Joint SDO/AIA and IRIS Observations of Propagating Coronal Disturbances

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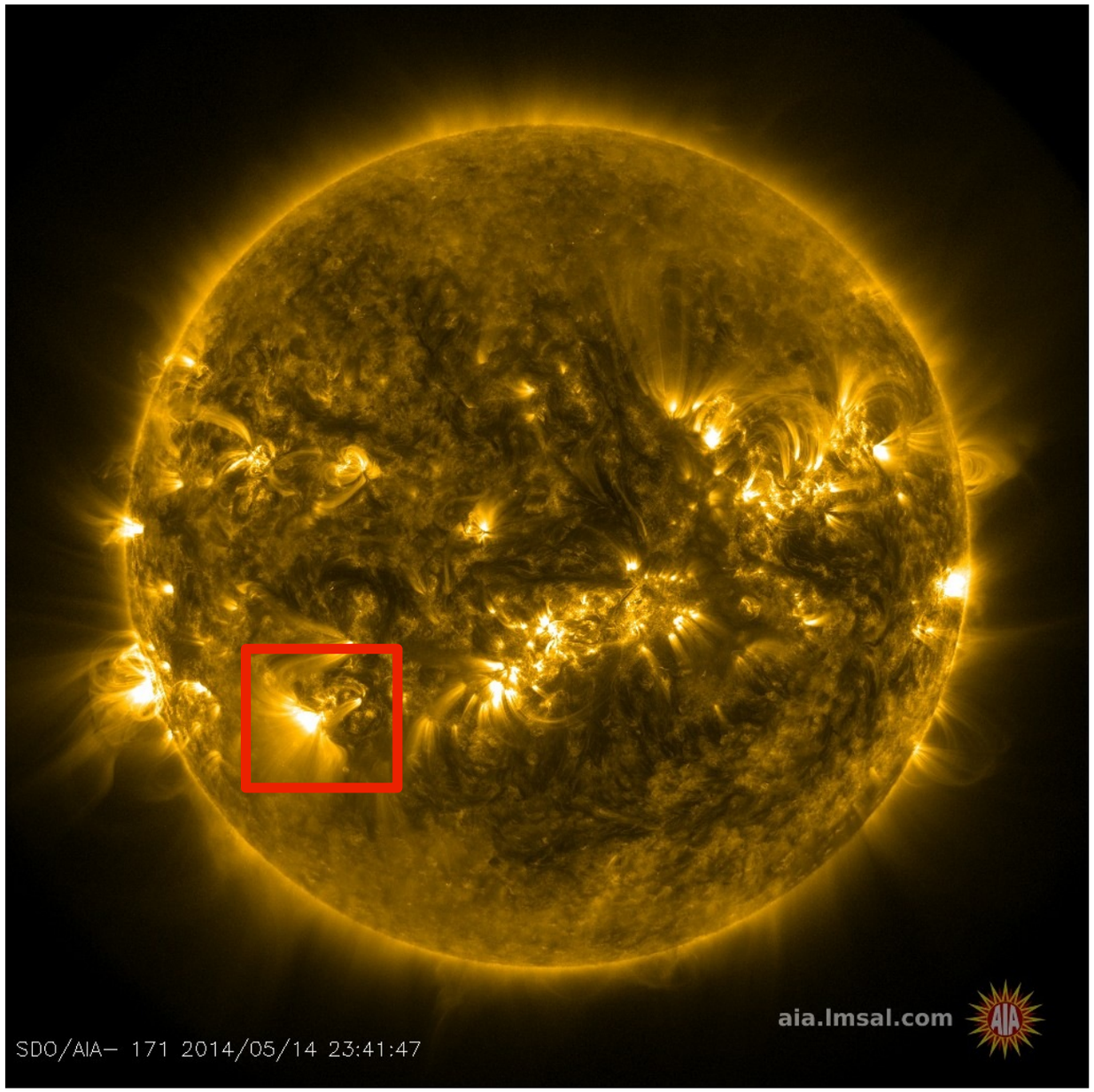
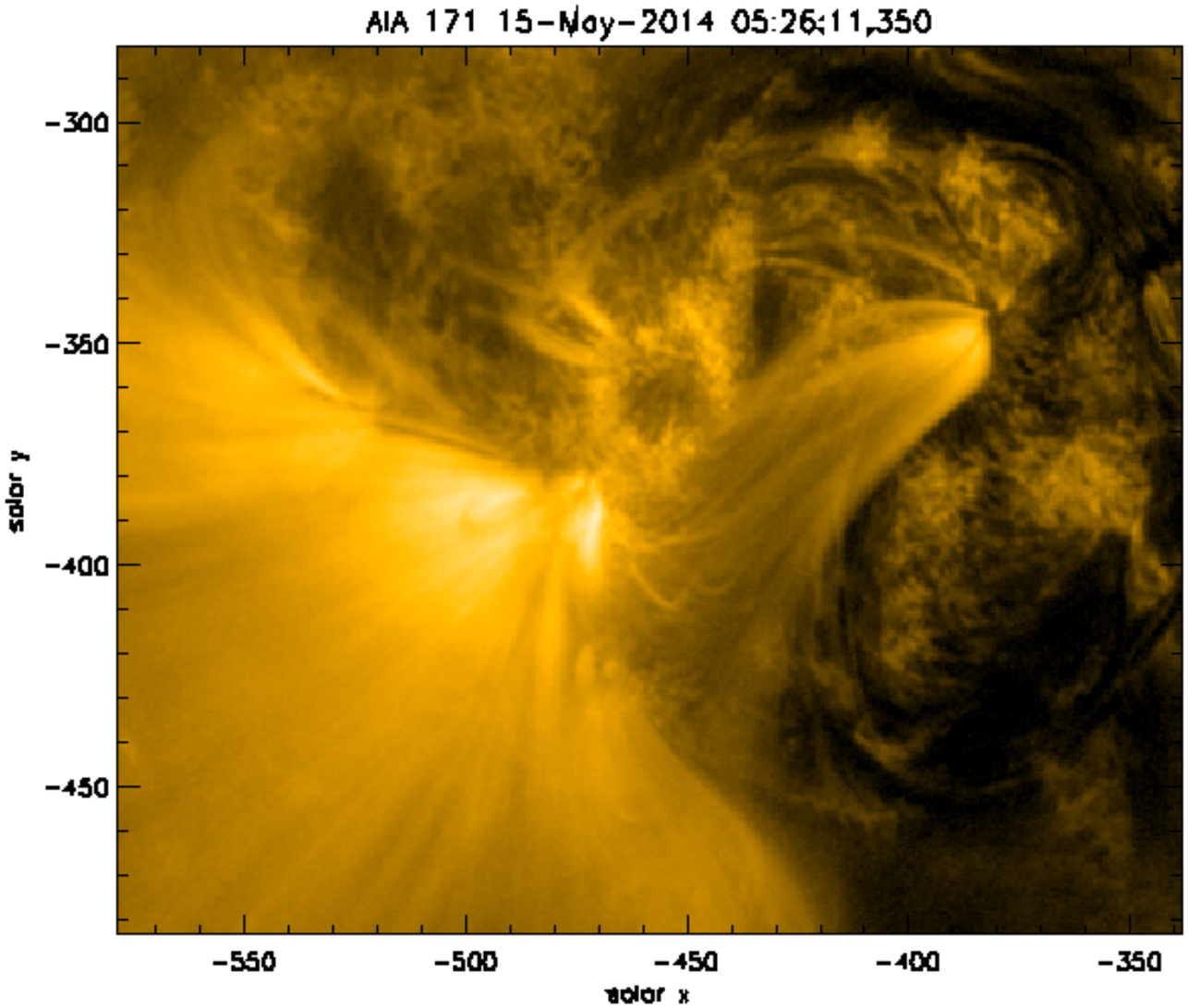
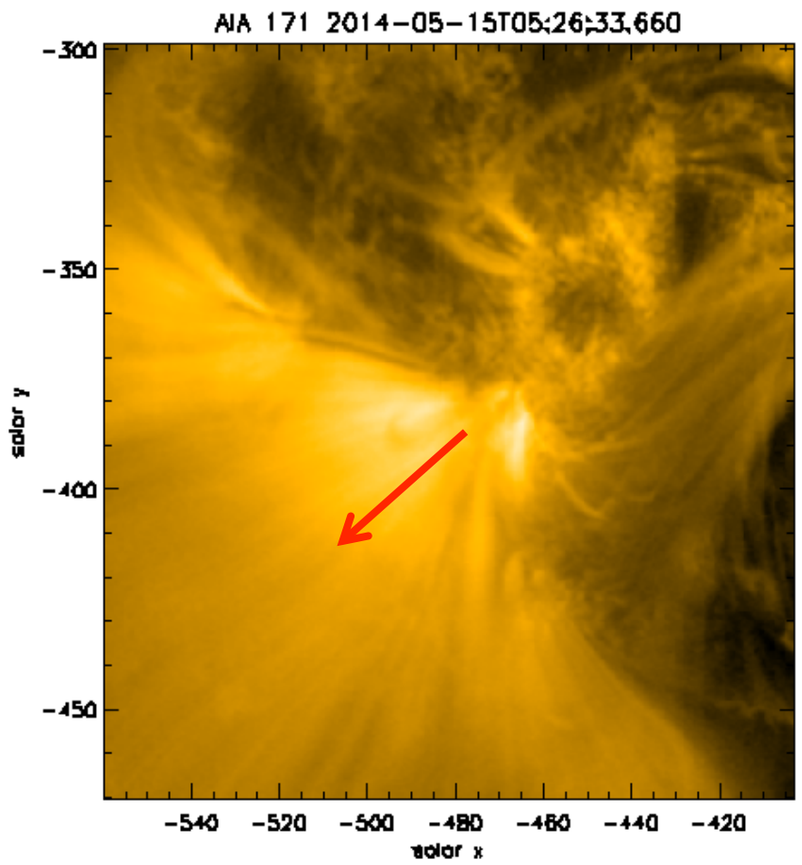
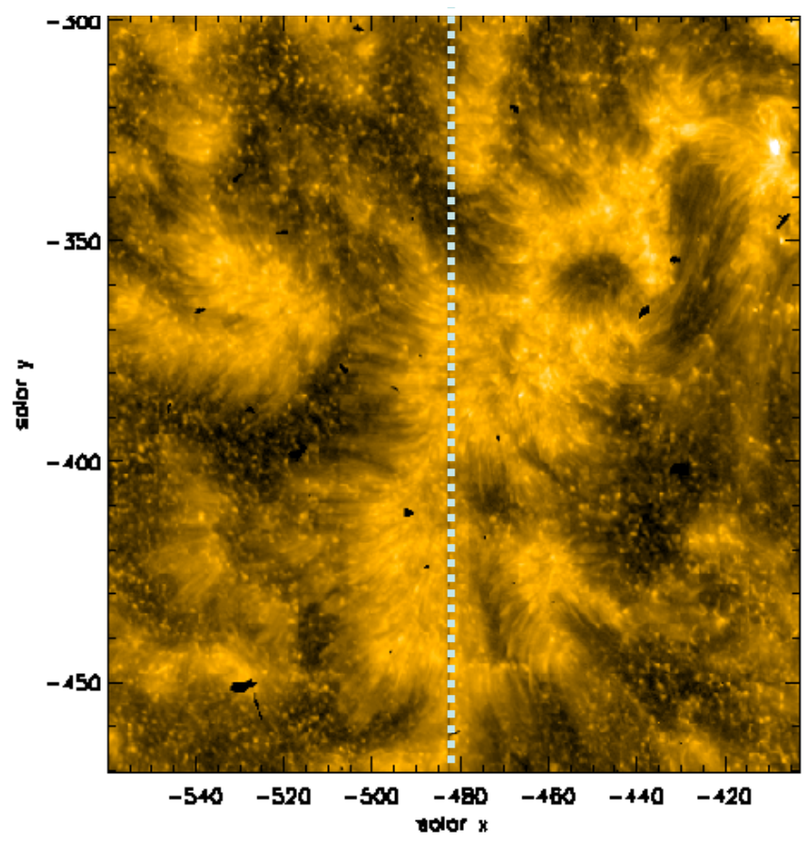
AIA 171 – 15/05/2014

