



Observations of an X-shaped Ribbon Flare & Its 3D Magnetic Reconnection *with IRIS and SDO*

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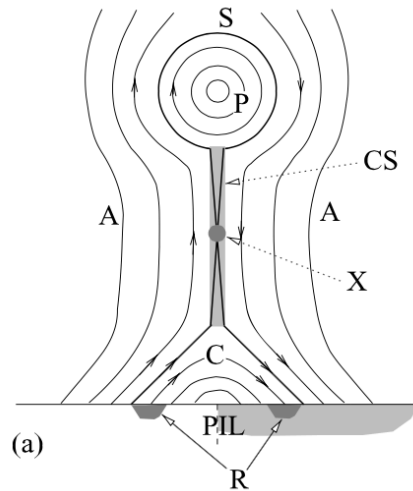
June 2 2016



Introduction

magnetic reconnection

In 2D picture (standard CSHKP model), reconnection takes place at **an X-point**.

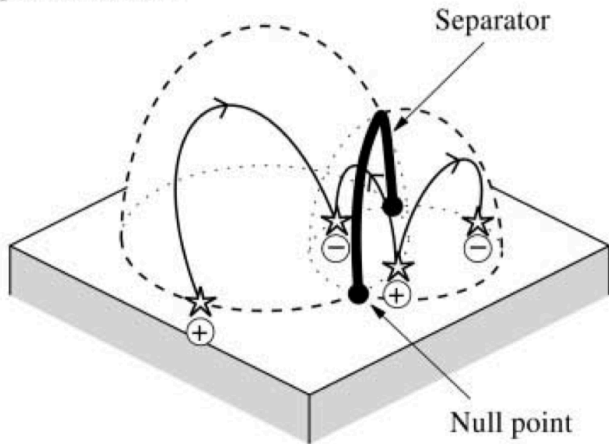


(Longcope et al. 2007)

In the more realistic 3D picture, reconnection occurs at **a separator** or **HFT**.

3D magnetic reconnection is manifest in many observations of *two-ribbon flares* and also *circular-ribbon flares*.

Separatrix surface



b

(Priest & Forbes 2002)



This present work:

an atypical X-shaped ribbon flare
observed with IRIS & SDO

—> Reconnection takes place at a very low height at an X-point.

