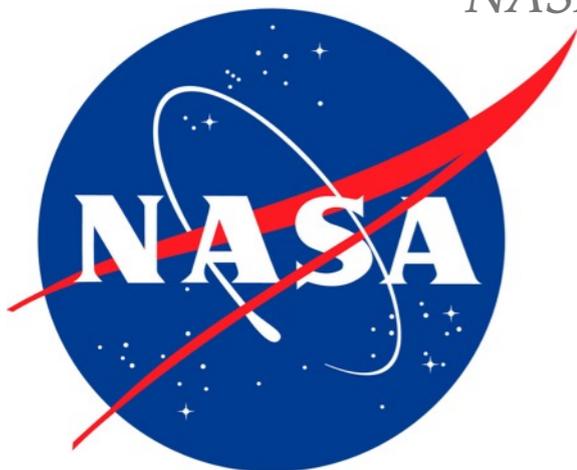


# Tracking a large pseudostreamer to pinpoint the southern polar magnetic field reversal

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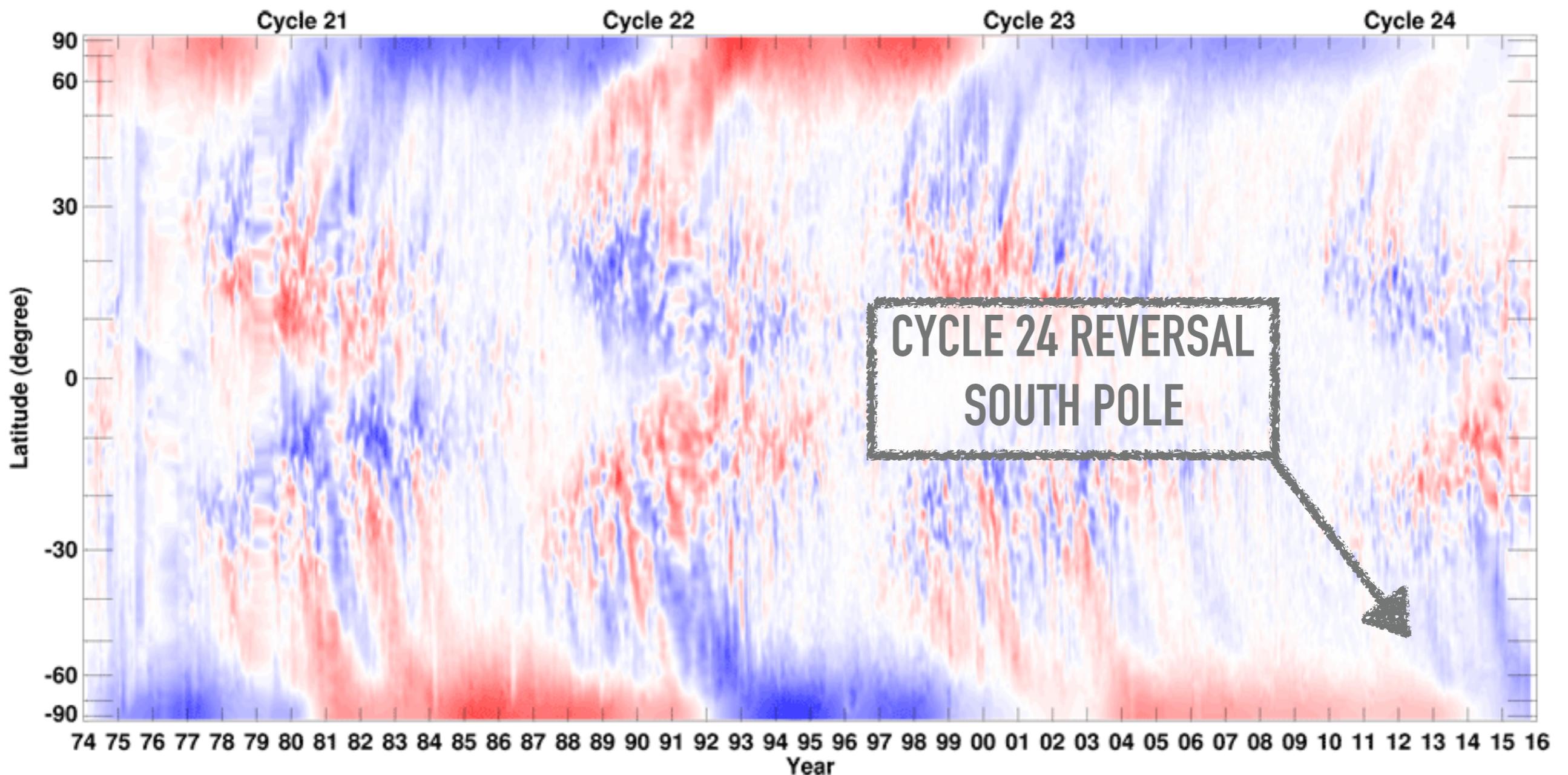
*L.A. Rachmeler<sup>1</sup>, C. Guennou<sup>2</sup>, D.B. Seaton<sup>3</sup>,  
S.E. Gibson<sup>4</sup>, F. Auchère<sup>5</sup>*