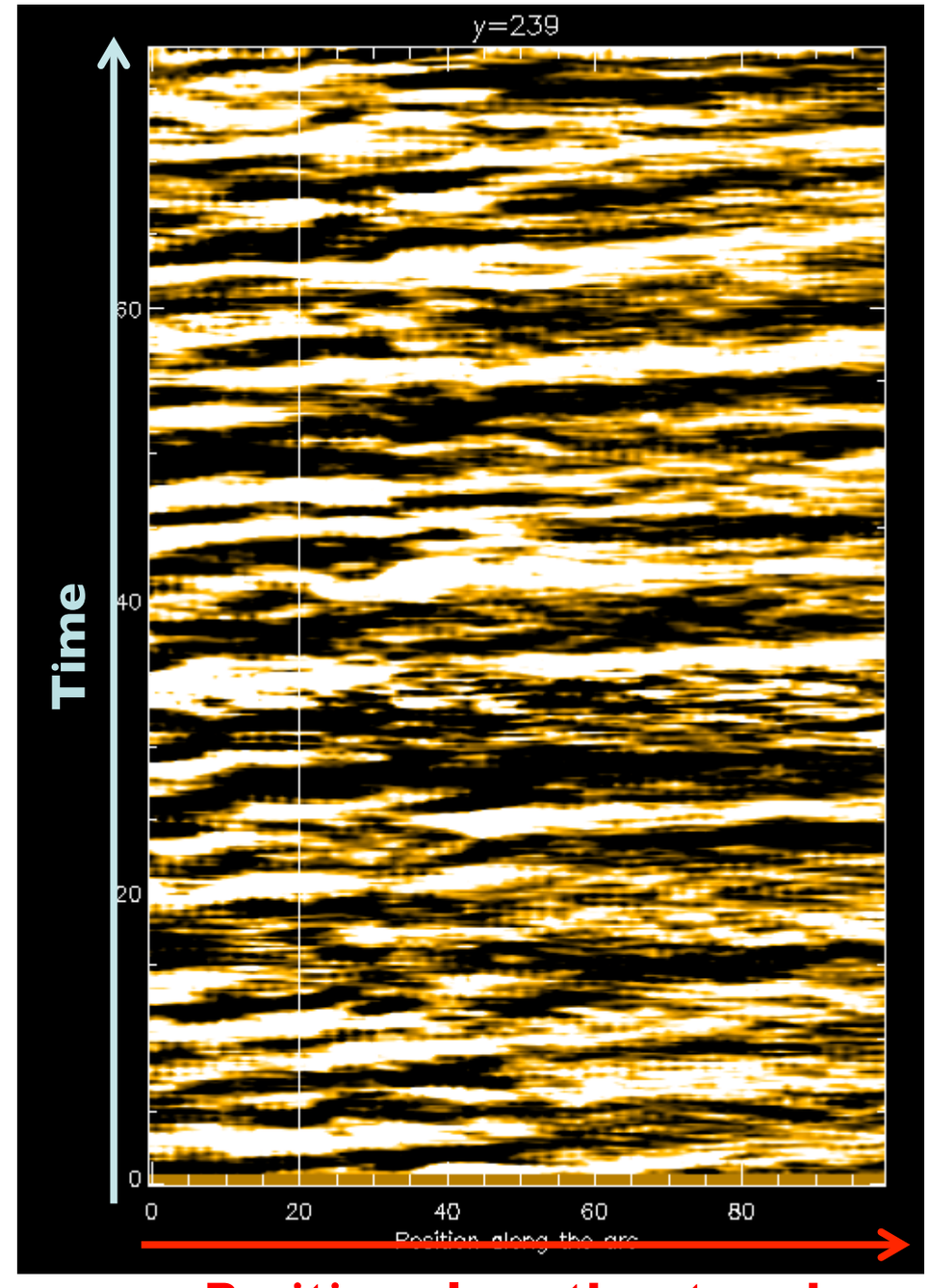




Observational Data



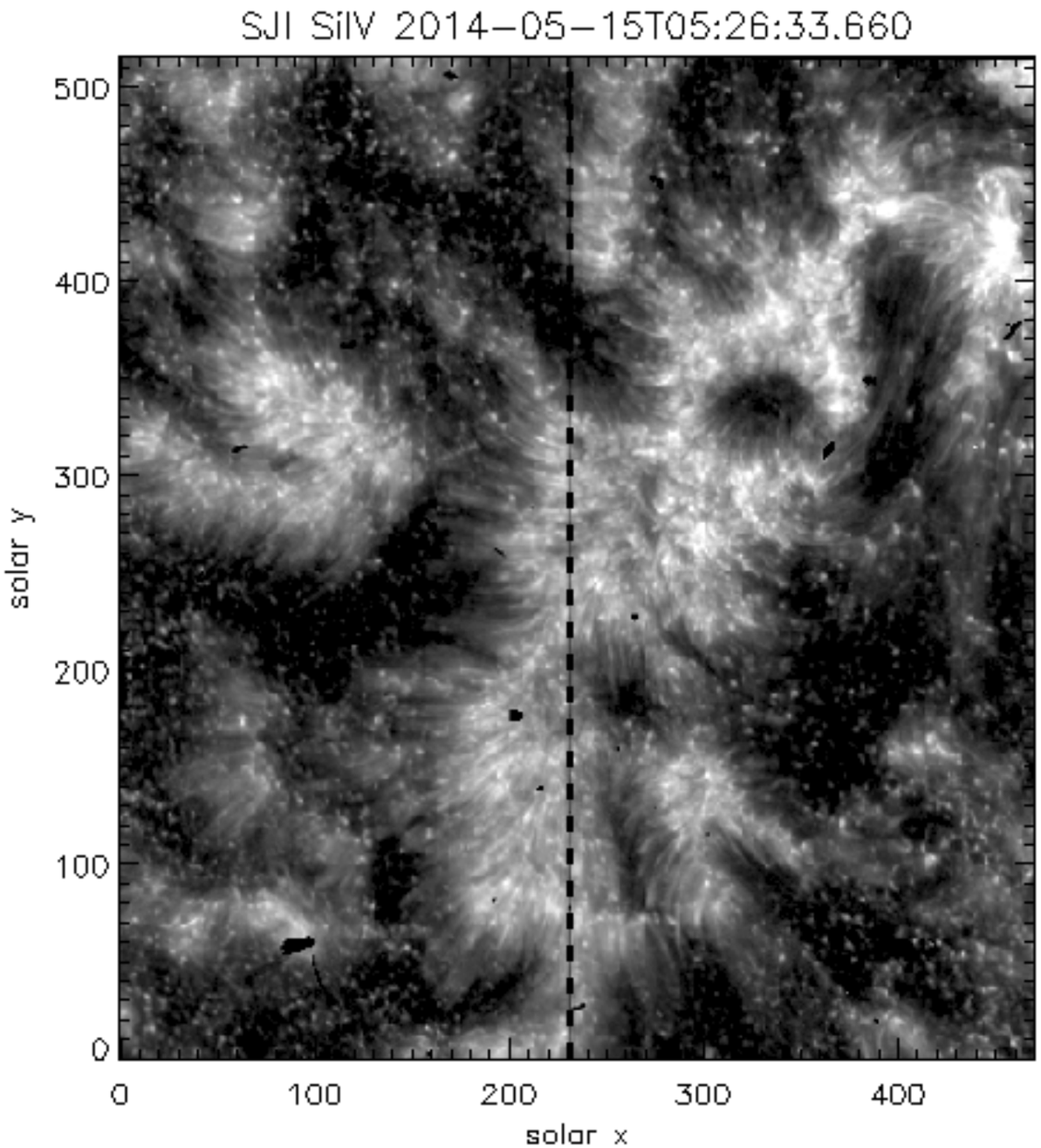




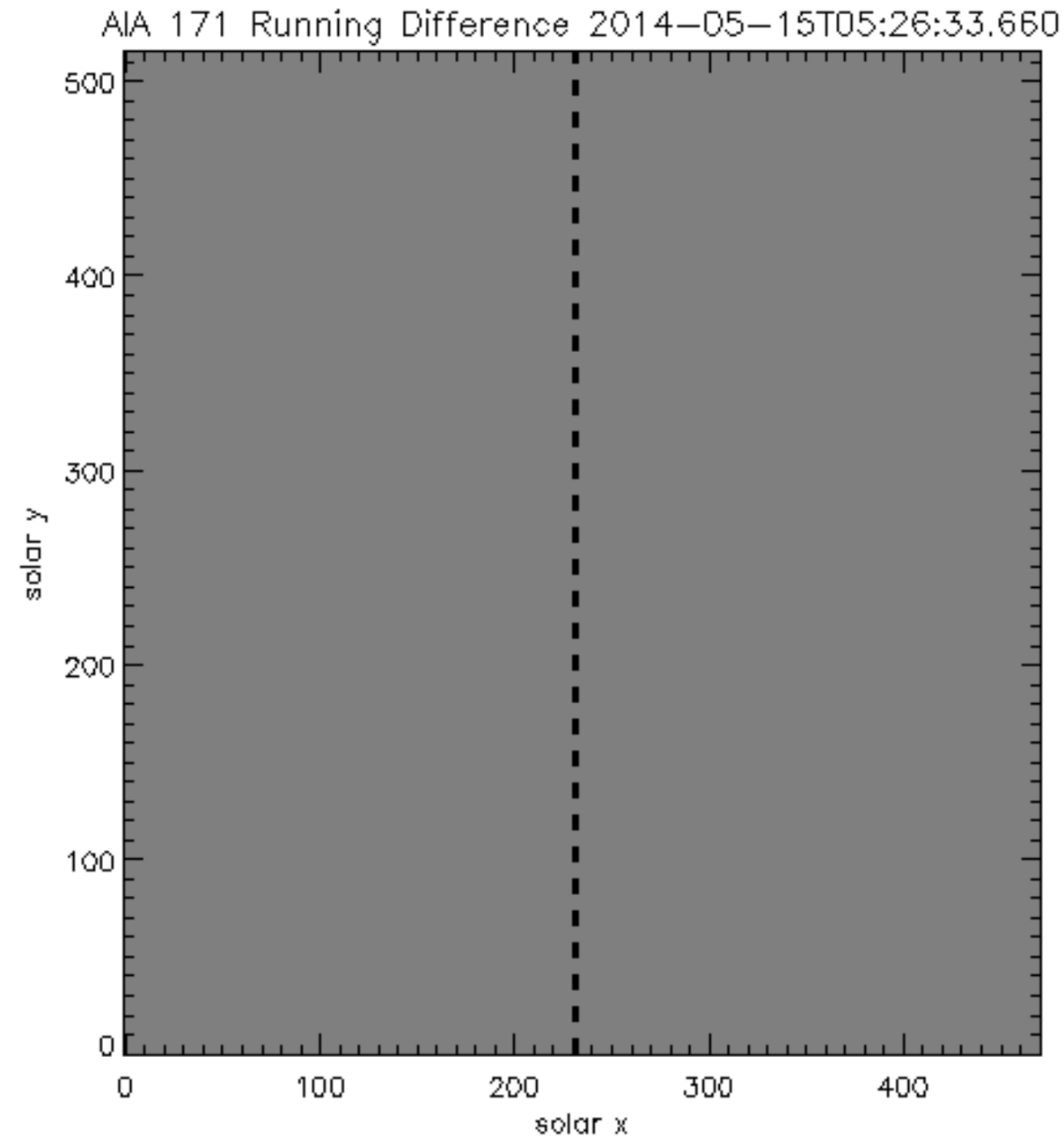
Position along the strand

- Data taken on 15/05/2014 – sequence nearly 80 mins
- Data have been aligned (using AIA 1600) and interpolated to the SJI resolution and cadence (~9.35 sec).
- IRIS Mg IIh (5,000 - 20,000 K) and Si IV (100,000K)
- Look at perturbations travelling along the strands (**Propagating Coronal Disturbances – PCDs**)

