

# The Structure and Dynamics of a Bright Point as seen with Hinode, SoHO and TRACE

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Rhona C. Maclean<sup>2</sup> J. Gerry Doyle<sup>1</sup> Maria S. Madjarska<sup>3</sup>

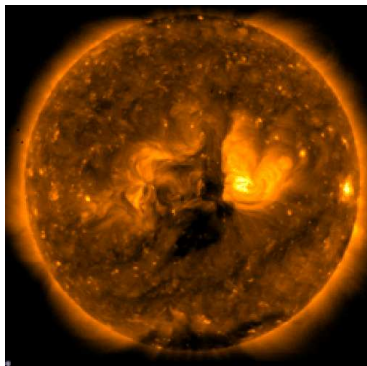
<sup>1</sup>Armagh Observatory, <sup>2</sup> St. Andrews, <sup>3</sup> Max Plank Institute

October 1<sup>st</sup>, 2008

## Hinode - 2

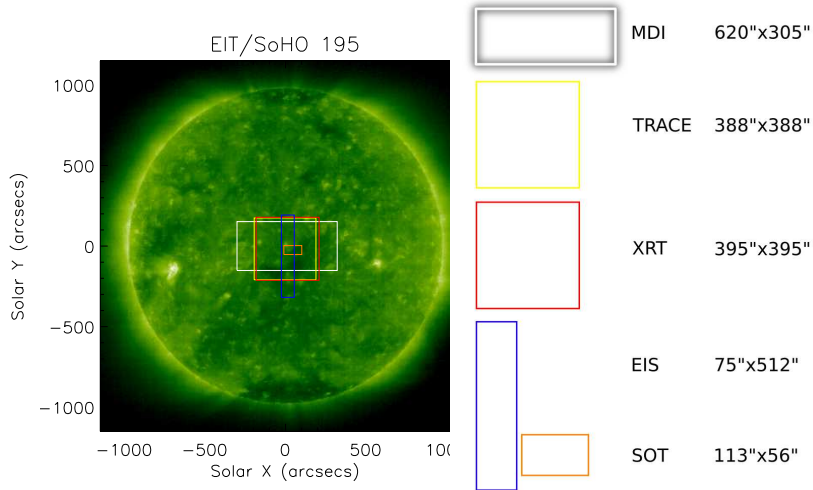
Beyond Discovery - Toward Understanding

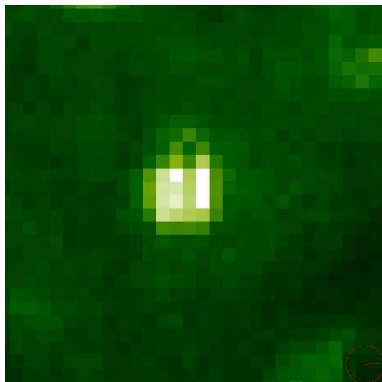
# Bright Points (Coronal!!)



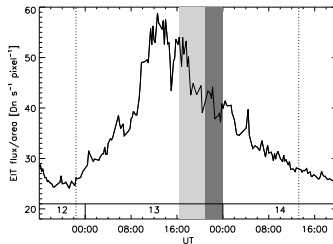
- Discovered: 1969 (Rocket X-ray images)
- Skylab, Yohkoh, SoHO, TRACE, Hinode,...
- size:  $\sim 20$  Mm, lifetime:  $\sim 30$  h.
- Associated with small bipolar magnetic field in the photosphere:
  - 1/3 emerging,
  - 2/3 cancellation

# Observations



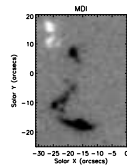
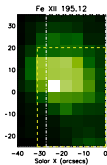


- Point like structure,  
 $A_{max} \sim 11.5 \times 10^8 \text{ km}^2$
- Lifetime  $\sim 37 \text{ h}$
- Created by the emergence of a positive patch.

