



National Aeronautics and Space Administration

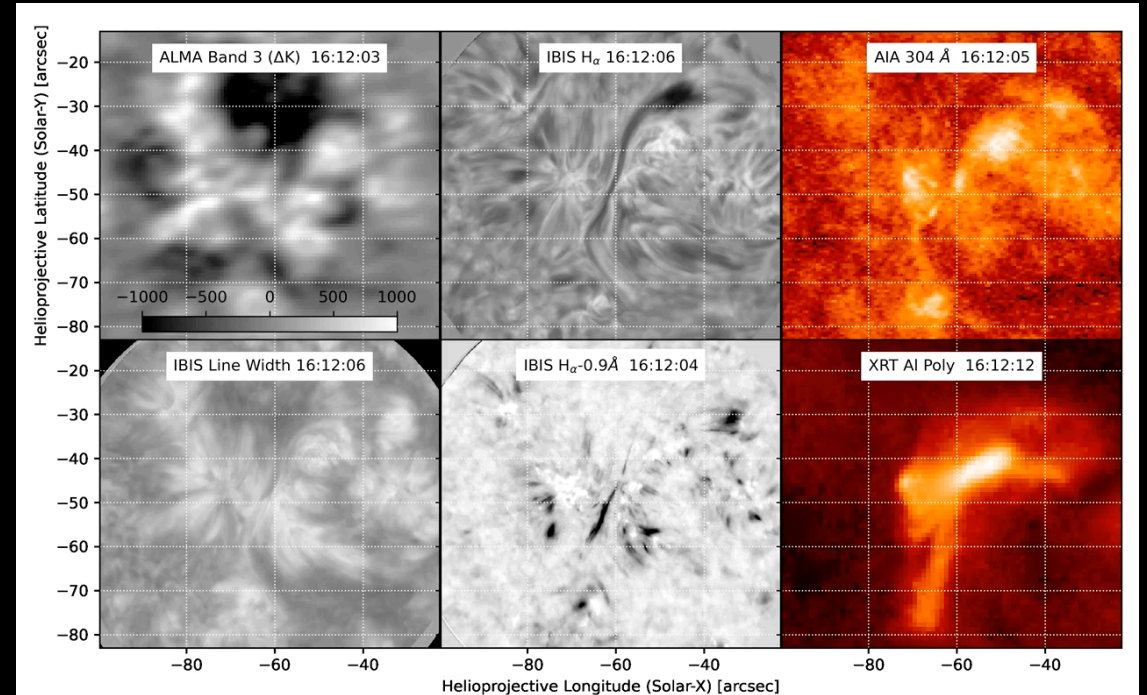
Small Events Involve the Entire Solar Atmosphere

Adam Kobelski¹, Sarah Jaeggli², Lucas Tarr², Ronald Moore³

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²National Solar Observatory, Maui, Makawao, HI

¹University of Alabama Huntsville, Huntsville, AL



Two papers form the basis for this talk:

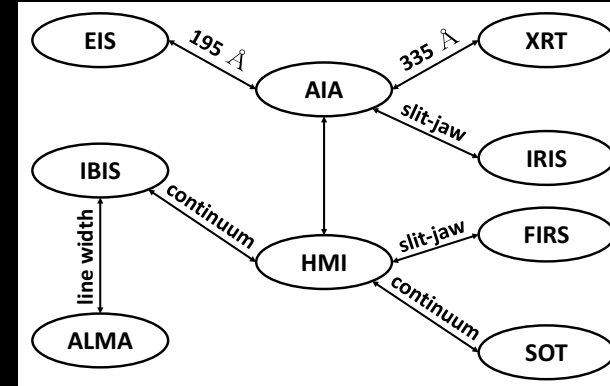
“A Publicly Available Multiobservatory Data Set of an Enhanced Network Patch from the chromosphere to the Corona”

Kobelski, Tarr, Jaeggli, Luger, Warren, Savage

ApJS 2022

Overview of the observations and calibration

Links to download the data



“Spatio-temporal comparisons of the hydrogen-alpha line width and ALMA 3mm brightness temperature in the weak solar network”

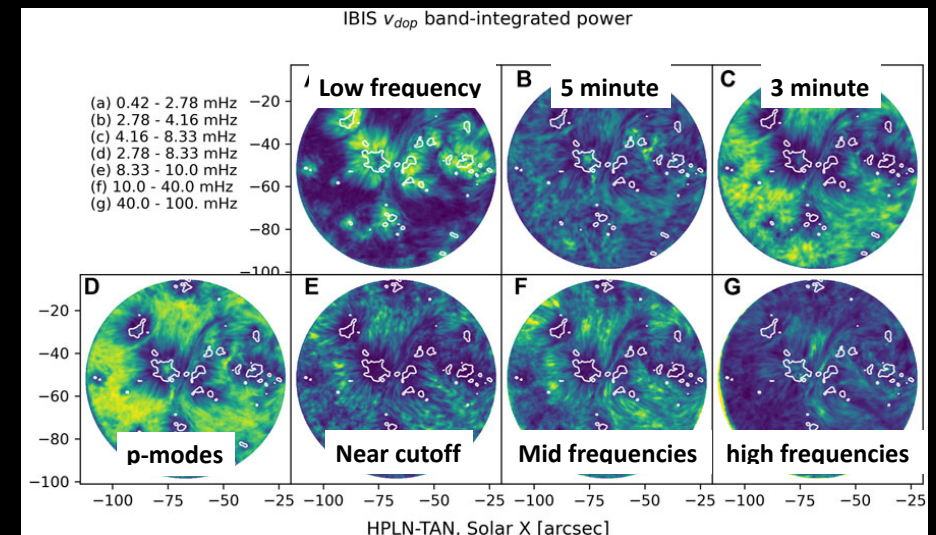
Tarr, Kobelski, Jaeggli, Molnar, Cauzzi, Reardon