*<sup>1</sup>NASA/MSFC; <sup>2</sup>LEISA/OBSPM, <sup>3</sup>CIRES, CU, NOAA; <sup>4</sup>HAO/NCAR; <sup>5</sup>IAS*

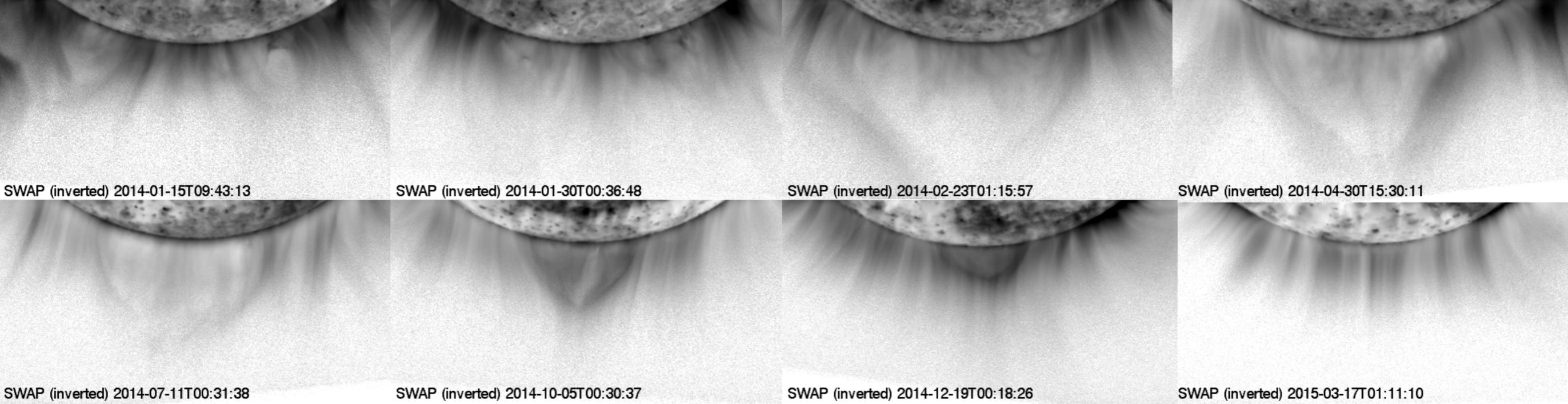


# POLAR FIELD REVERSAL

- Near solar maximum, the poles reverse polarity.



Red is positive magnetic flux, color scale is saturated at 15 G.