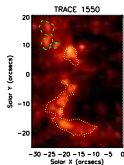
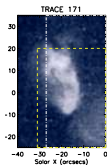


# Its faces

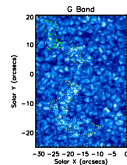
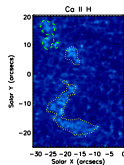
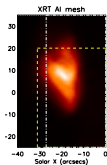
SoHO



TRACE

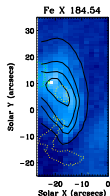


Hinode

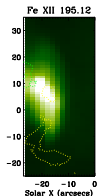


# Spectroscopically

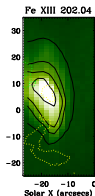
FeX 184.54  
6.0



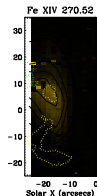
FeXII 195.12  
6.2



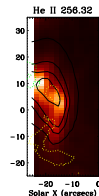
FeXIII 203.04  
6.2



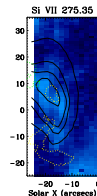
FeXIV 270.52  
6.3



HeII 256.32  
4.7



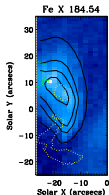
SiVII 275.35  
5.8



# Spectroscopically

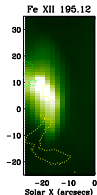
FeX 184.54

6.0



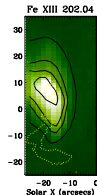
FeXII 195.12

6.2



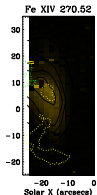
FeXIII 203.04

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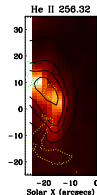
FeXIV 270.52

6.3



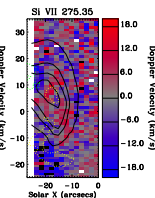
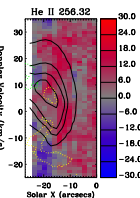
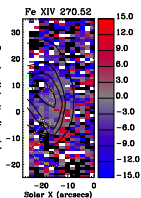
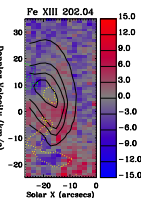
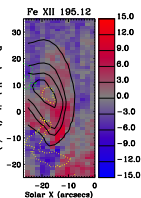
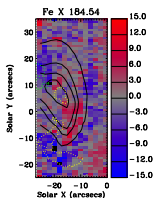
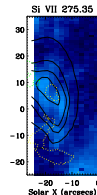
HeII 256.32