Frontiers in Astronomy (ALMA specific issue) 2022

Look at power spectra, and

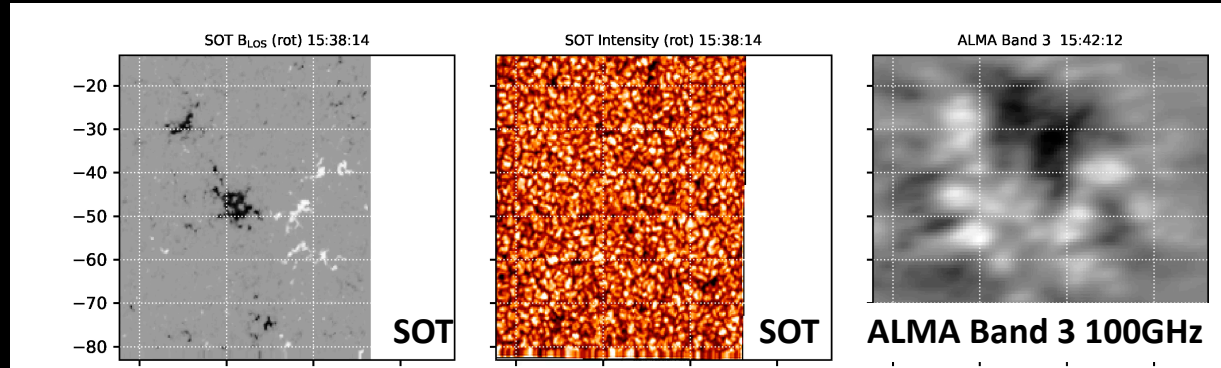
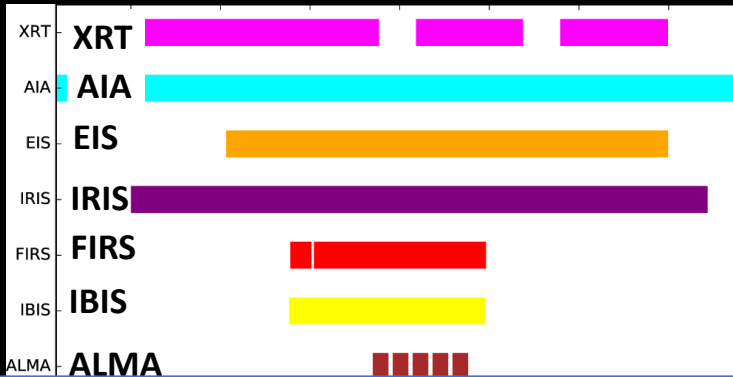
discussions comparing to other results

Check out Tarr+ poster here for updated info.

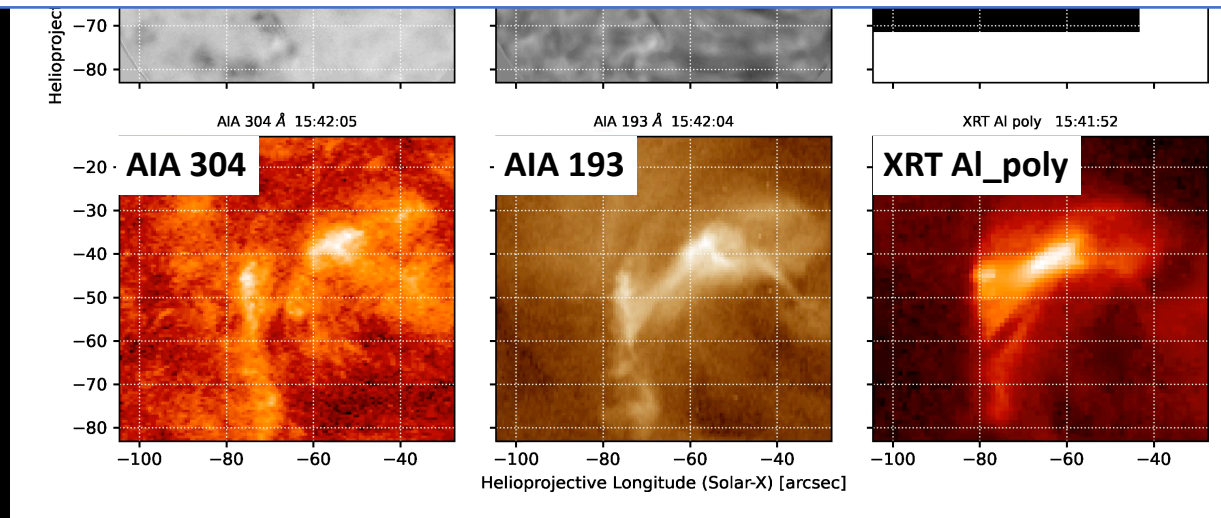
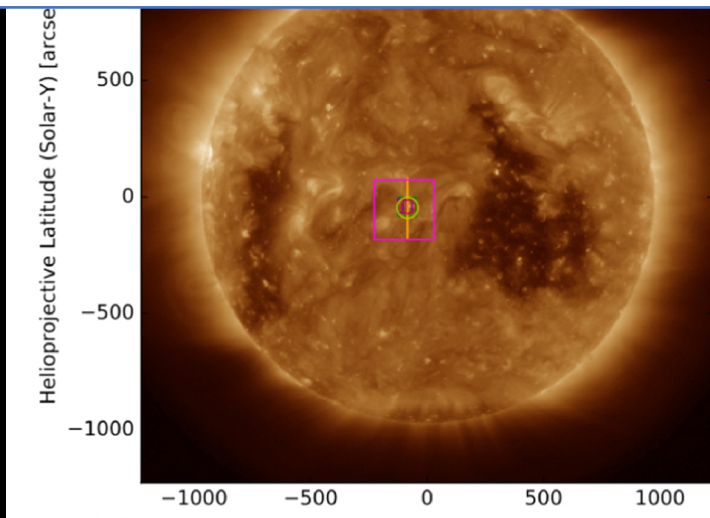


Overview of observations

March 21, 2017



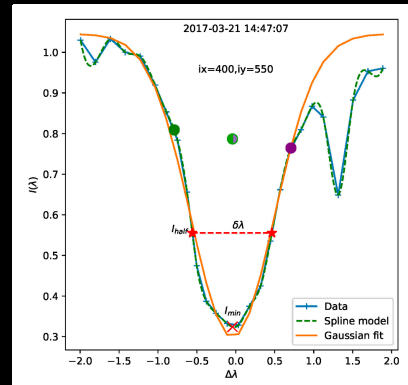
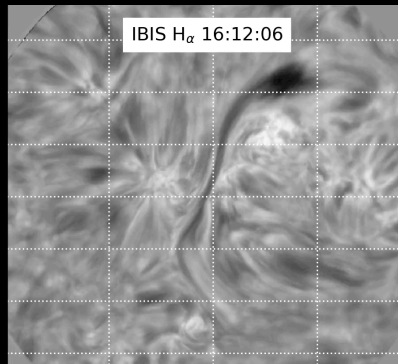
Thank you to Hinode/IRIS coordination. Thank you COs/CP and the organization.