# A pseudostreamer traces the polar reversal

.....  
*Solar cycle 24, south pole, SWAP 174 Å images*

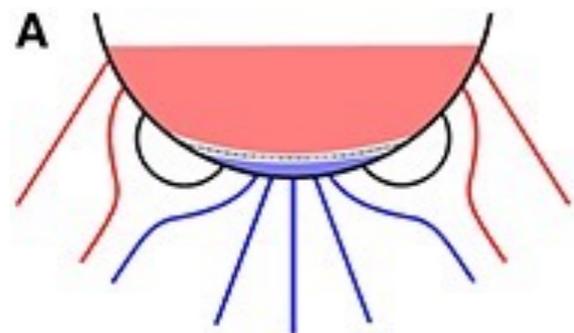
**A**

SWAP (inverted) 2014-01-15T09:43:13

SWAP (inverted) 2014-01-30T00:36:48

# MAGNETIC STRUCTURE EVOLUTION

---



Coronal hole  
with positive  
polarity  
surrounded by a  
streamer.

Circumpolar  
cavity (N. Karna  
PhD talk)

**A**

SWAP (inverted) 2014-01-15T09:43:13

**B**

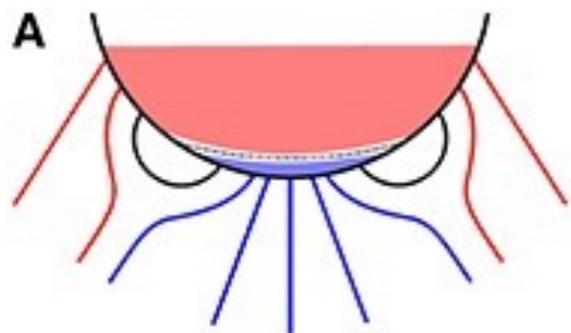
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**B**

SWAP (inverted) 2014-02-23T01:15:57

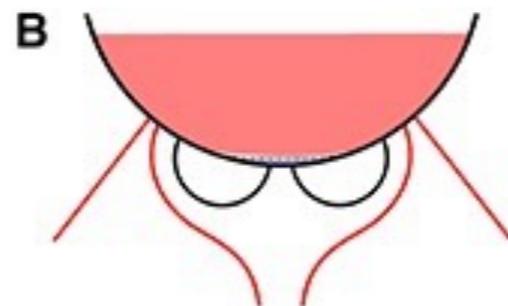
# MAGNETIC STRUCTURE EVOLUTION

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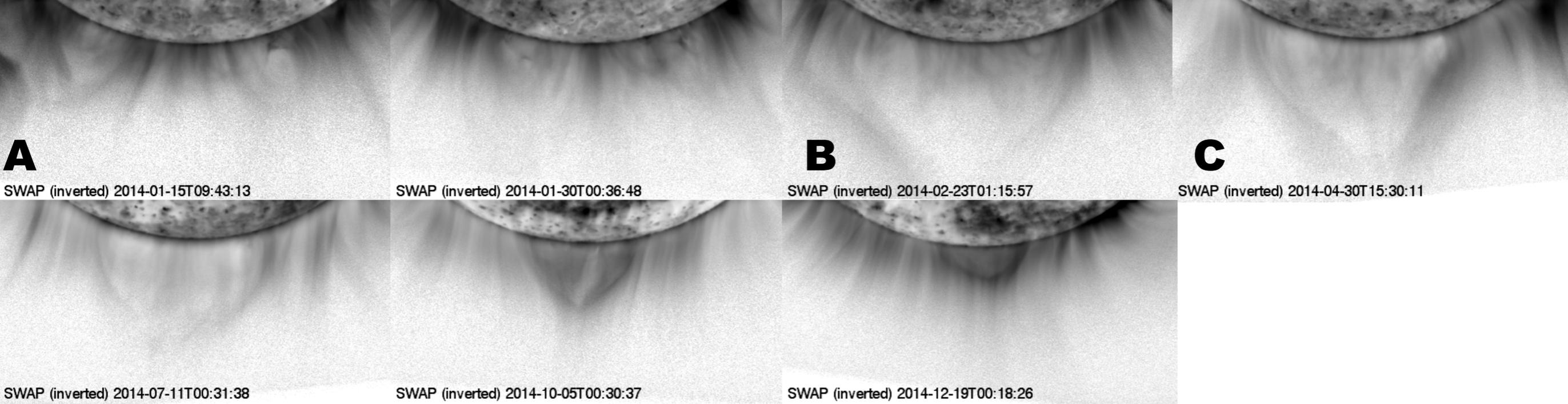
Coronal hole  
with positive  
polarity  
surrounded by a  
streamer.

