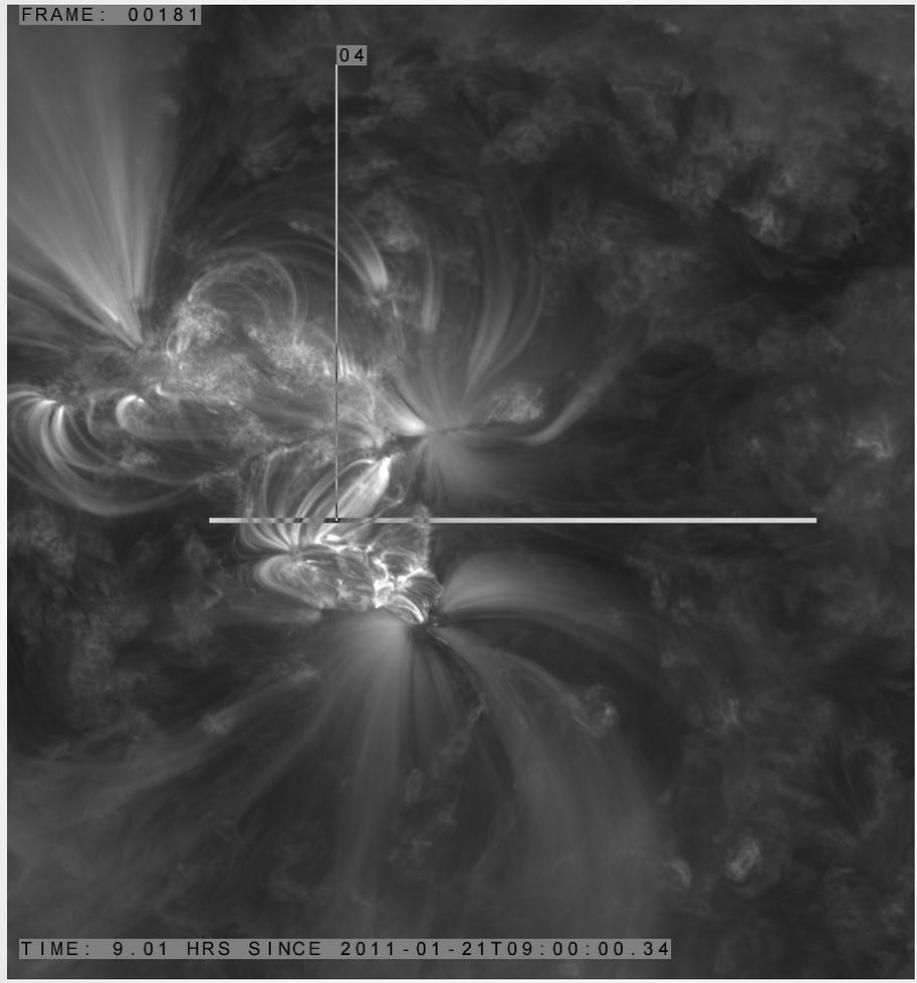
Zoom image