IRIS Slit-Jaw-Images (SJI) & AIA 171



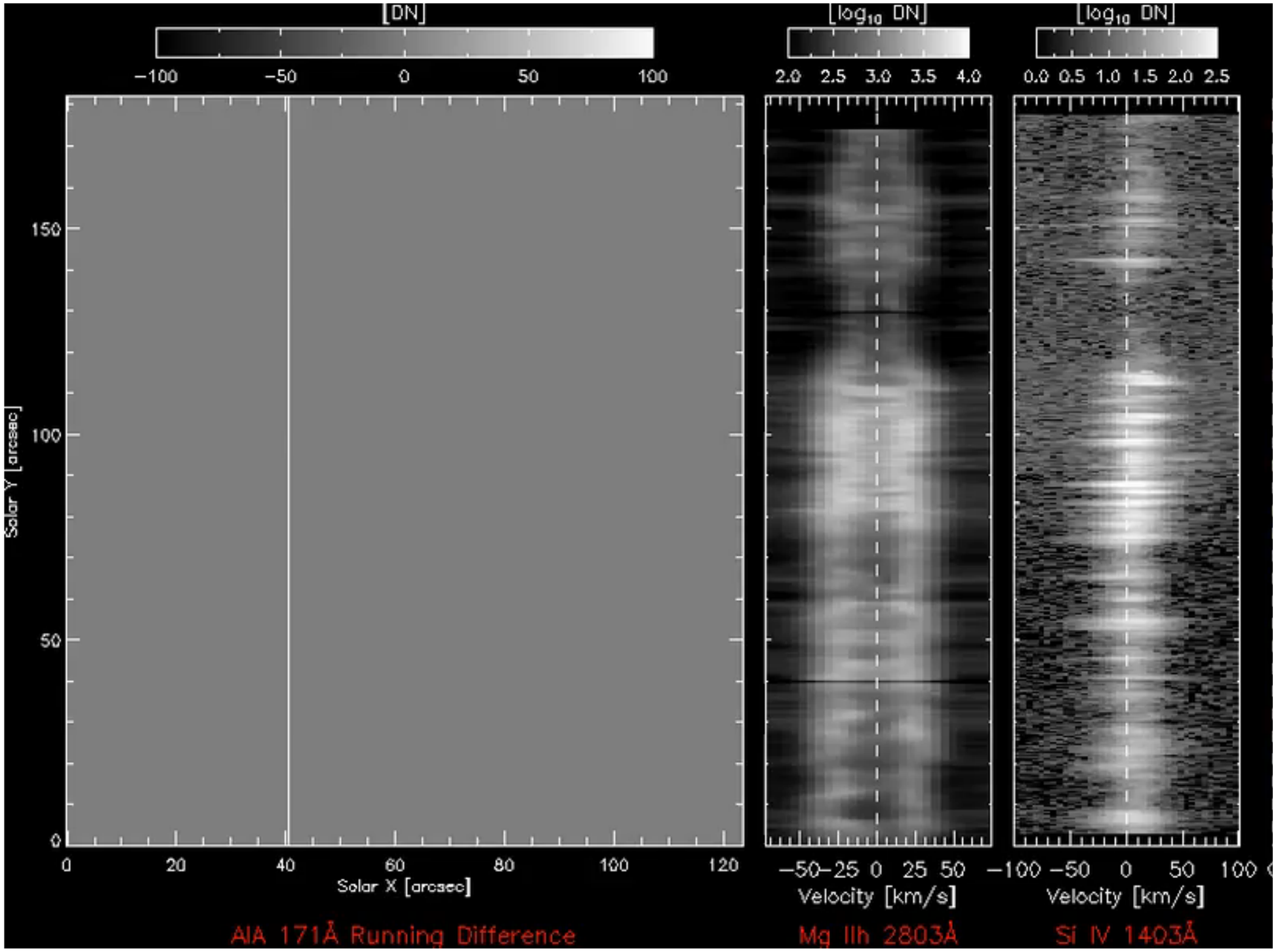
IRIS SJI Si IV



AIA 171 Running Difference

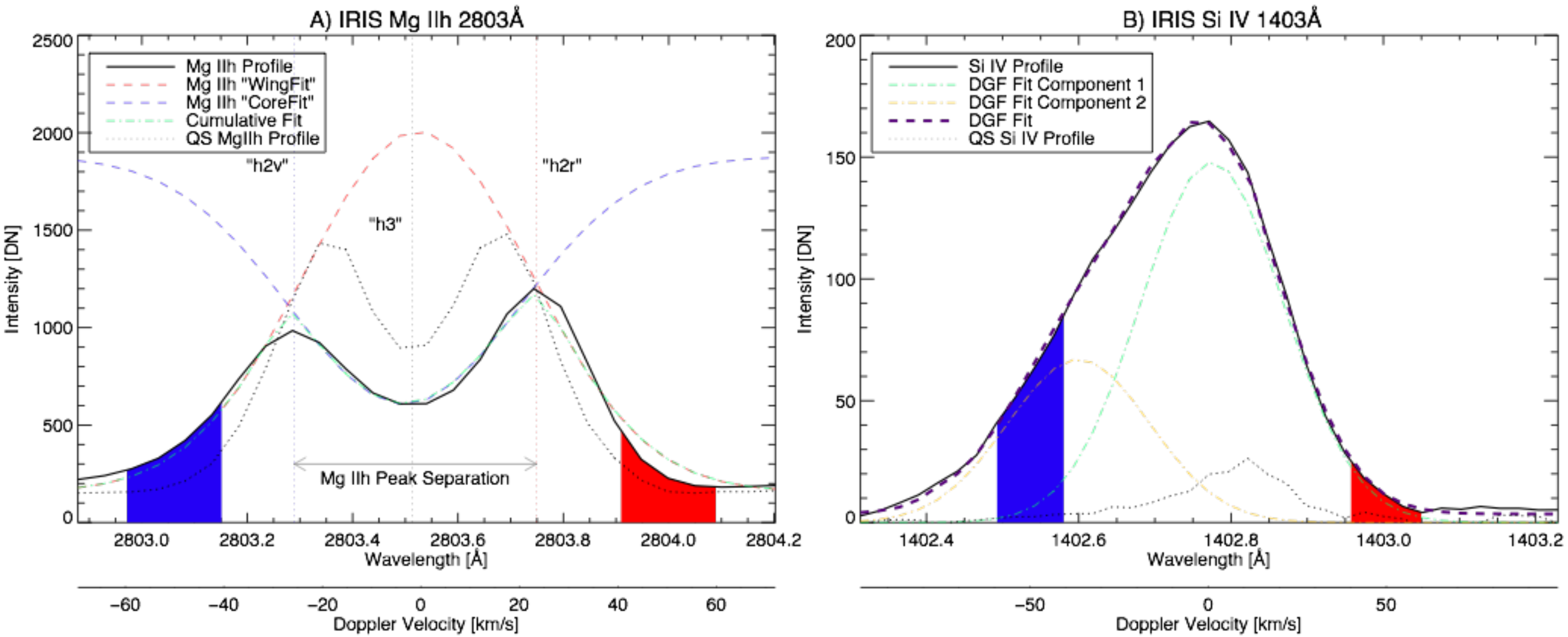
- Continuous outwards movement visible in the AIA 171 running difference
- Similar small scale outward motions visible in SJI sequence (but also inward)

AIA 171 & IRIS MgIIh – Si IV



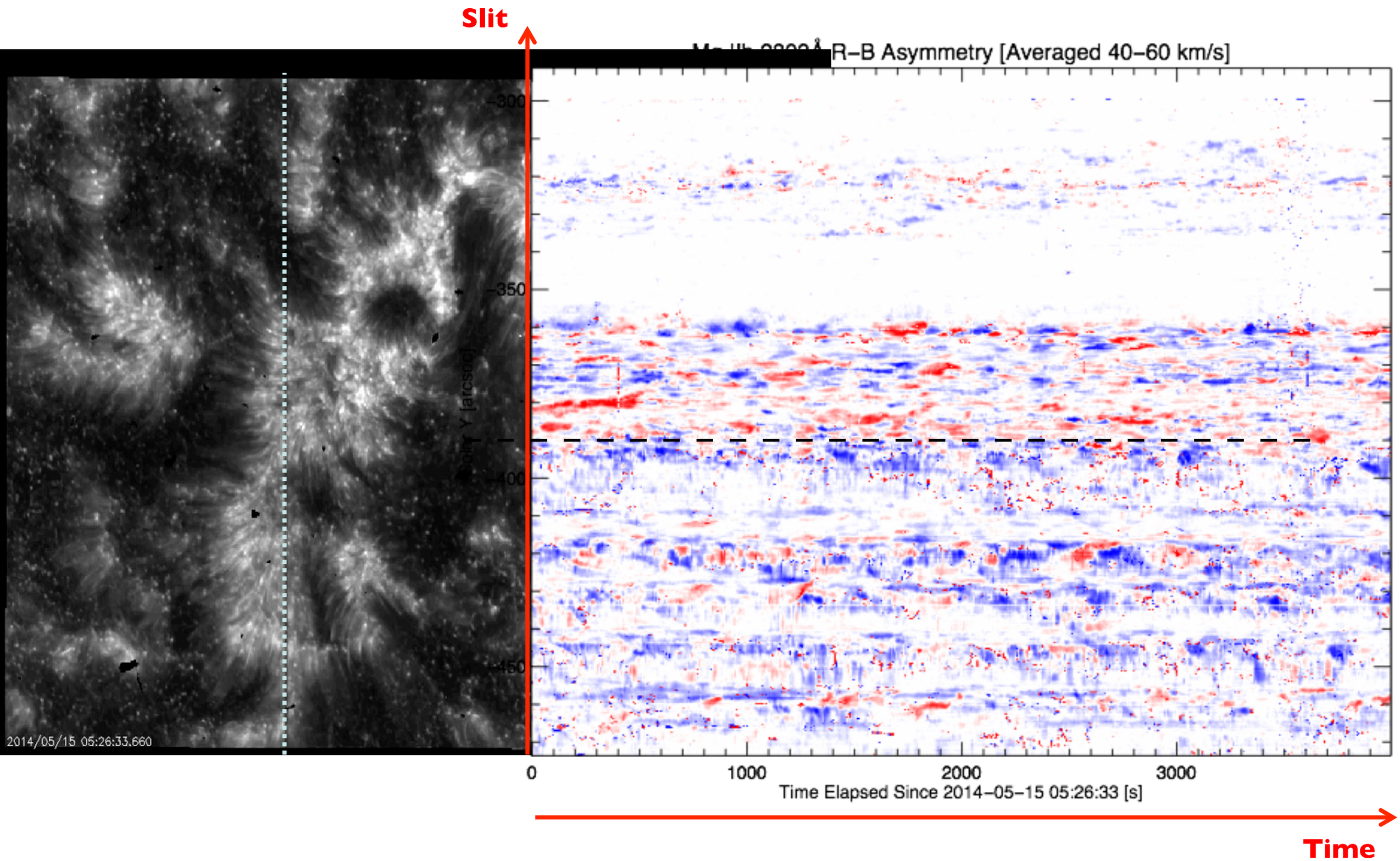
- PCDs clearly visible in the AIA 171 running difference sequence
- Continuous rapid events in MgIIh and Si IV
  - Can we connect these events?