Circumpolar  
cavity (N. Karna  
PhD talk)

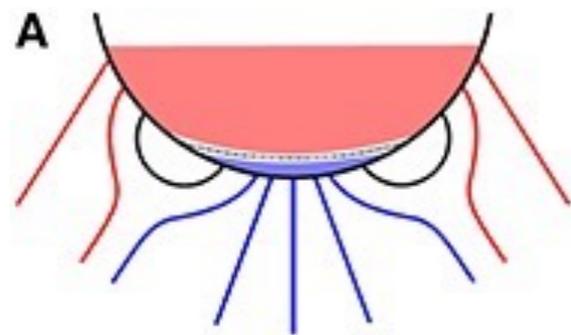


The neutral line  
moves south. A  
pseudostreamer  
is born.

**The coronal  
field reverses.**

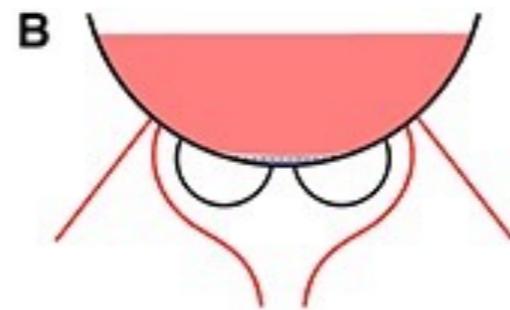


# MAGNETIC STRUCTURE EVOLUTION



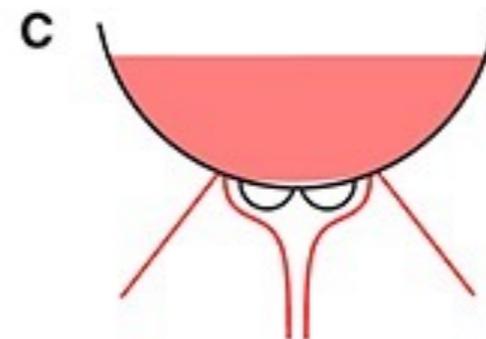
Coronal hole  
with positive  
polarity  
surrounded by a  
streamer.

Circumpolar  
cavity (N. Karna  
PhD talk)