Non-Hinode/IRIS/SDO data discussed

IBIS

- Interferometric Bidi-mensional Spectrometer at Dunn Solar Telescope
- H_{α} (656.3 nm)
- ~ 4.2 s cadence
- ($\sim 90''$) FOV

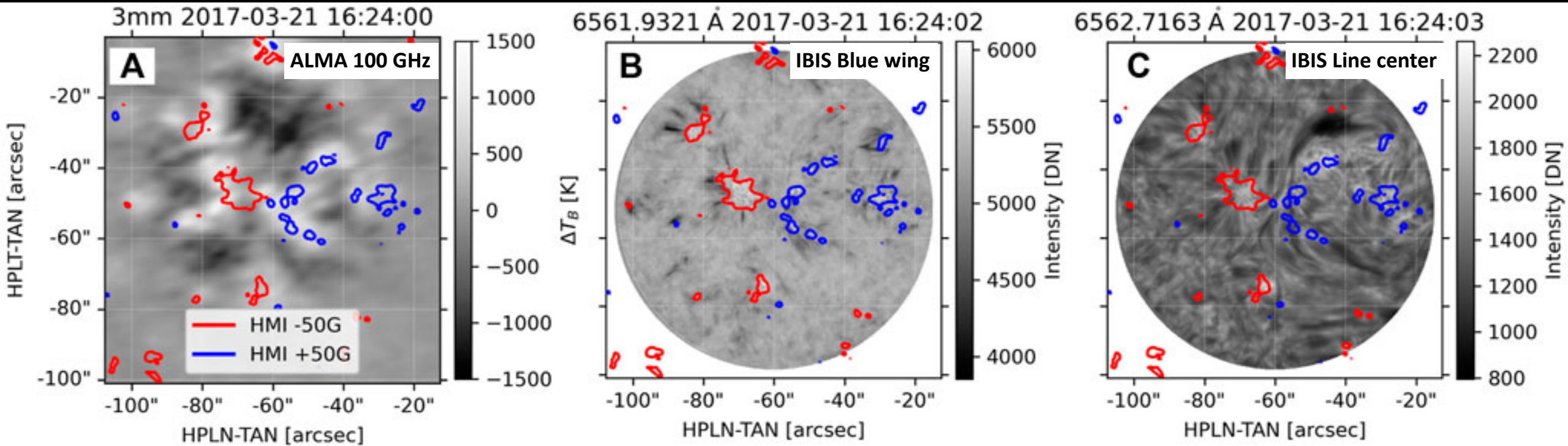


ALMA

- Atacama Large Millimeter Array
- Interferometer in compact configuration
 - 100 GHz, 4'' pixels
- Linear thermometer



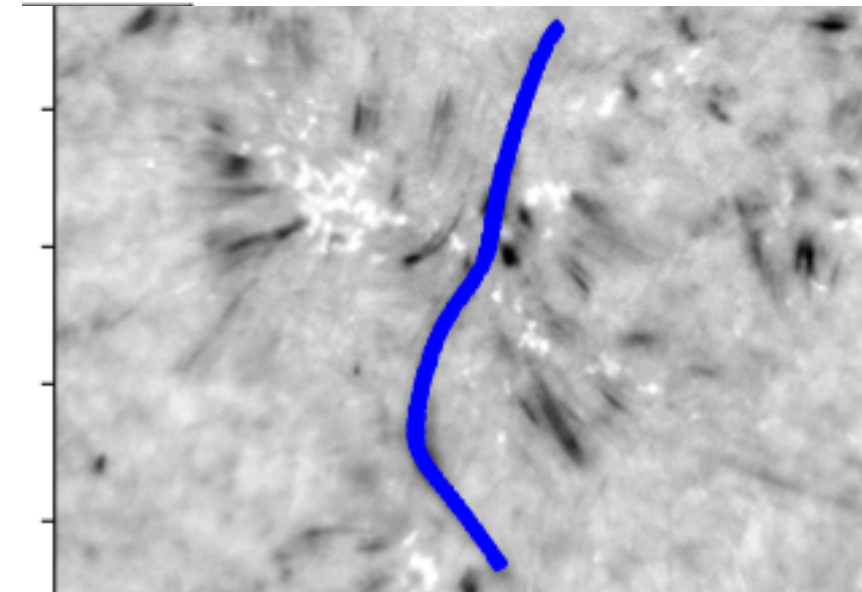
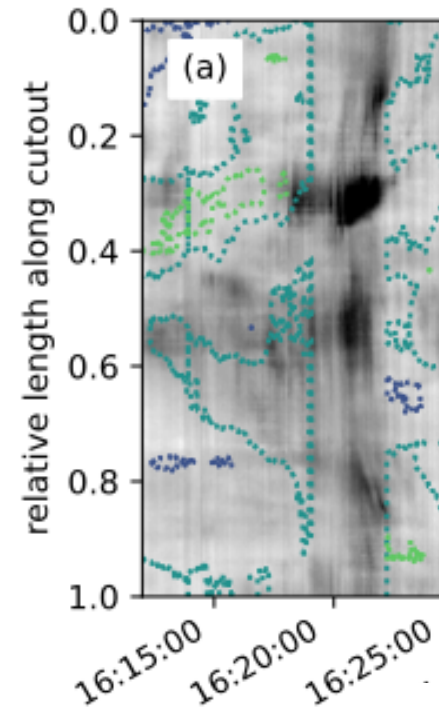
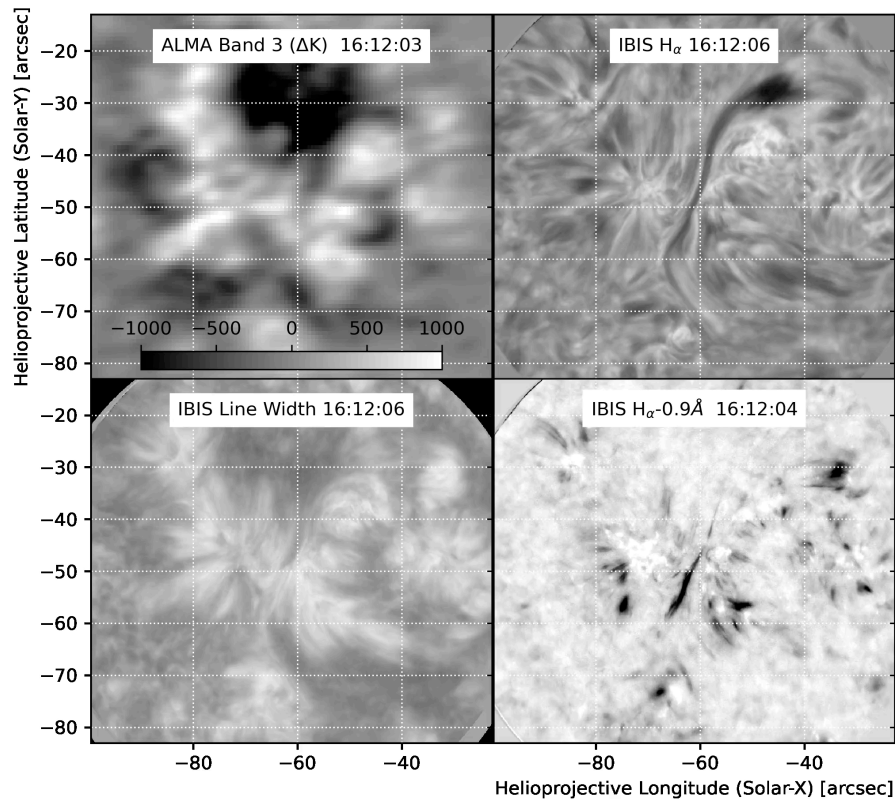
Even for this weak network patch, the upper features follow the magnetic structures until they don't.