“Typical” IRIS Magnetic Footpoint Spectra



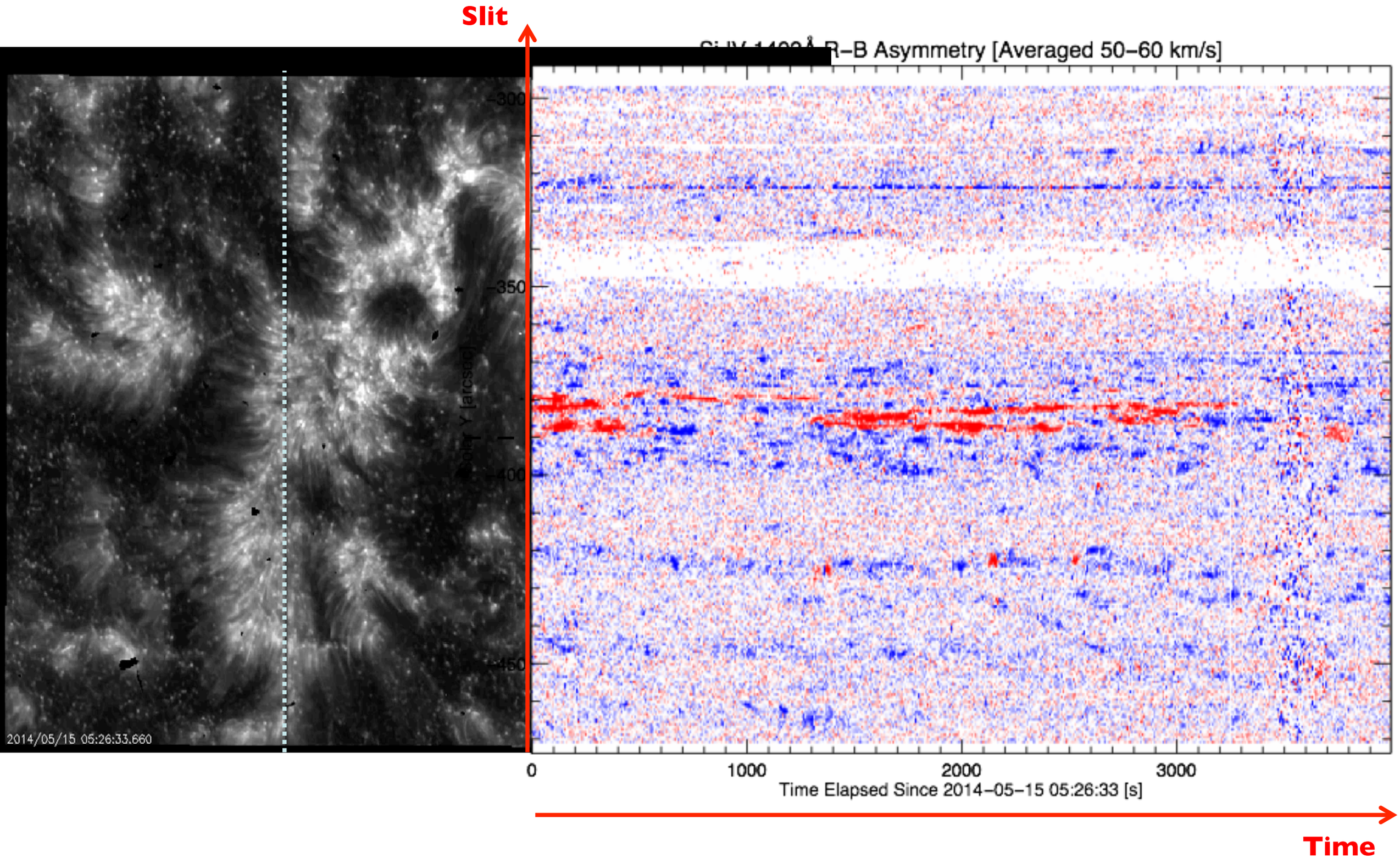
- Excess emission in the blue wing of the spectral line
  - ➢ Measure as Red-Blue (RB) asymmetry
- Asymmetry often present in both spectral lines.