4.7



SiVII 275.35

5.8



0.2 km/s

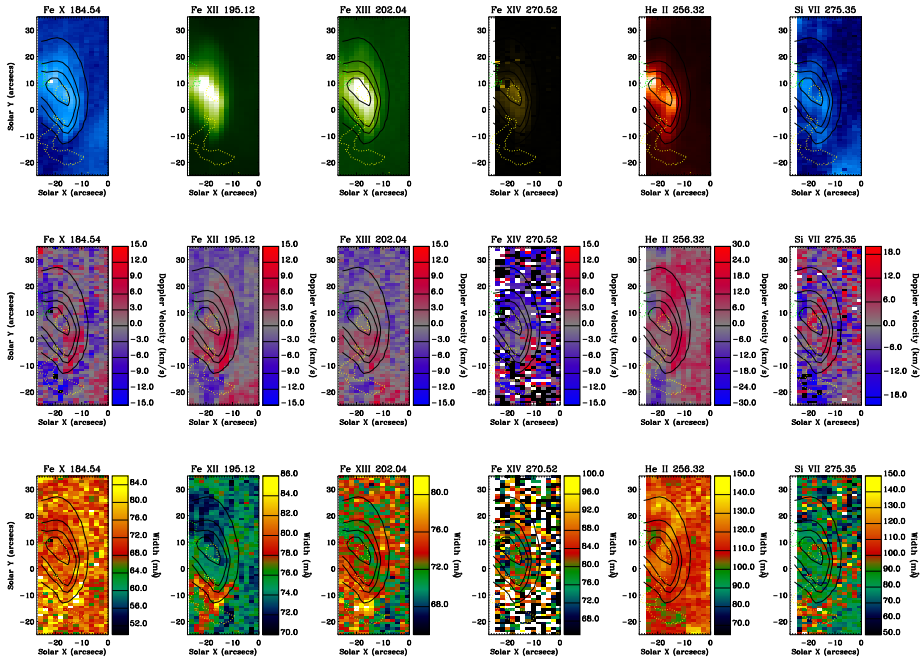
1.2 km/s

2.3 km/s

6.4 km/s

1.8 km/s

0.2 km/s

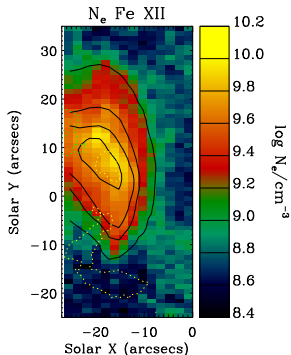


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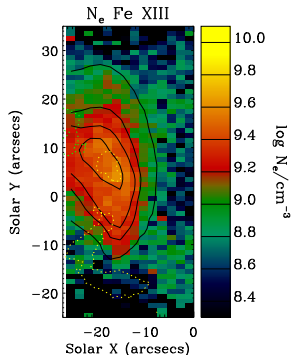
# Electron Density

$$\text{Fe XII} \quad \frac{186,88+186,854}{195,119}$$



9.56

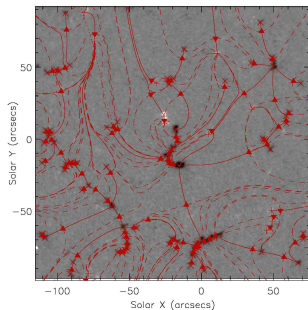
$$\text{Fe XIII} \quad \frac{203,797+203,838}{202,04}$$



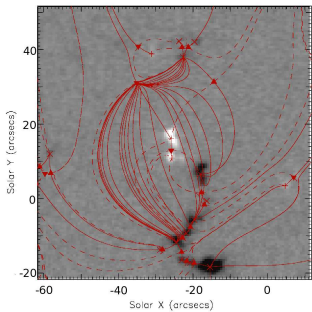
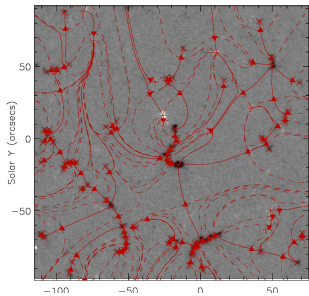
9.52

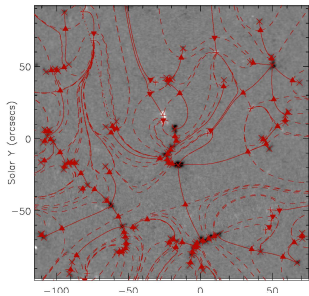
*Atomic values from CHIANTI*

# Magnetic Topology

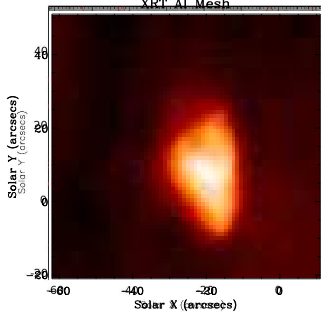


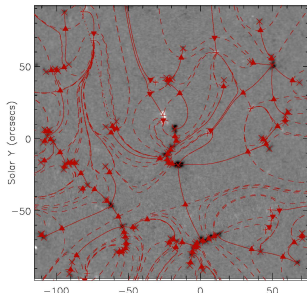
- YAFTA → Isolate and track the features
- MPOLE → Magnetic topology
  - *Force-free*  $\mathbf{B}$  in the corona  
 $\nabla \times \mathbf{B} = 0$