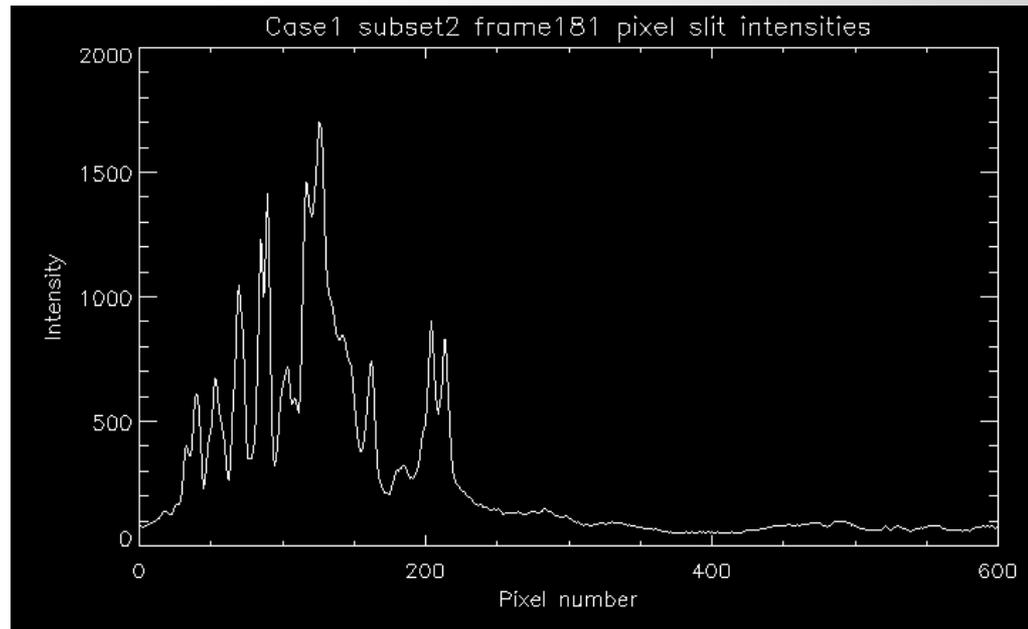
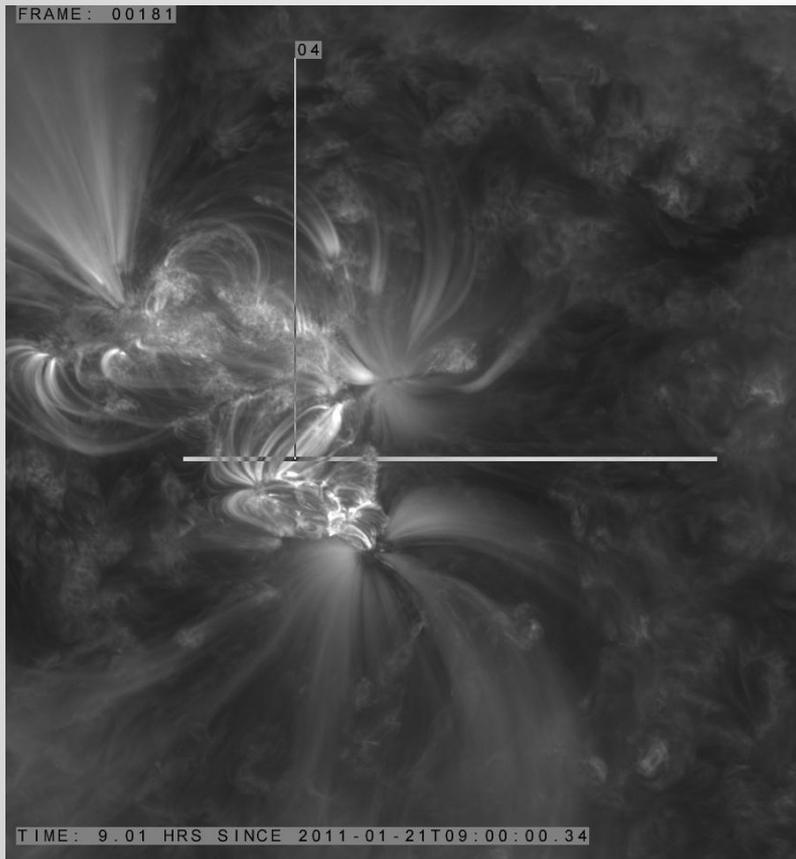