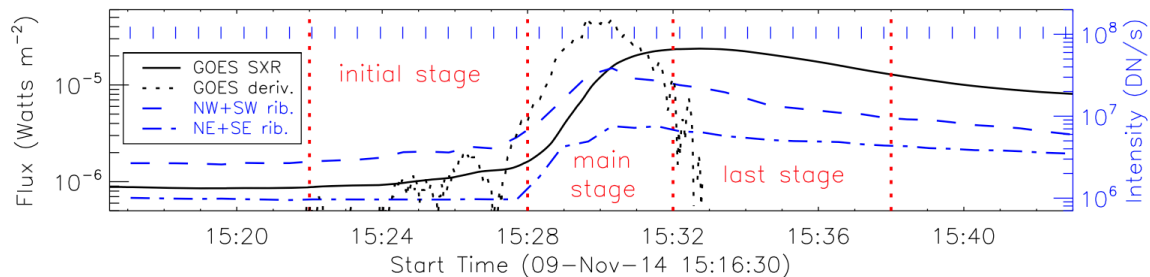
magnetic topology

using the MCT method & LFFF extrapolation

“see” a special case of 3D magnetic reconnection at a separator

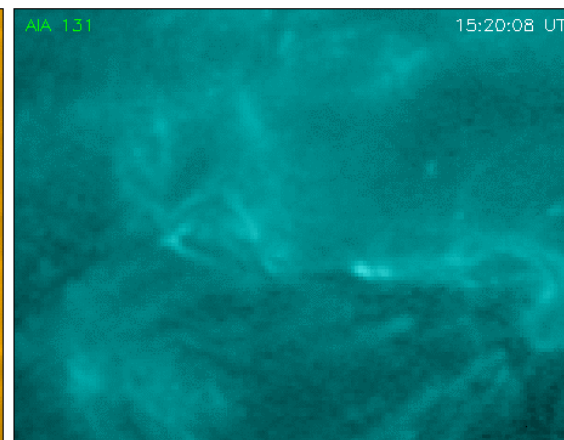
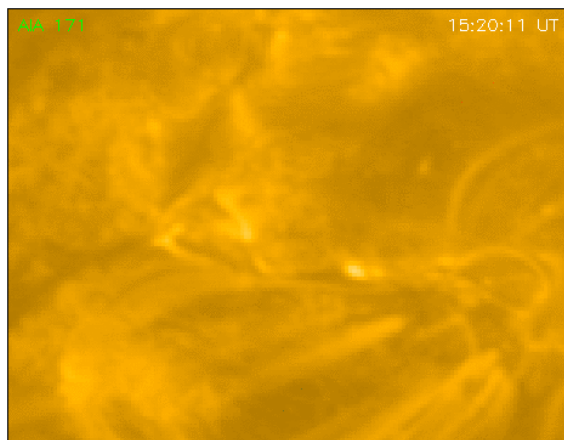
Observations

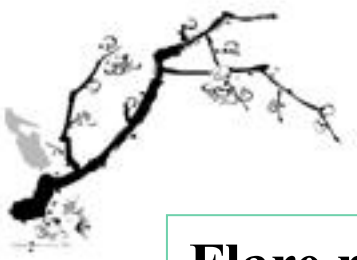
M2.3 flare on November 9, 2014 in AR 2205 (N14E11)



Movie here, please see:

<http://solar.physics.montana.edu/yingli/20141109/HMIInugget/index.html>





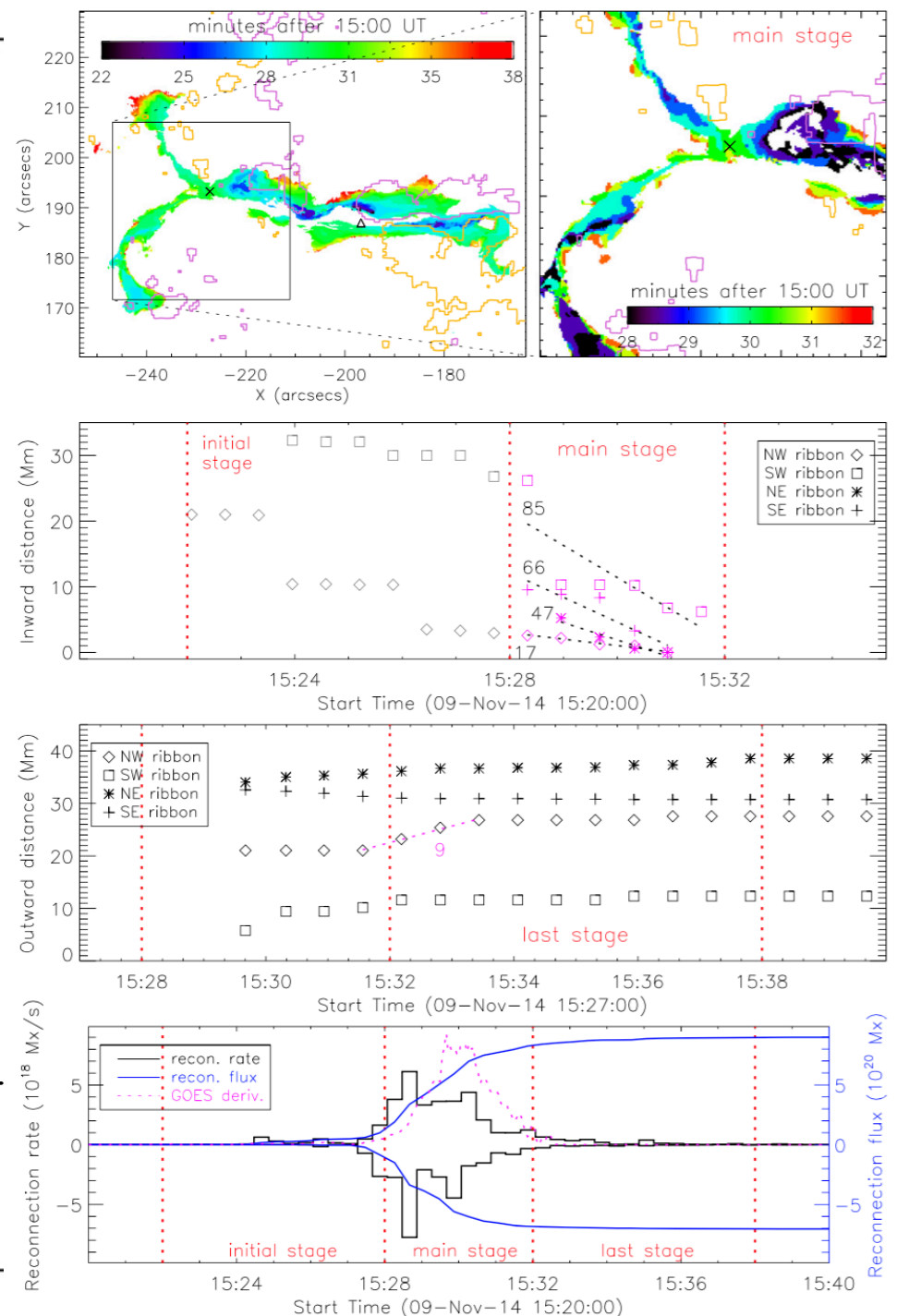
Results

Flare ribbon motion

inward motion *at the main stage*
intersect at an X-point ~ peak time
outward motion *at the last stage*

Most of reconnection flux & energy release take place during the main stage of the flare.