Asymmetric Component: Mg IIh

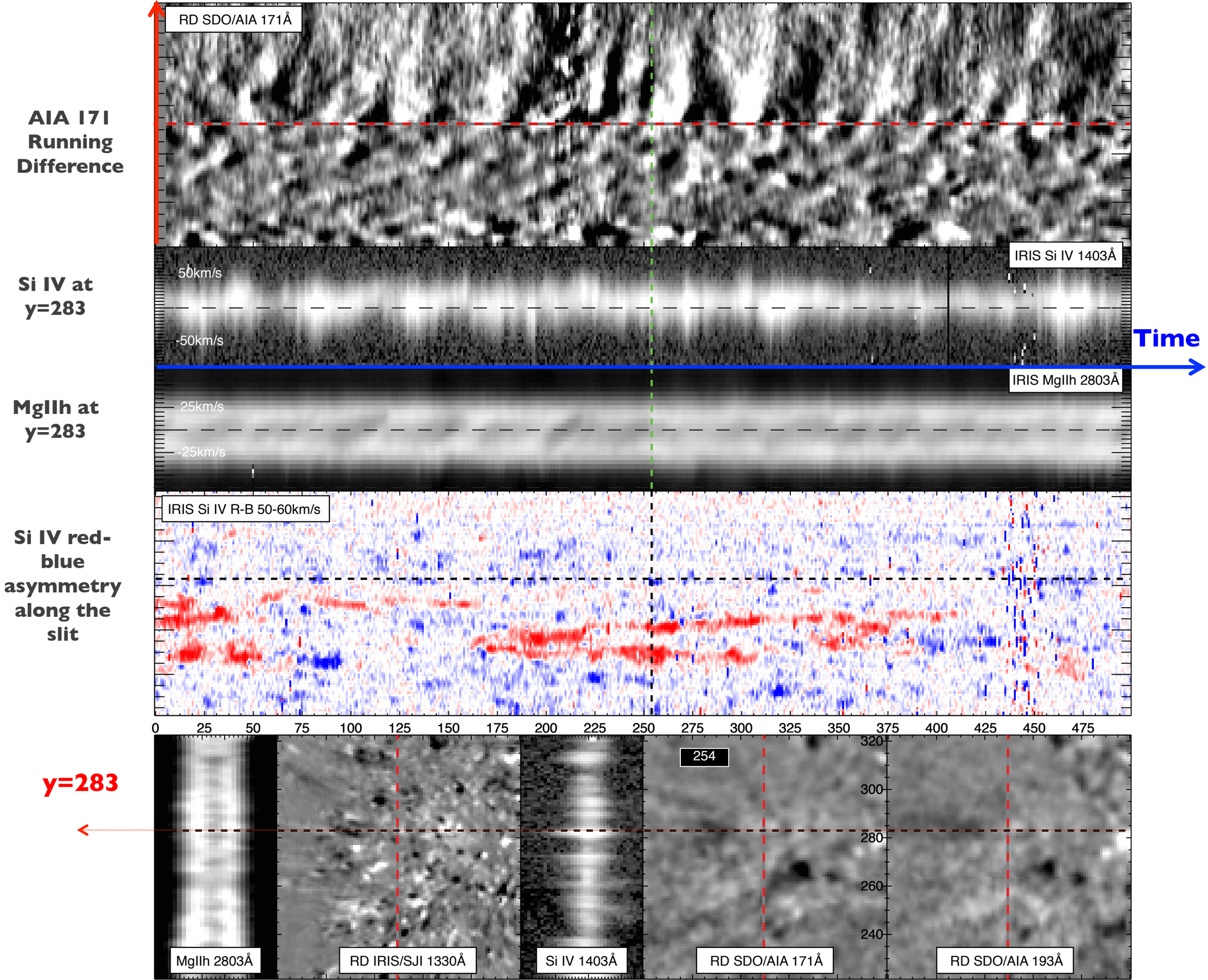


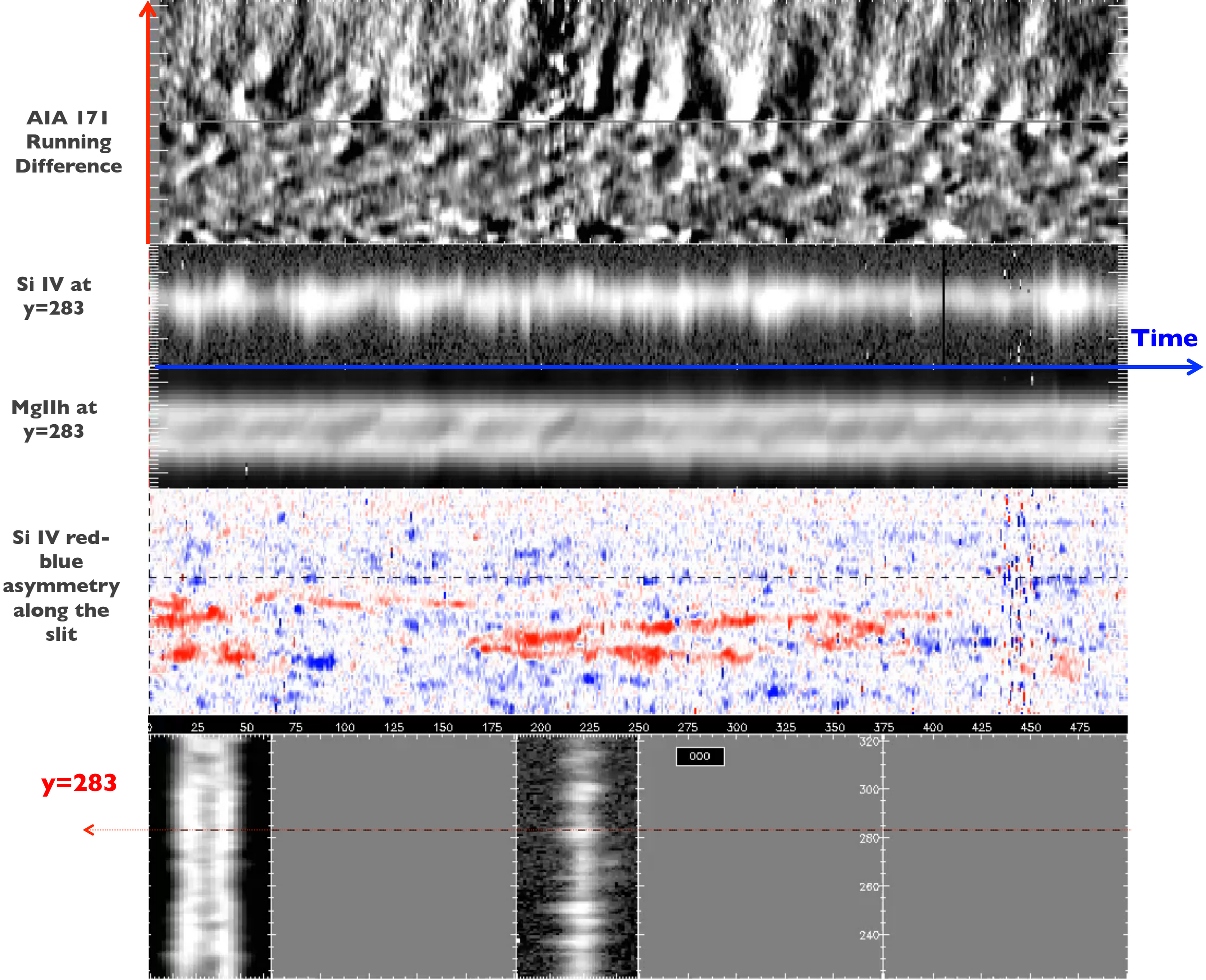
- Spectra display strong upflows (blue asymmetry) in both spectral lines.