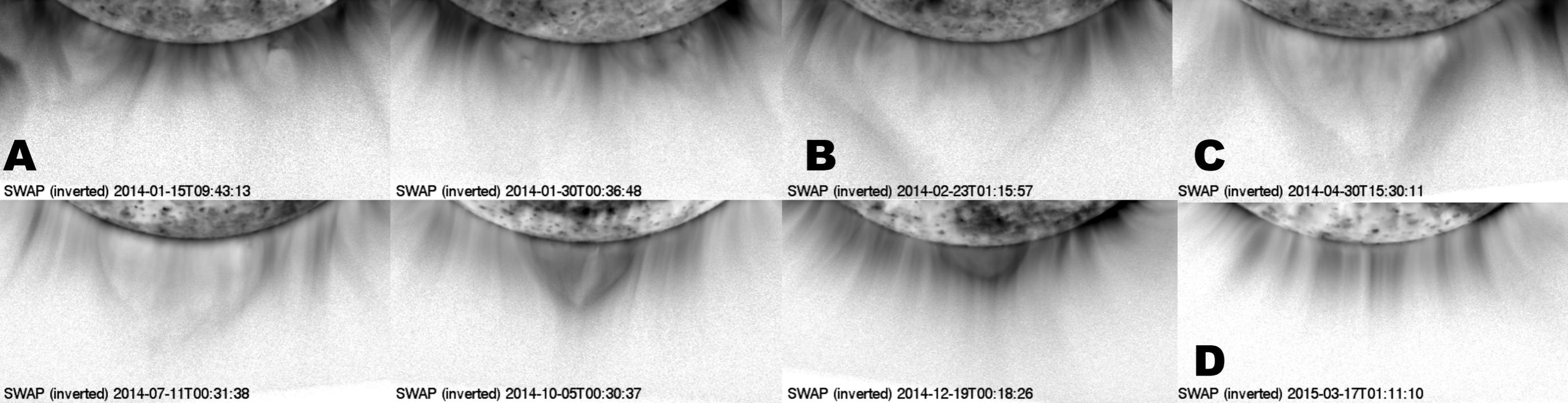


The neutral line  
moves south. A  
pseudostreamer  
is born.

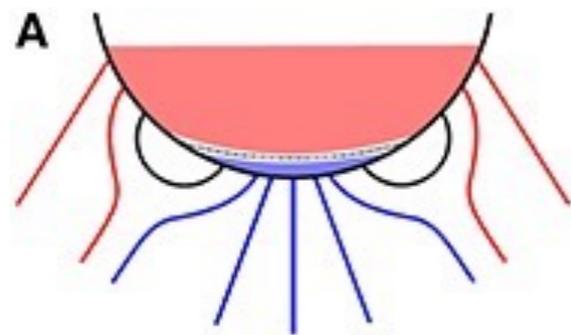
**The coronal  
field reverses.**



The  
pseudostreamer  
shrinks.

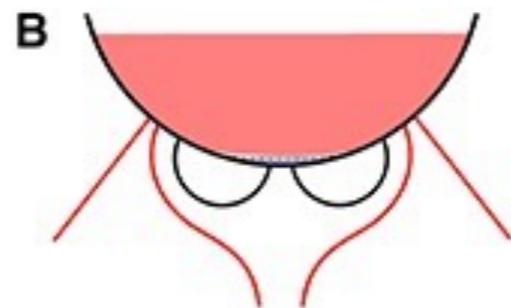


# MAGNETIC STRUCTURE EVOLUTION



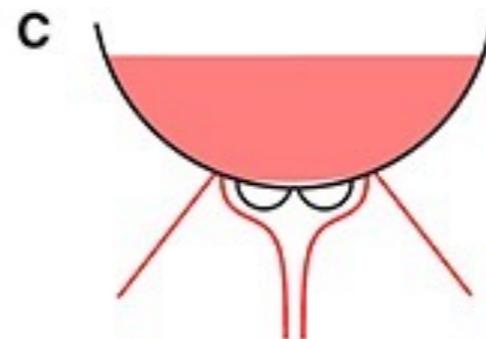
Coronal hole with positive polarity surrounded by a streamer.

Circumpolar cavity (N. Karna PhD talk)

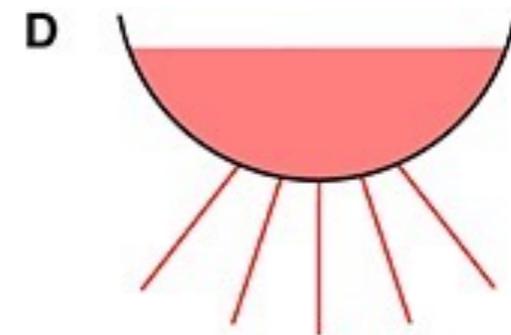


The neutral line moves south. A pseudostreamer is born.

**The coronal field reverses.**



The pseudostreamer shrinks.