the 47th SPD meeting

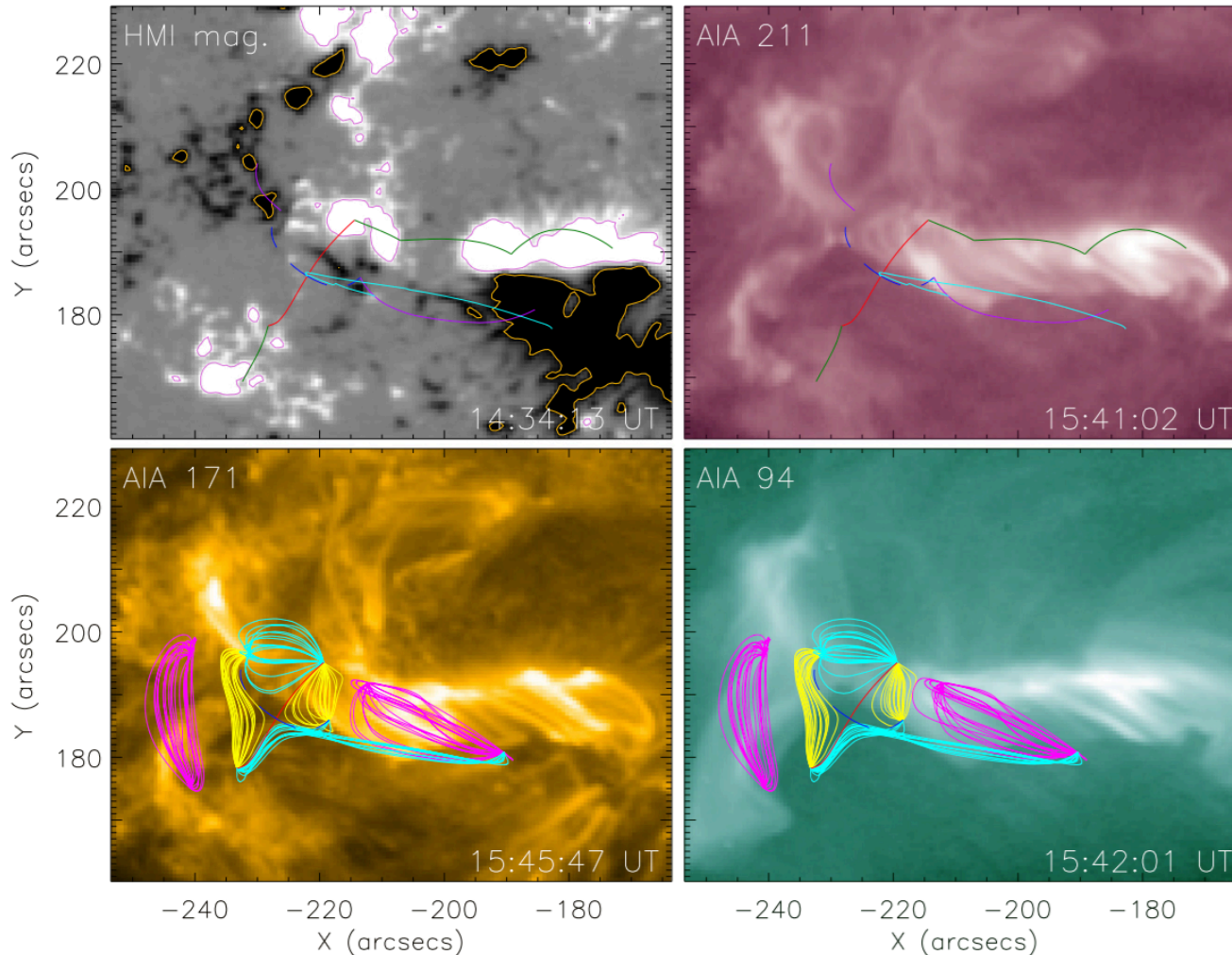




Results

Magnetic topology

null point / **separator** / pre- & post-reconnection field lines

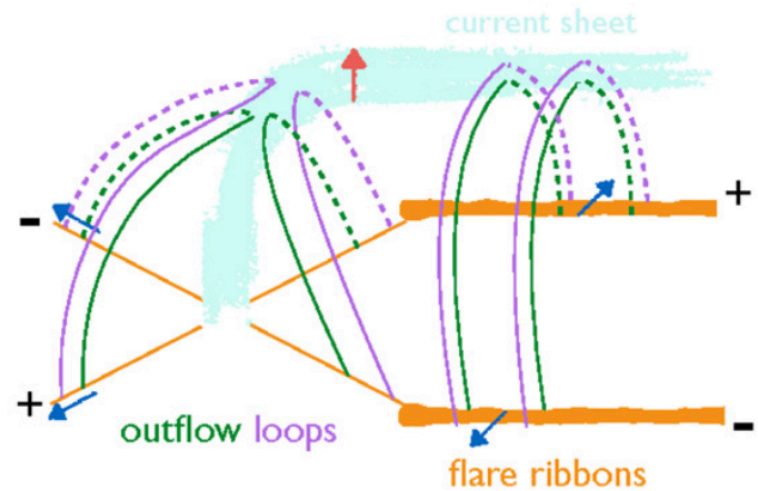
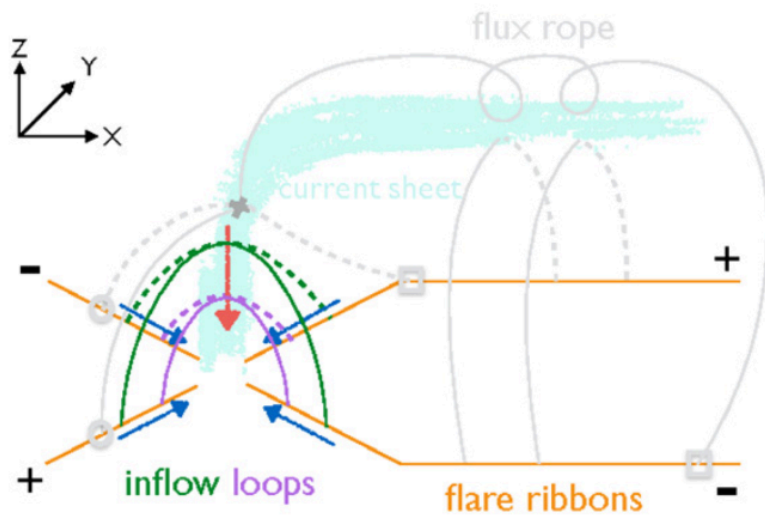