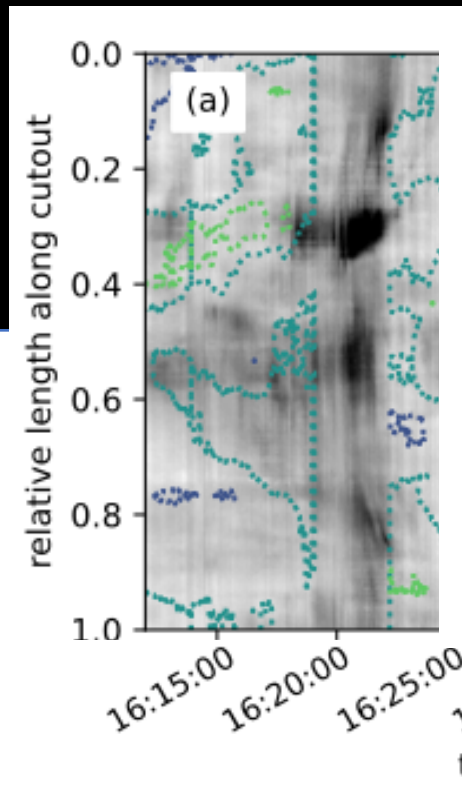
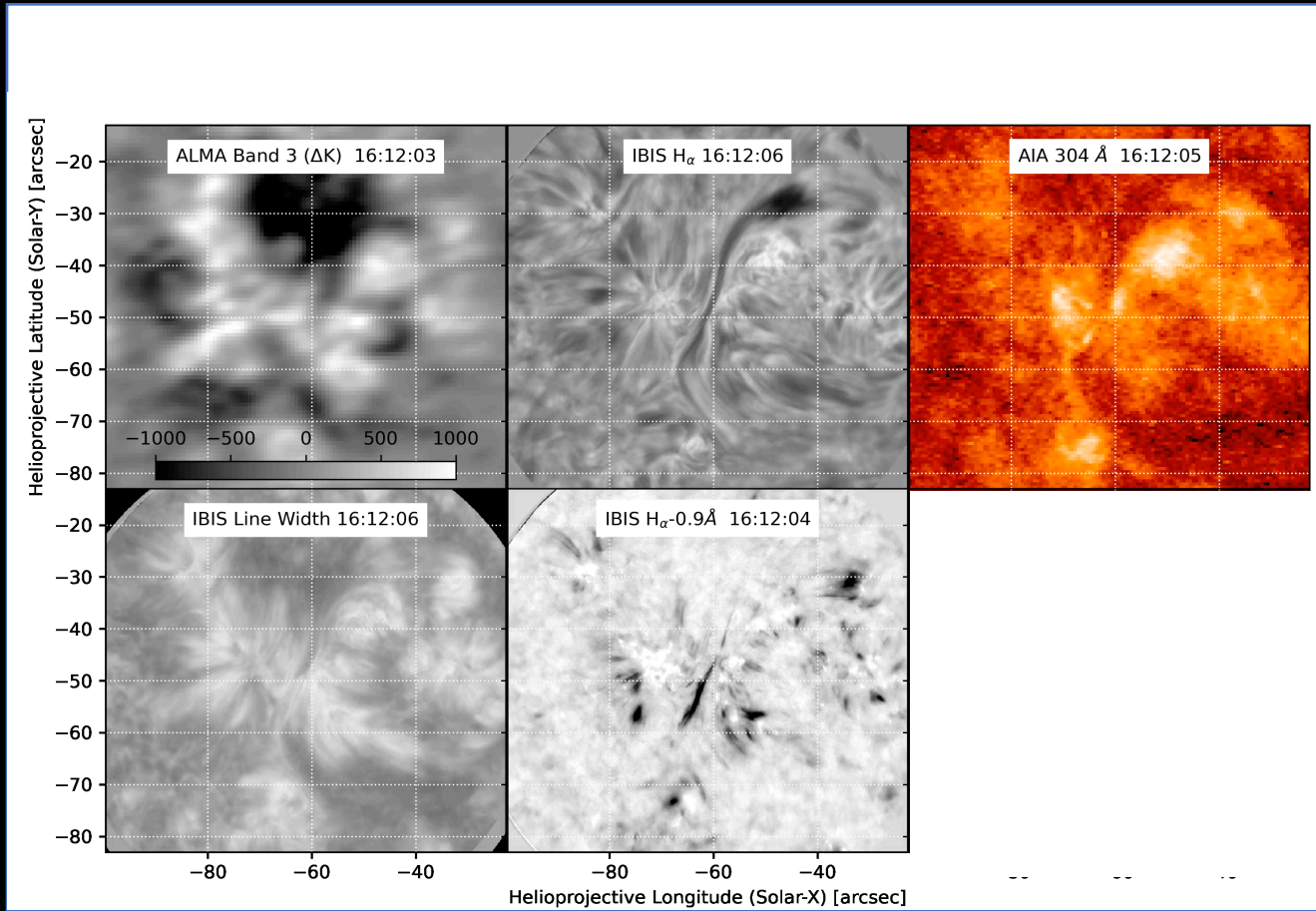


See Lucas Tarr's poster for more info on power spectral analysis of these data.

- (a) the IBIS blue wing with ALMA contours:
- 1) The filament moves outward from the central location bidirectionally.
 - 2) It is visible as a heating in ALMA before a blue shift in IBIS.