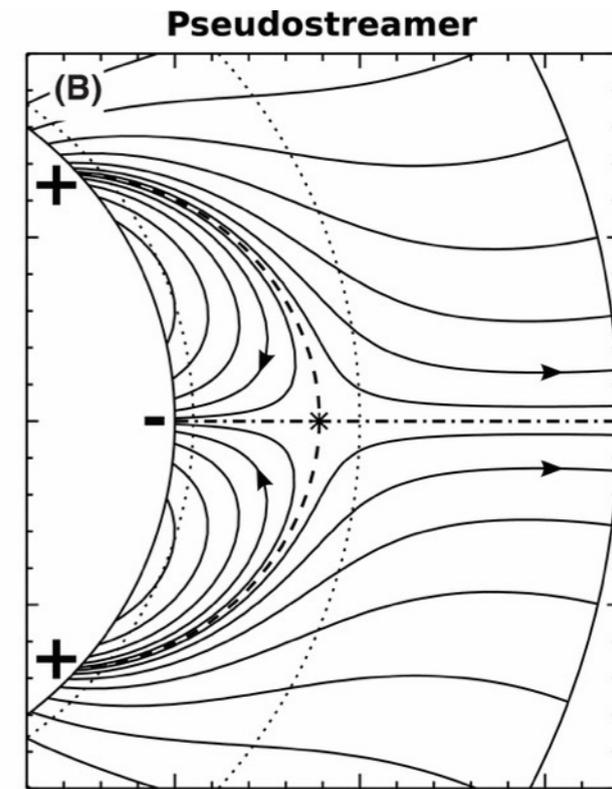
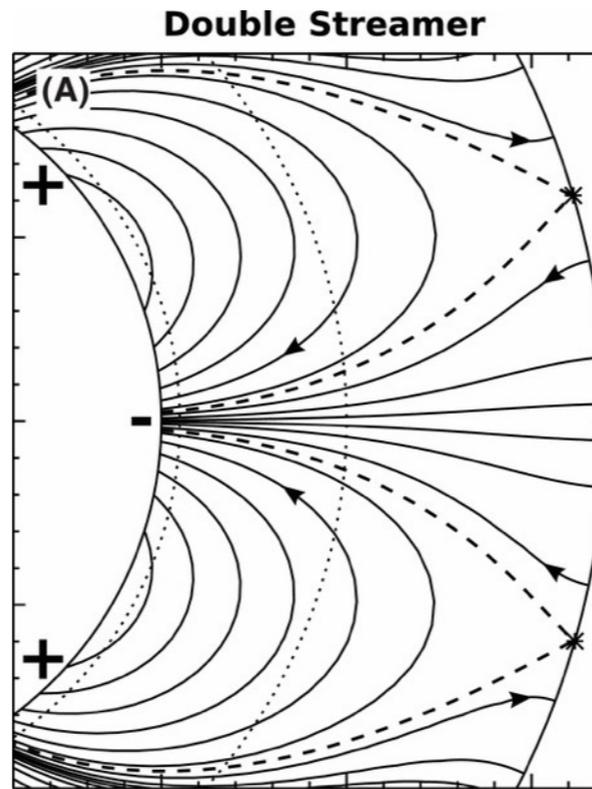


The structure disappears leaving a negative polarity coronal hole.