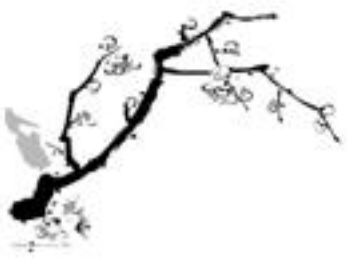


Sketch of the 3D separator reconnection & evolution in the flare

main stage

last stage





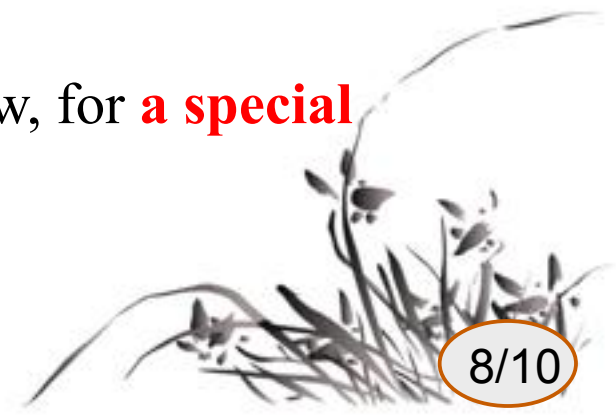
Summary

Using the high-resolution observations from IRIS and SDO, we present **an atypical X-shaped flare ribbon**, its evolution, and **magnetic topology**.

The **inward motion** of four flare ribbons as well as **converging post-flare loops** illustrate **sequential 3D reconnection between two sets of non-coplanar loops** that approach laterally.

Reconstruction of magnetic topology in the active region suggests the presence of **a separator connecting to the X-point** outlined by the ribbons.

These present the first evidence, as far as we know, for **a special scenario of separator reconnection**.