FRAME: 00181

04

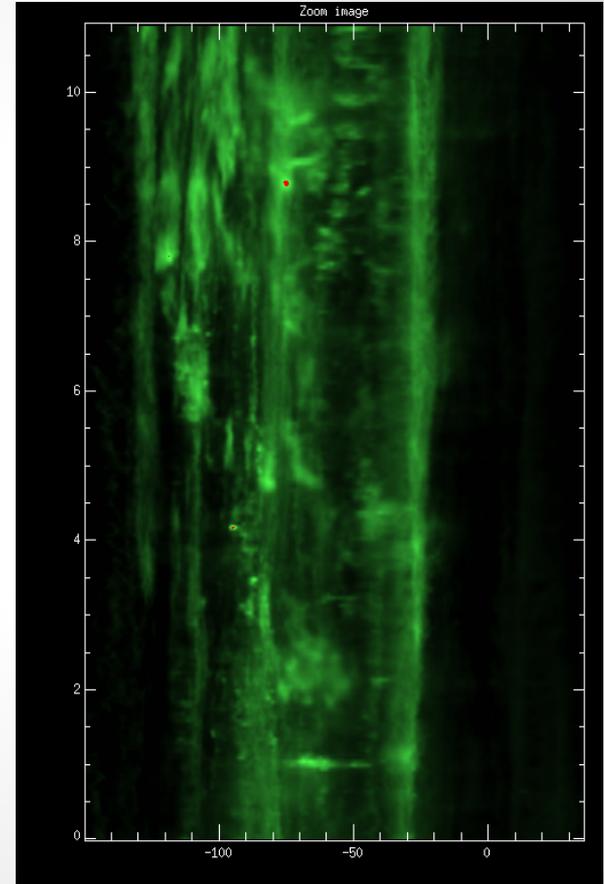


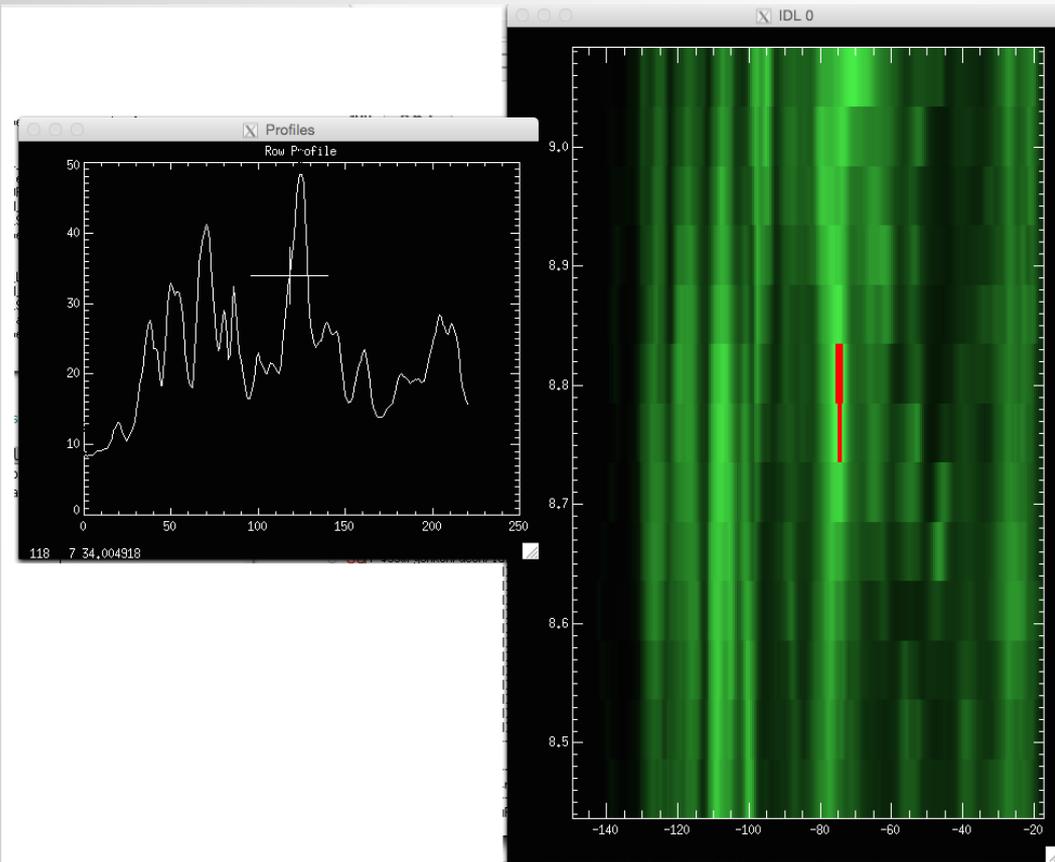
TIME: 9.01 HRS SINCE 2011-01-21T09:00:00.34