**The photospheric field reverses.**

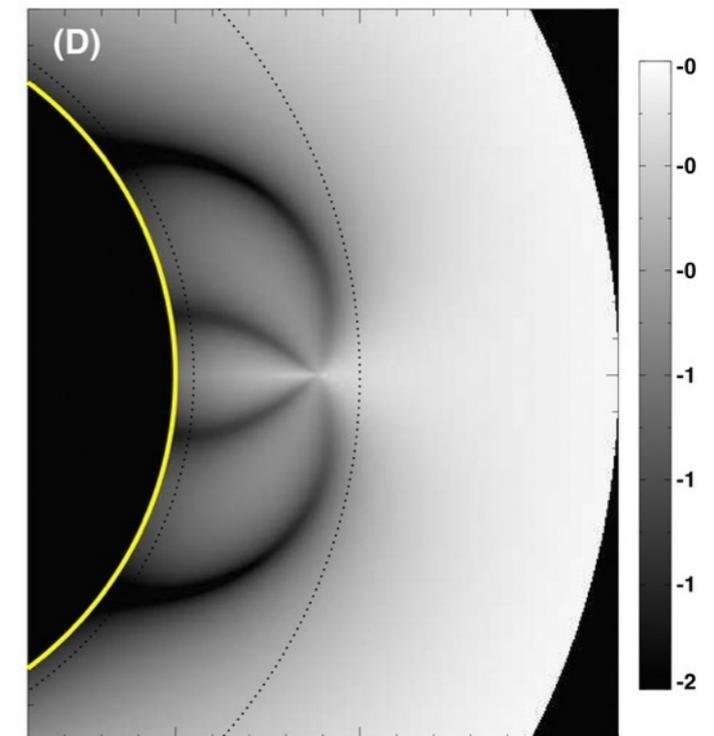
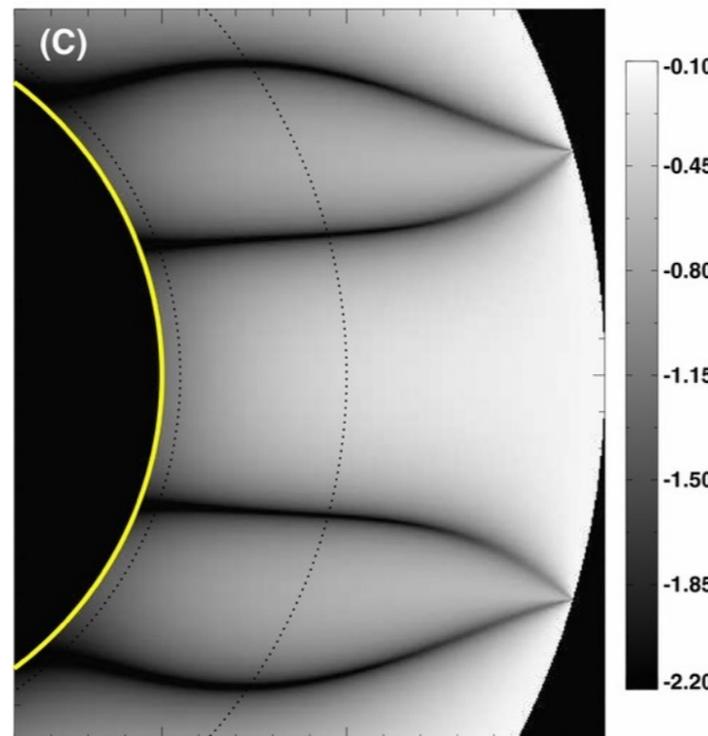
# STREAMER TO PSEUDOSTREAMER TOPOLOGY CHANGE