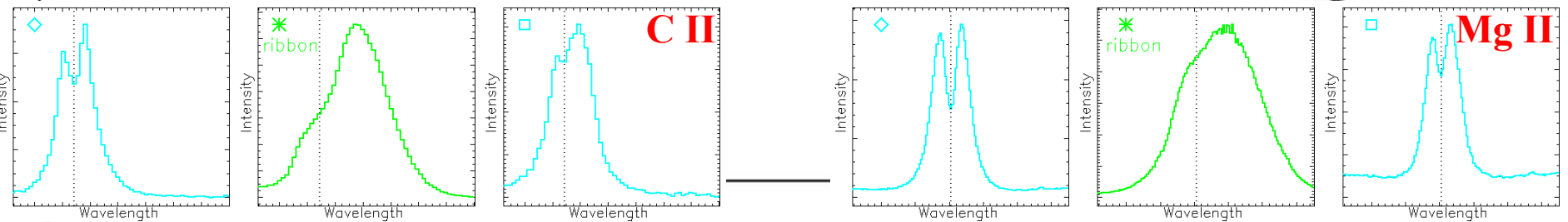
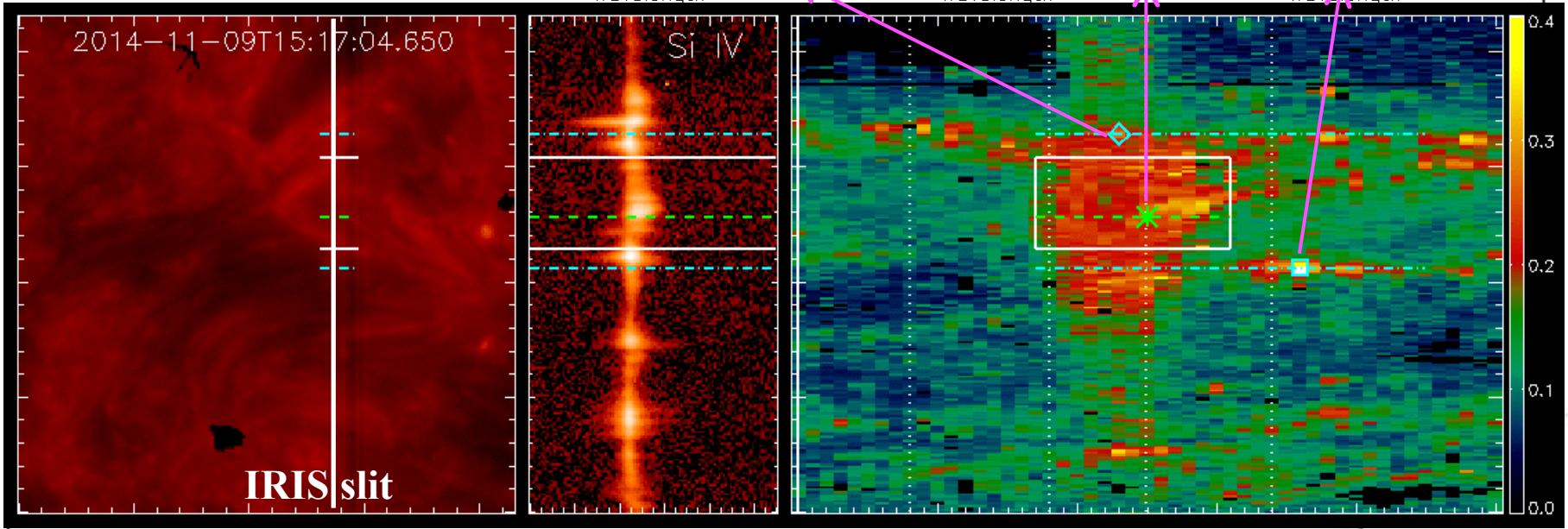
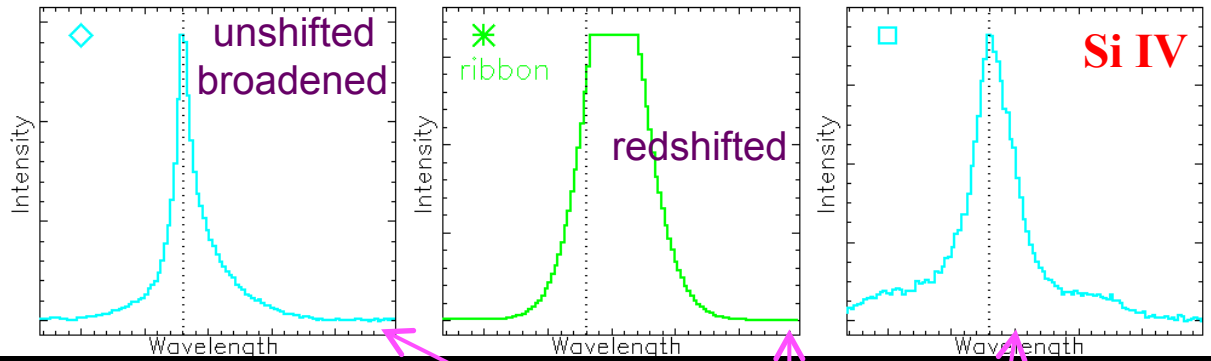


Future work

2 distinct types of line profiles

Spectral response to the separator reconnection

Boulder, CO
June 20





Thanks for your attention!