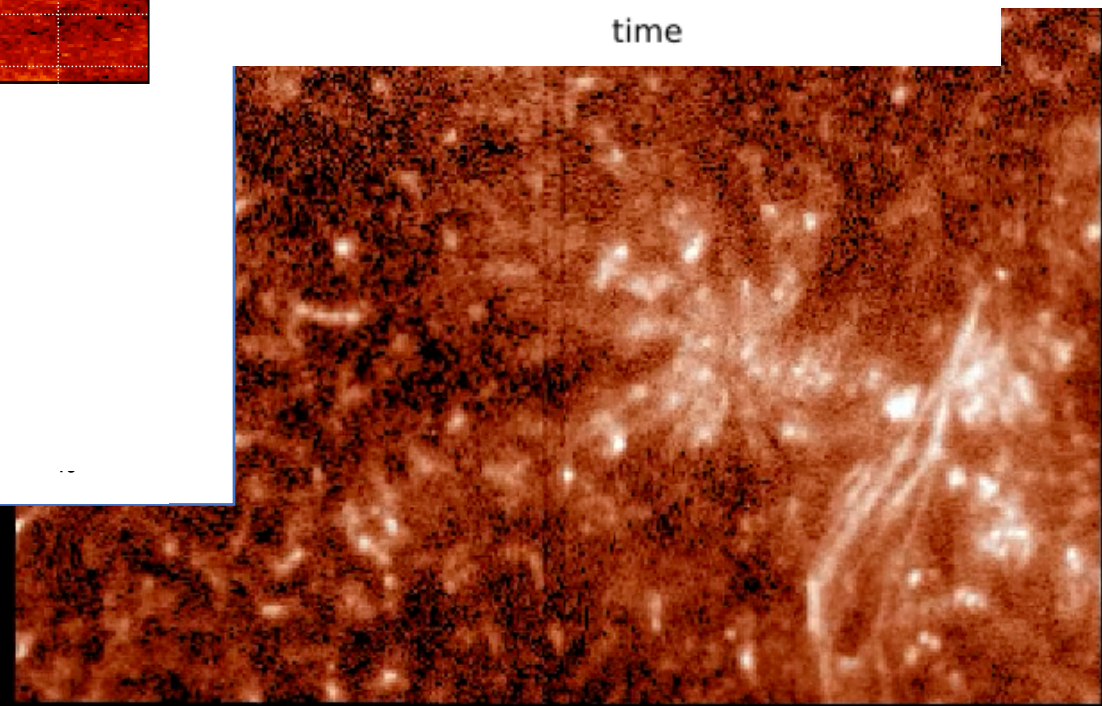
Lets make a stack plot along the filament

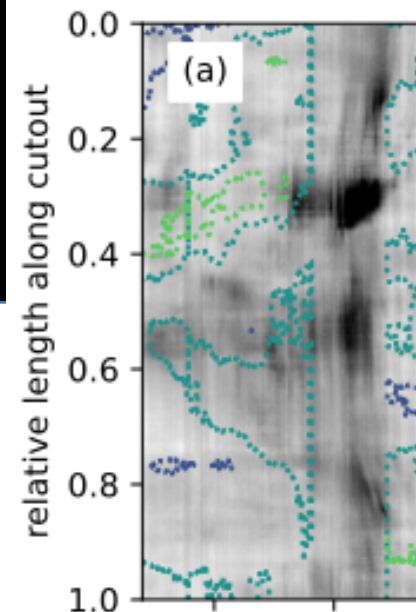
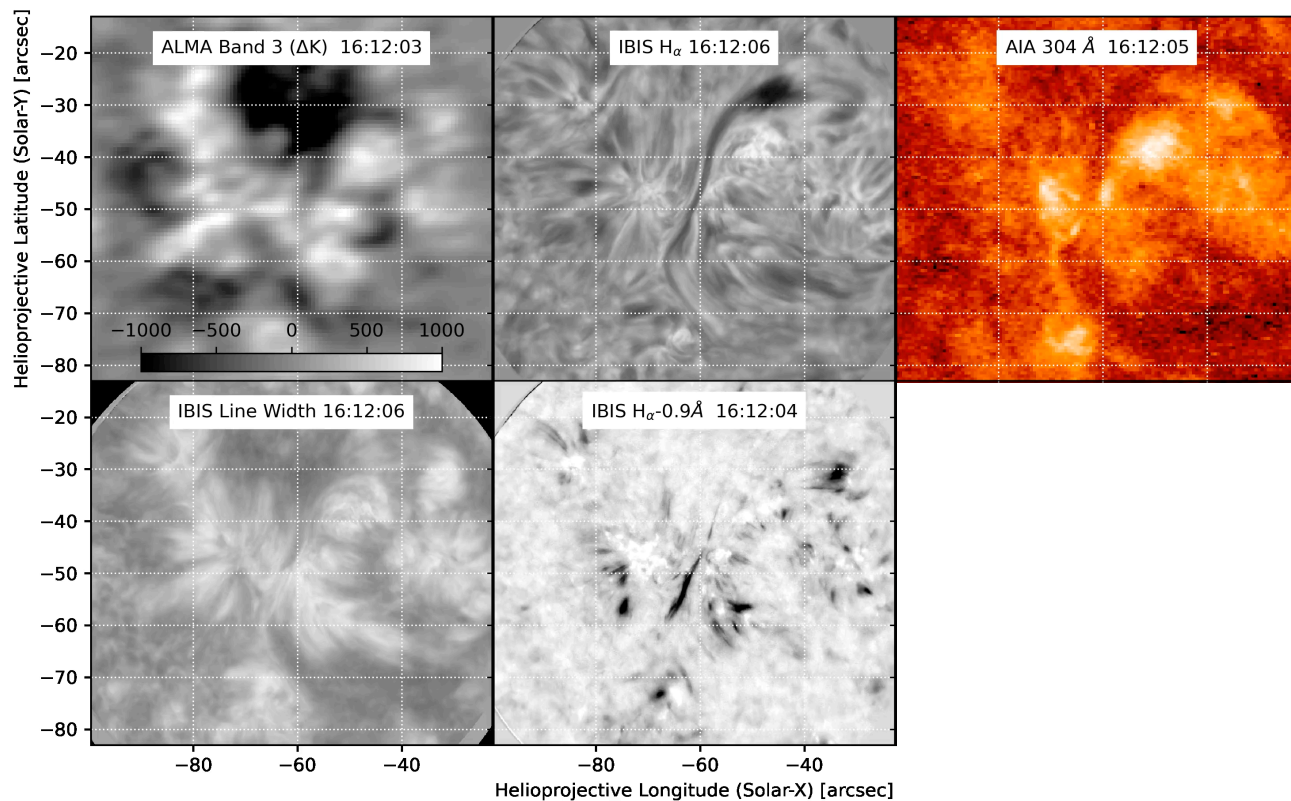




(a) the IBIS blue wing with ALMA contours: The filament moves outward from the central location bidirectionally. It is visible as a heating in ALMA before (16:15) a blue shift in IBIS (16:20).