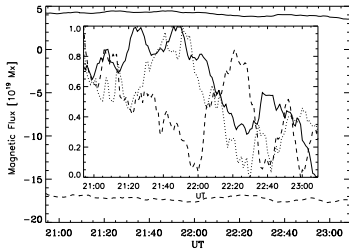
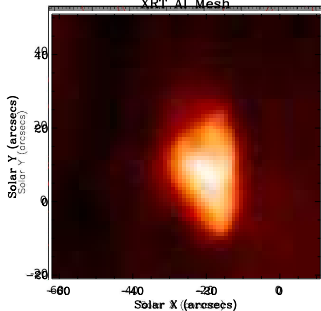


XRT Al Mesh

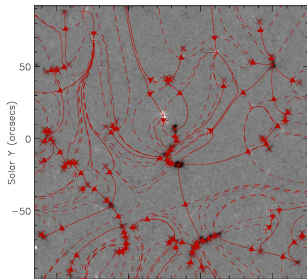




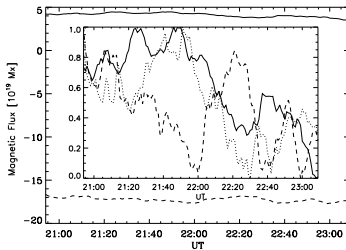
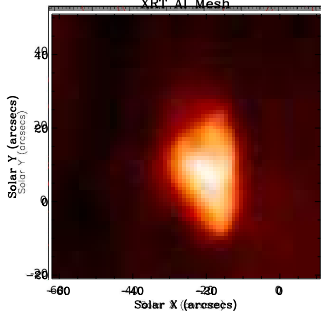
XRT Al Mesh



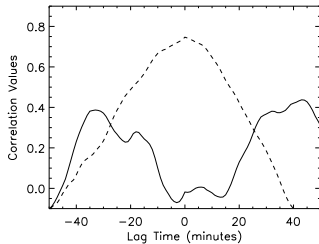
Pearson Coeff Pos-XRT 0.75  
Neg-XRT 0.01



XRT Al Mesh

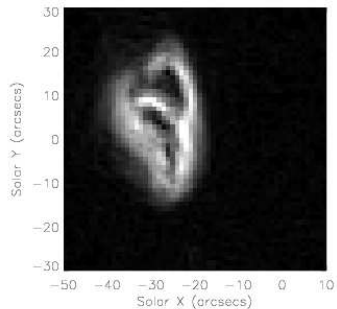
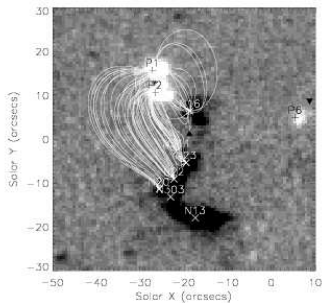


Correlation between MDI and XRT Data



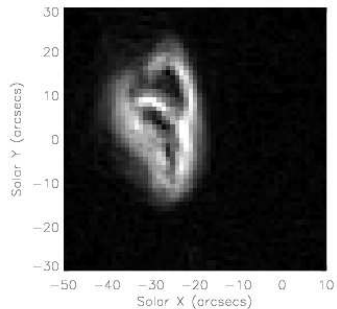
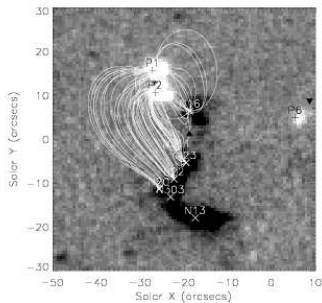
Lag Pos-XRT  $\dot{}$  1 min.

# Extrapolated vs Detected



- MDI → Extrapolated field lines
- XRT → Edge detection

# Extrapolated vs Detected



- MDI → Extrapolated field lines
- XRT → Edge detection
- All the BPs are NOT potential.



# Overview and Future

This BP:

- $\tau \sim 37$  h, size  $20'' \times 40''$
- Corona: Doppler Flows  $\pm 15$  km/s,  $\text{Log } N_e \sim 9.5$
- Potential field

Future BPs:

- Find the link between the different layers
- Study the  $N_e$  variation on time within the BP
- Classify statistically their magnetic behaviour