Asymmetric Component: Si IV

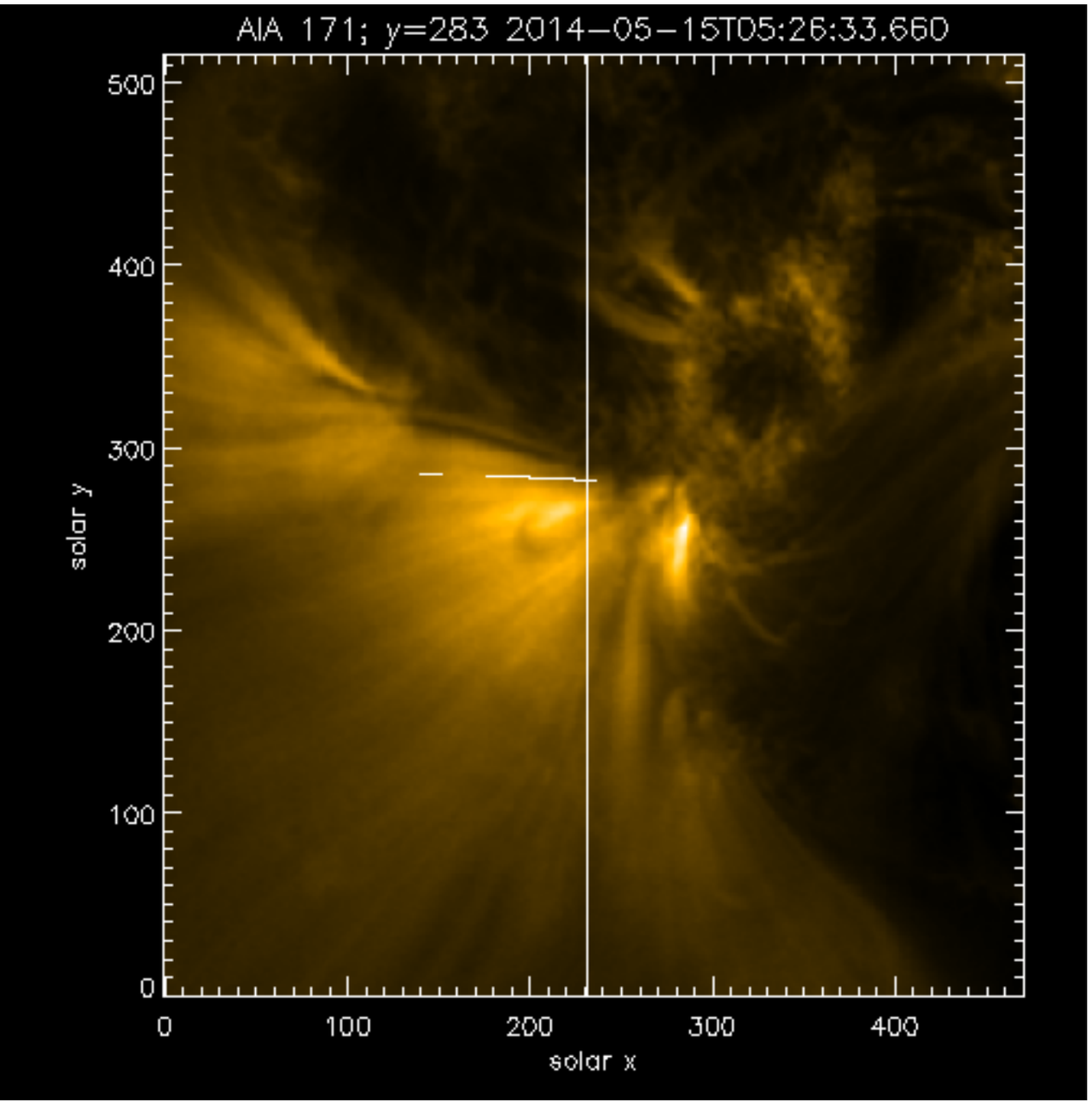


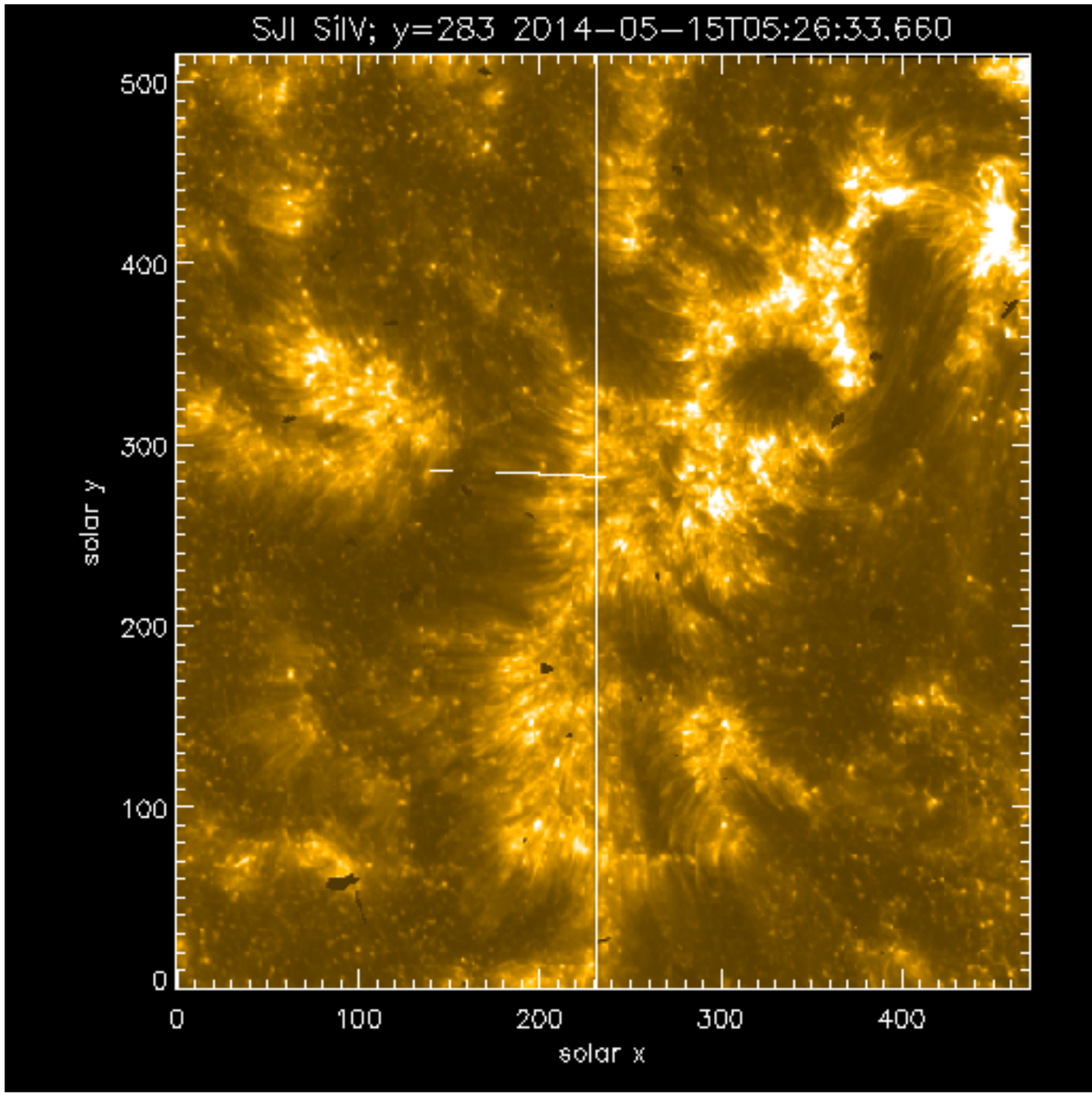
- Spectra display strong upflows (blue asymmetry) in both spectral lines.


AIA 171 Running Difference
RD SDO/AIA 171Å
Si IV at y=283
50km/s
-50km/s
IRIS Si IV 1403Å
Time
MgIIh at y=283
IRIS MgIIh 2803Å
25km/s
-25km/s
Si IV red-blue asymmetry along the slit
IRIS Si IV R-B 50-60km/s