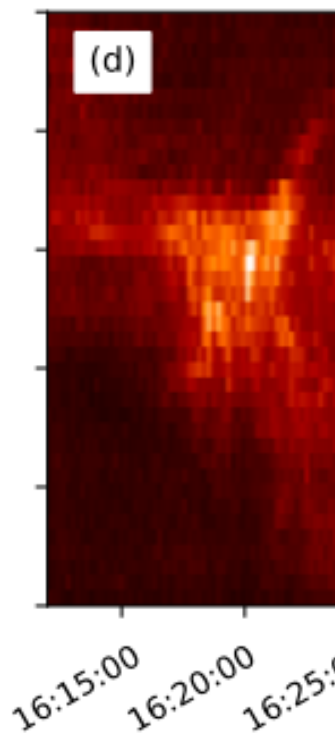
IRIS1400 see this motion begin at 16:17



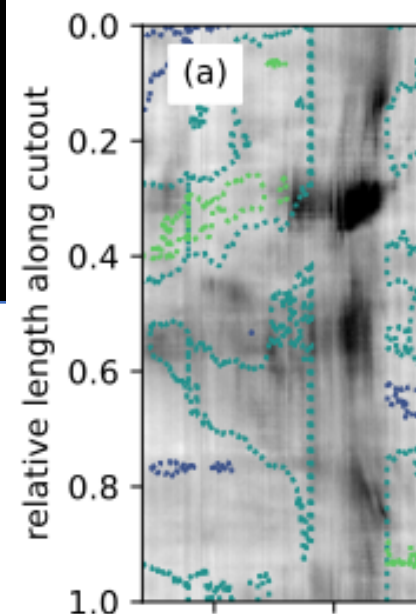
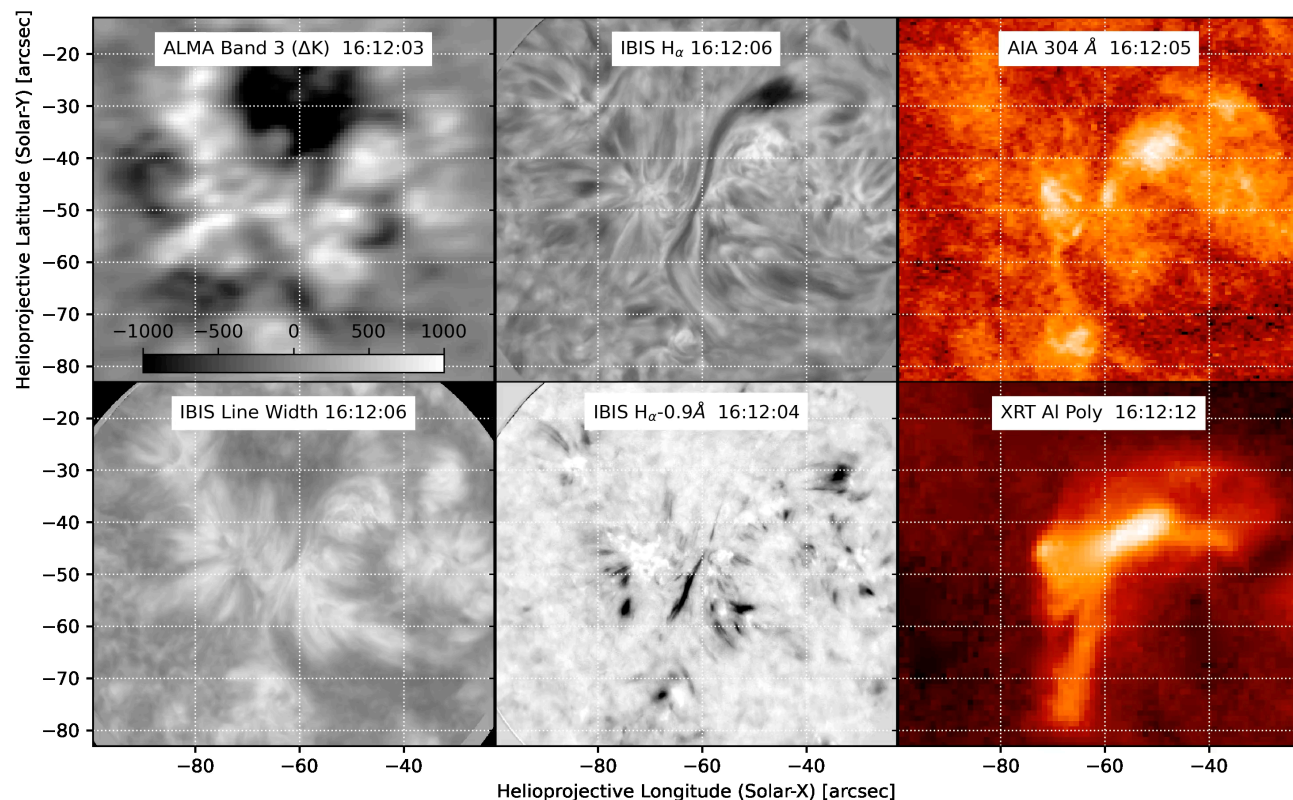


(a) the IBIS blue wing with ALMA contours: The filament moves outward from the central location bidirectionally. It is visible as a heating in ALMA before (16:15) a blue shift in IBIS (16:20).

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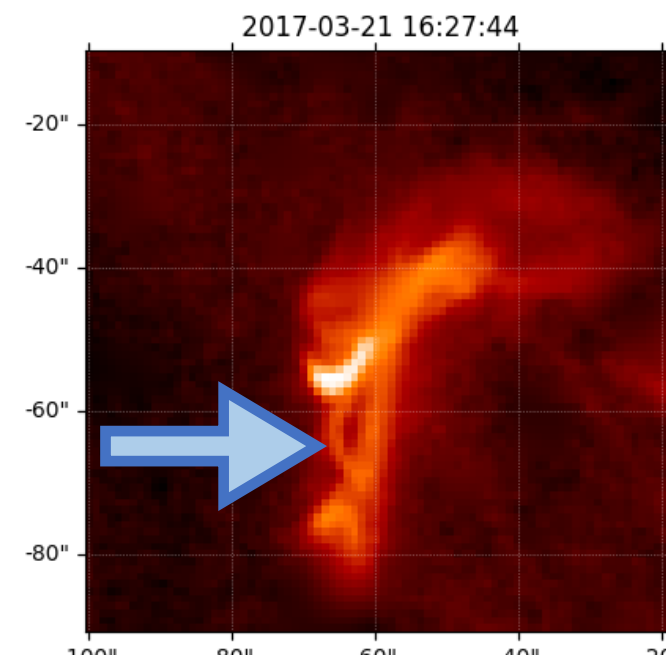
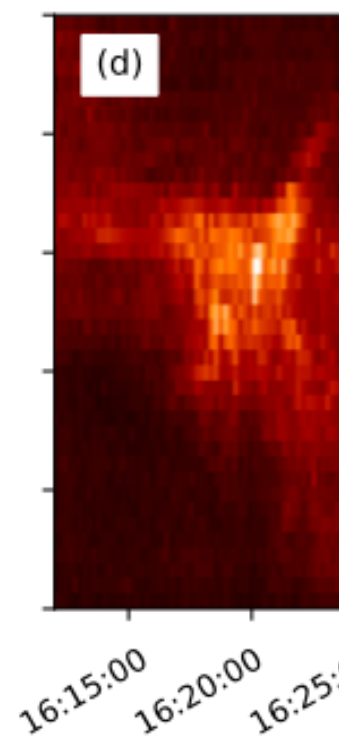
(d) Followed by a similar movement in 304 (~16:20)