Adapted loop selection

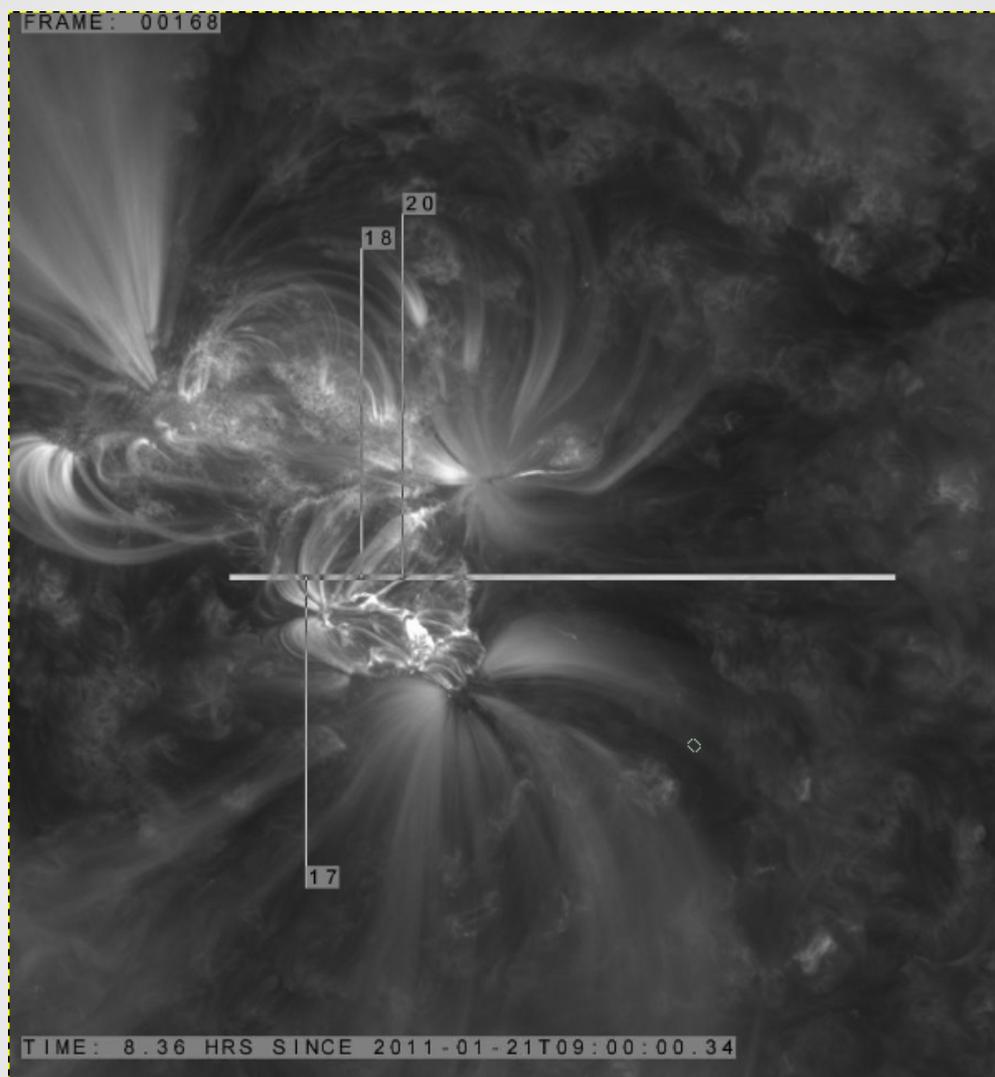
‘Hotdog’ orientation to see loops easier as streaks (vs blobs when ‘hamburger style’)





Added IDL 'profiles' to determine points of high intensity

FRAME: 00168



TIME: 8.36 HRS SINCE 2011-01-21T09:00:00.34

Next steps

- Continue analyzing reconnection events
- More pipeline
 - Implementing creation of the magnetic model

- With the magnetic model, we can ask questions besides quantifying the observed time delay...
 - How much coronal current builds up before reconnecting?
 - What is the relationship between topological change and energy release?
 - What range of reconnection electric fields is observed in these reconnection events?
 - What is the distribution of flux tube diameters (and fluxes) created by the reconnection process? Does it vary or is it a fundamental characteristic of coronal reconnection?

Questions?