0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475
y=283
254
320
300
280
260
240
MgIIh 2803Å
RD IRIS/SJI 1330Å
Si IV 1403Å
RD SDO/AIA 171Å
RD SDO/AIA 193Å

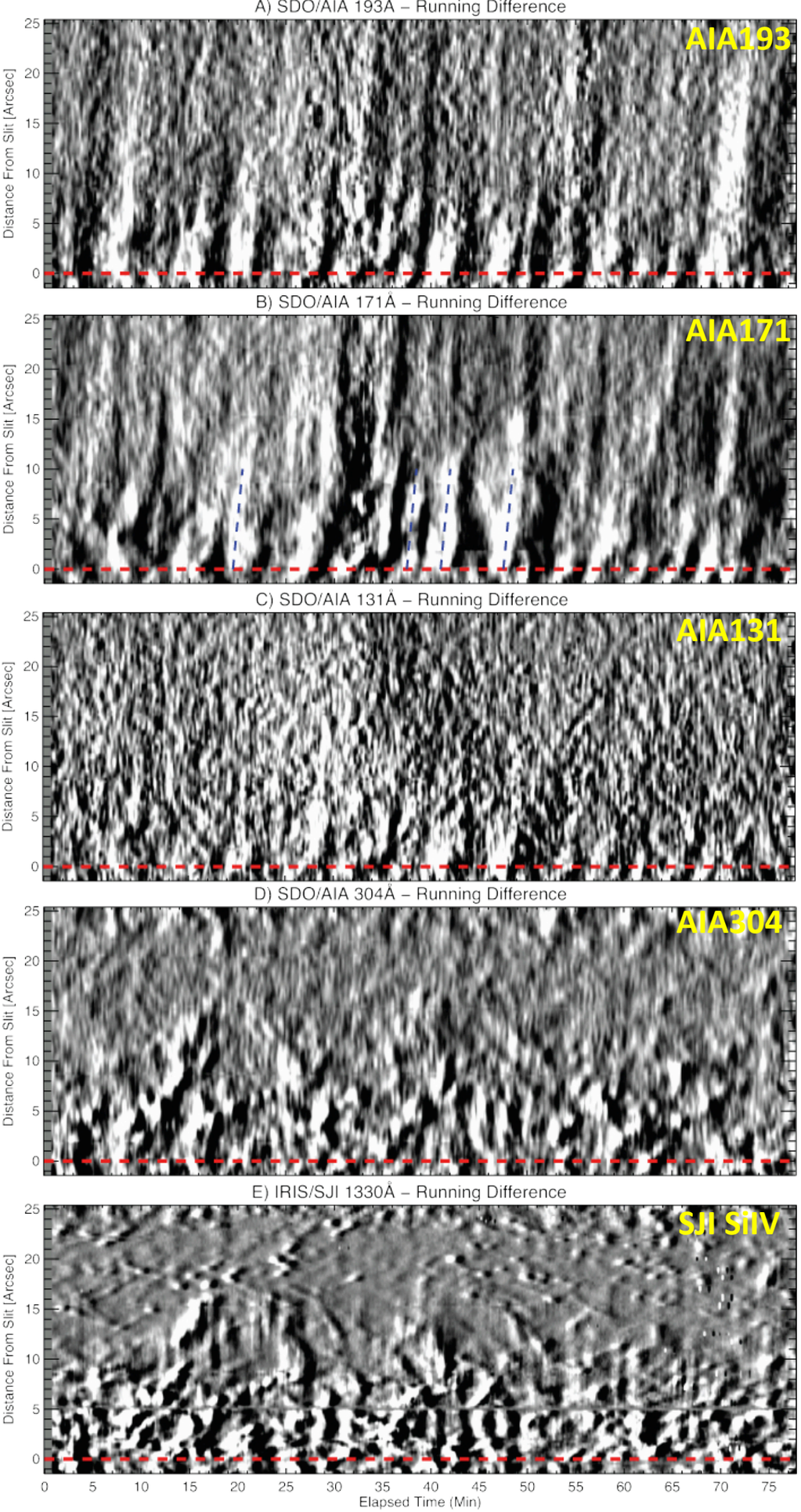

AIA 171 Running Difference
Si IV at y=283
MgIIh at y=283
Si IV red-blue asymmetry along the slit
y=283
Time
0
25
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
475
000
320
300
280
260
240