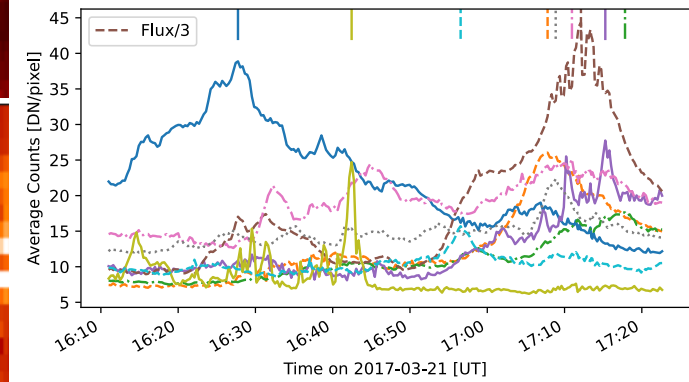
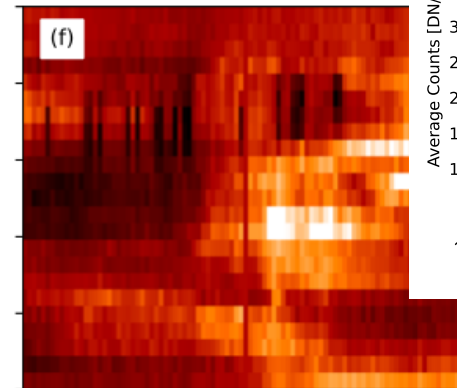
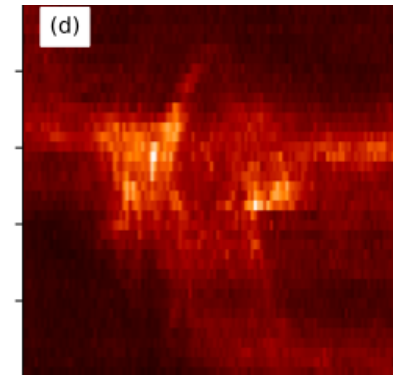
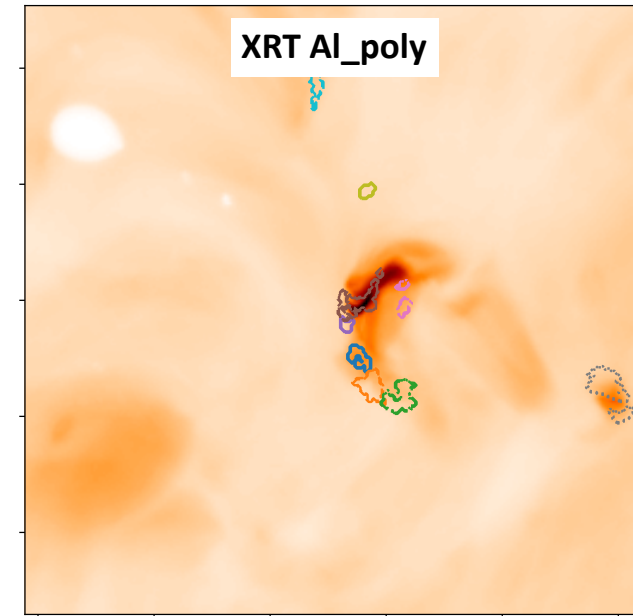
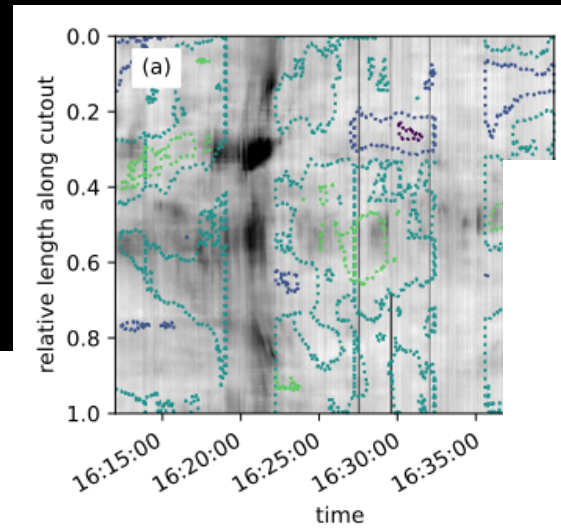
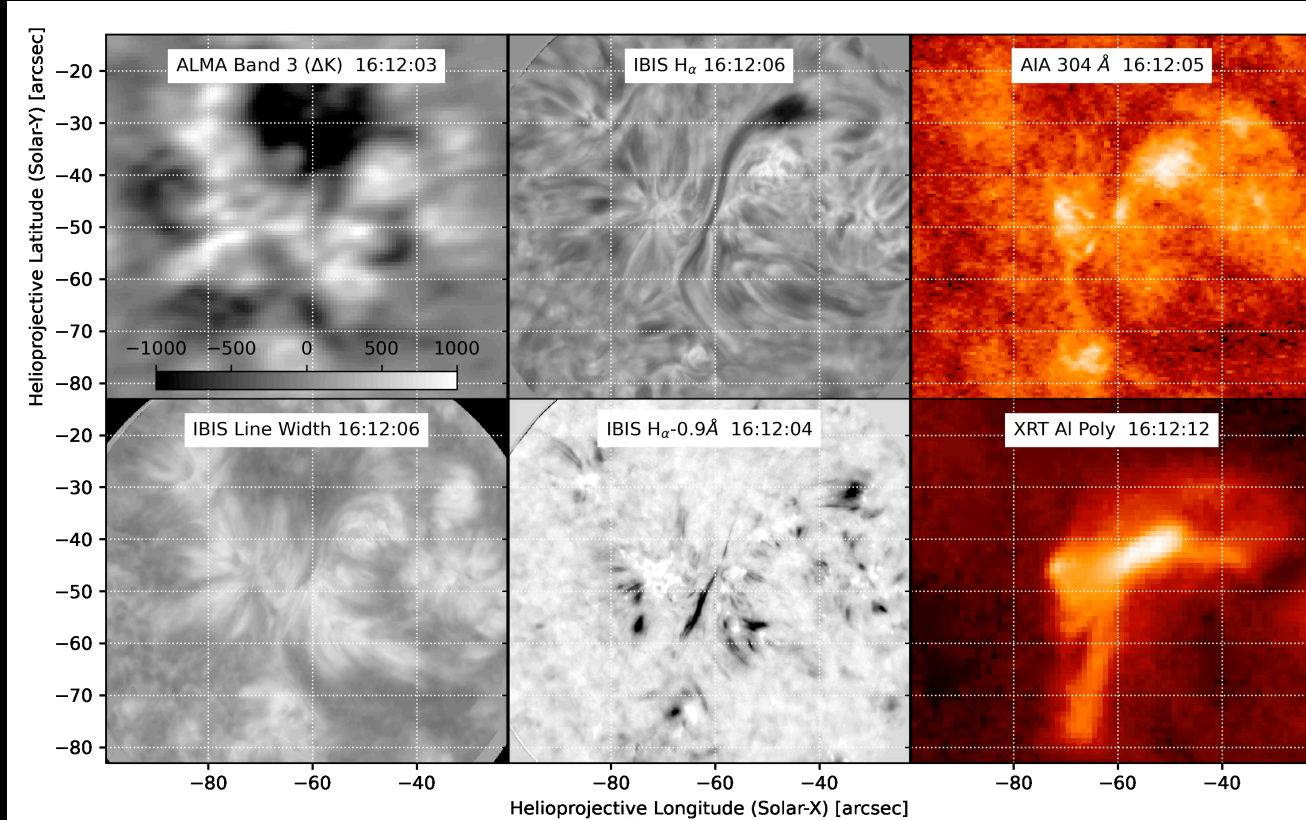
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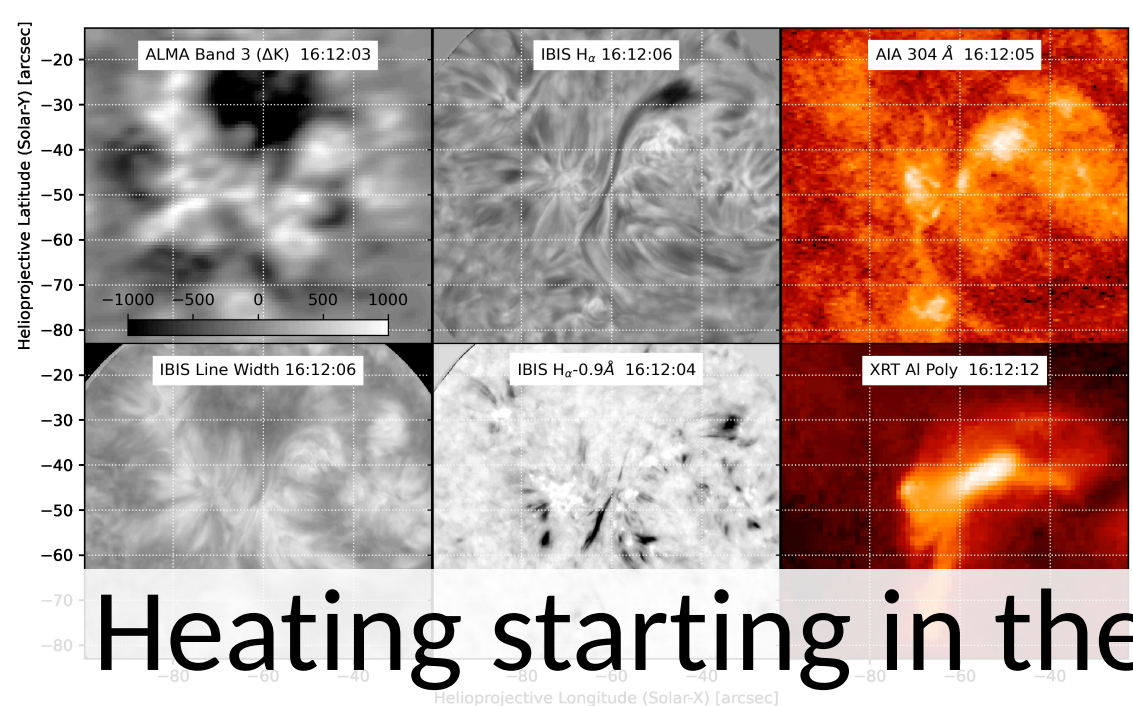
IRIS1400 see this motion begin at 16:17

(d) Followed by a similar movement in 304
XRT filament brightens minutes later

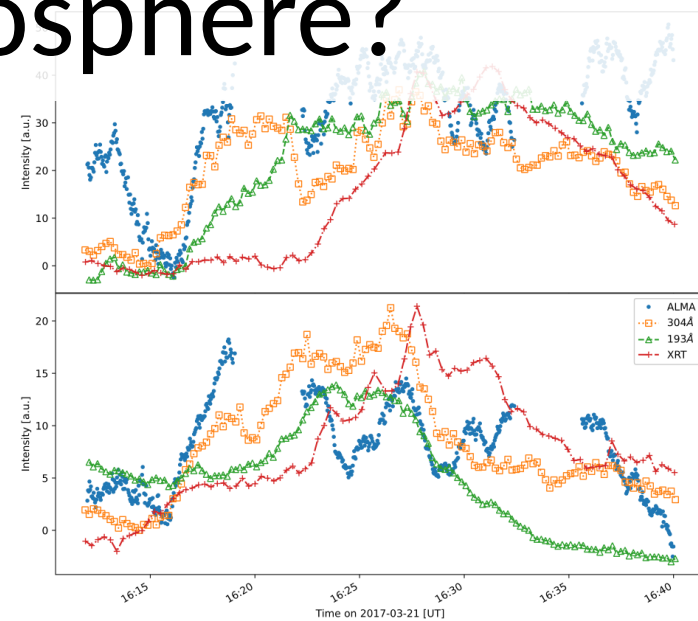
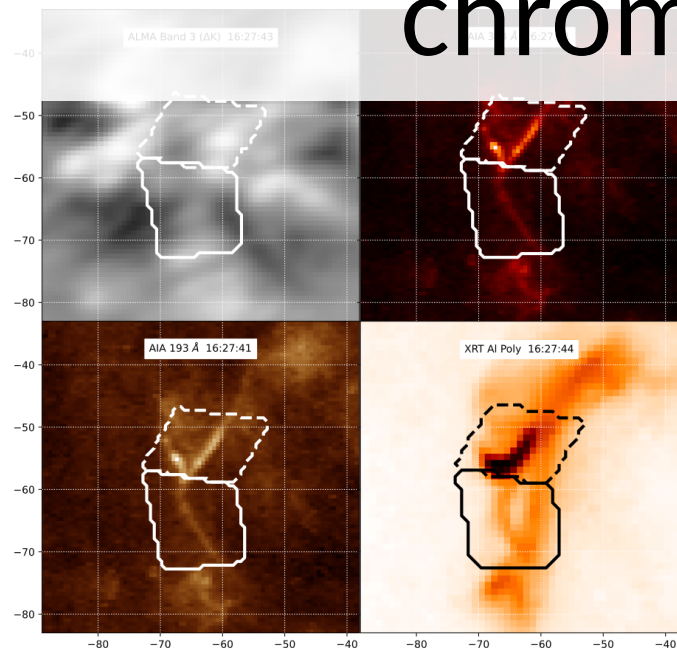


small transients involve the entire atmosphere





Heating starting in the chromosphere?



Thank you.

- Co-aligned data set is ready for you to use (links in Kobelski+2022 and Tarr+2023)
- Even small events can be traced throughout the entire atmosphere
- **Chromospheric signature in transients is not just evaporation/ablation/ribbons**
- We continue to need coordinated observations throughout the atmosphere
 - More chromospheric diagnostics will only help