y=283





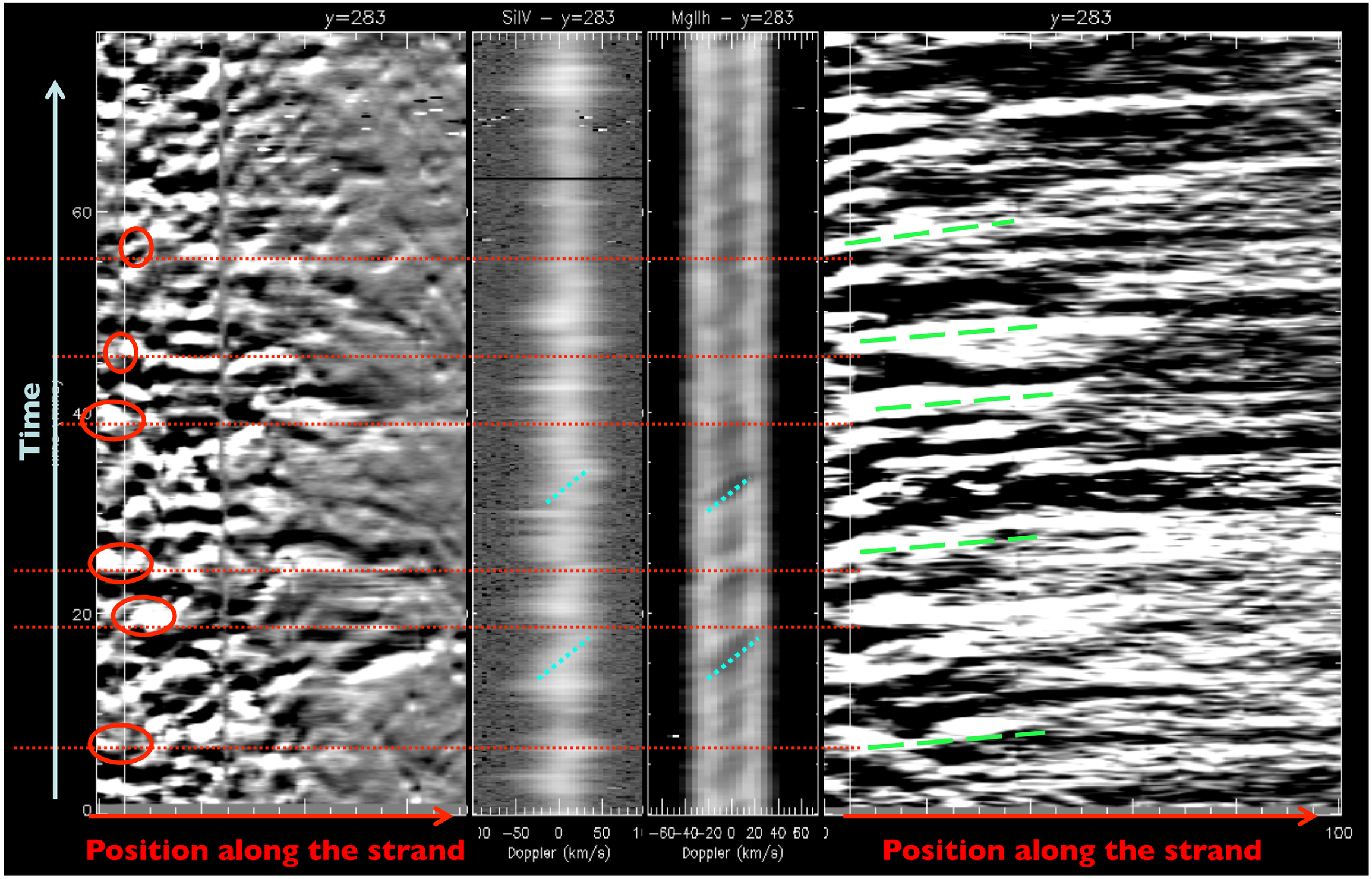
- Look in detail along the marked trajectory/arc crossing the IRIS slit at y=283



y=283

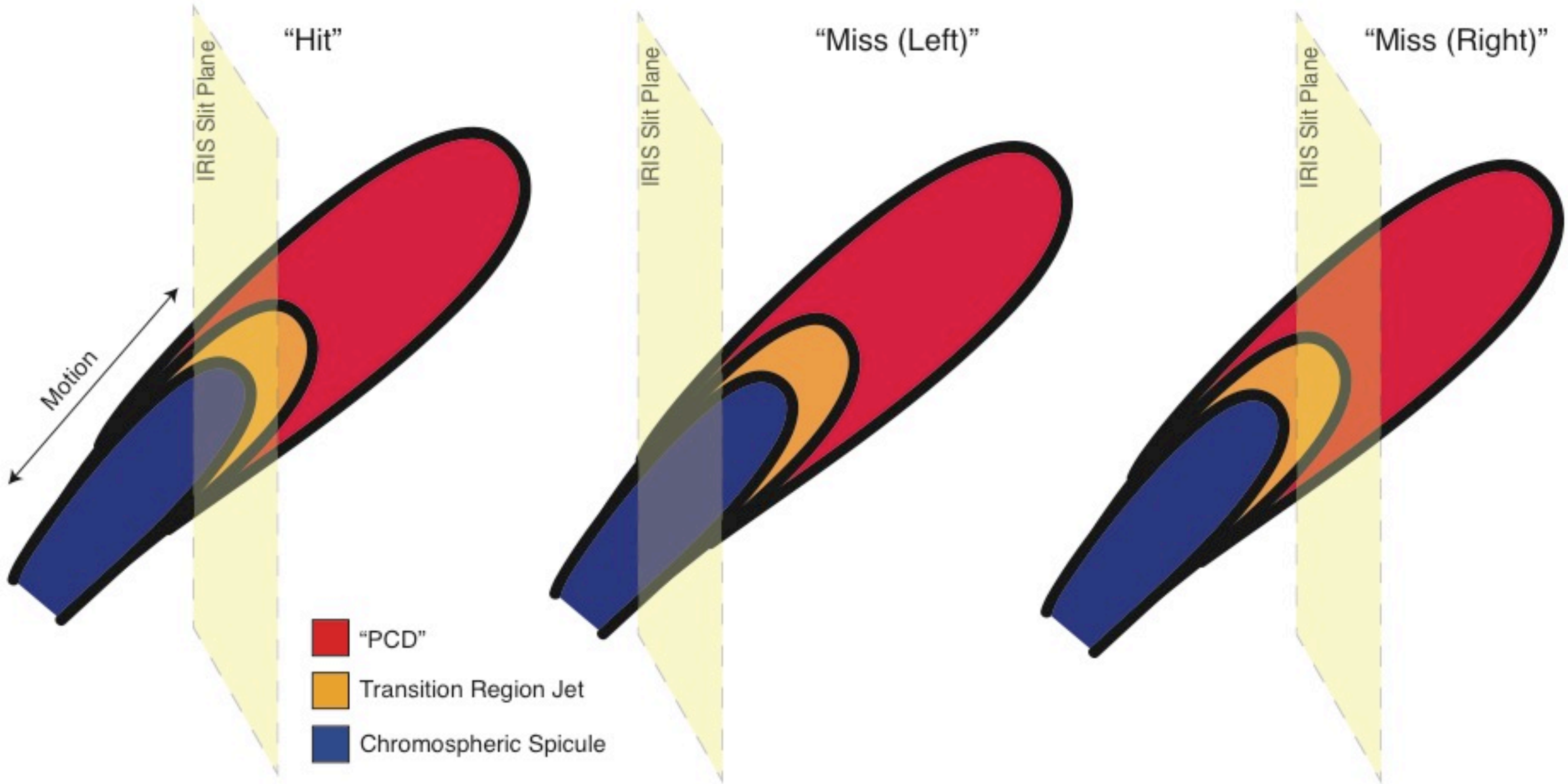
- 6 timestep running differences along the same spatial track.
- AIA171 and 193 show very similar PCD tracks
- AIA 131 signal poorer but consistent periods
- AIA 304 and SJI SiIV show much shorter structures
- Again many similarities in patterns and timescales

y=283



- Correspondence in some locations (but not all) between
  - Timescales of shocks (MgIIh dark cores – type I spicules) and PCDs (see De Pontieu et al 2005)
  - RRE and RBE events in Si IV and PCDs
  - Diagonal features in SiIV (blue lines) seem to correspond to magneto-acoustic (MgIIh) shocks

Trouble establishing a connection



- Establishing a clear connection strongly depends on the position of the 1D IRIS slit.
- Footpoints change very rapidly (timescale ~ few PCD periods)

Conclusions

- IRIS and AIA show there is a connection between PCDS and chromospheric activity – spicules (type I and II, RRE and RBE's, jets, RB asymmetries, dynamic fibrils)
- Clearest connection seems to be the MgIIh shocks and PCDs
- Print through of
  - RB asymmetries in chromosphere (MgIIh) and transition region (SiIV).
  - SJI and AIA running differences.
- Establishing a one-to-one connection is non-trivial – sampling problem (need to look in the right place, at the right time).
- Footpoints clearly evolve over course of observation – does not help establishing a connection.
- High resolution turns out to be problematic!