Analytical model



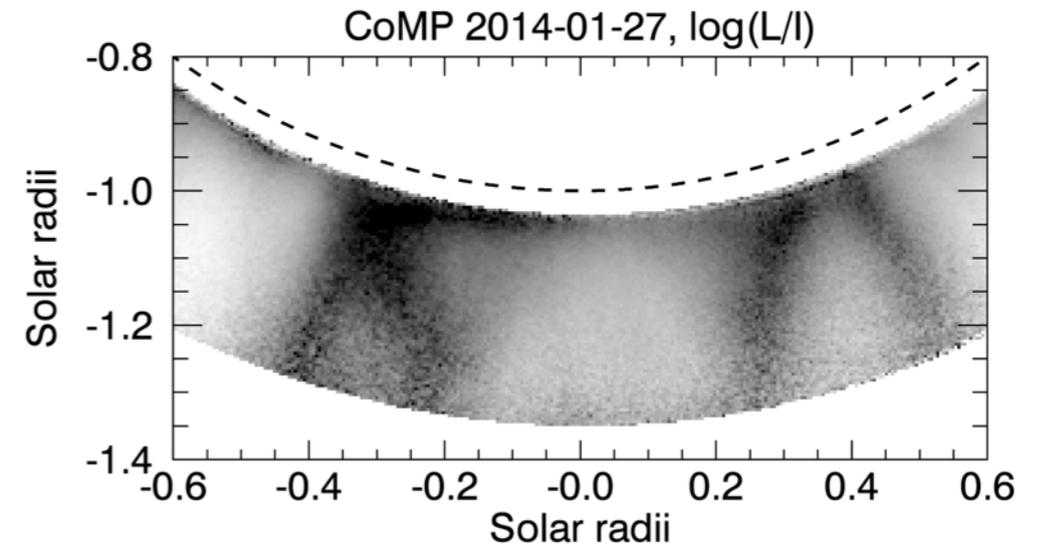
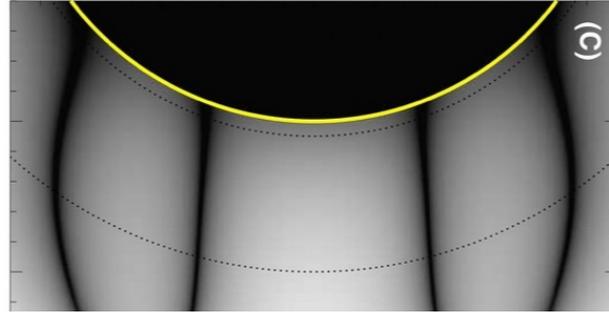
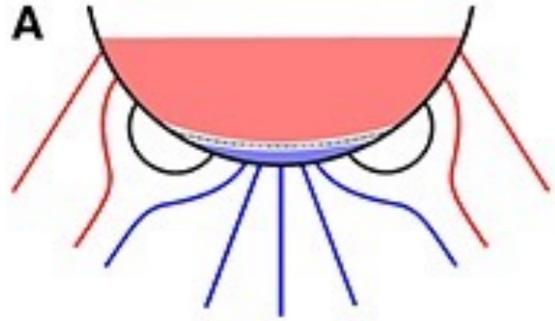
Modeled  
coronal polarization

$$\frac{L}{I} = \frac{\sqrt{Q^2 + U^2}}{I}$$



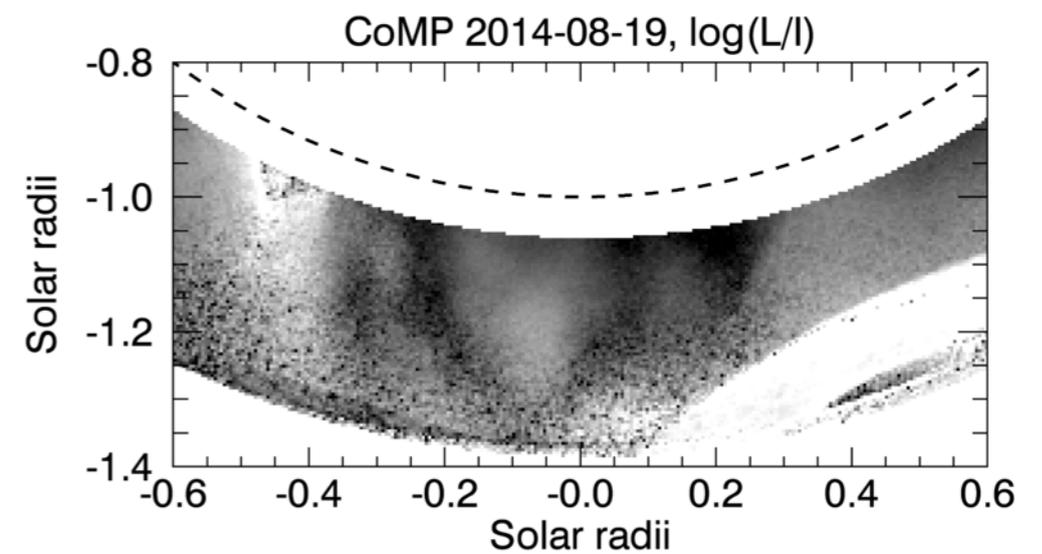
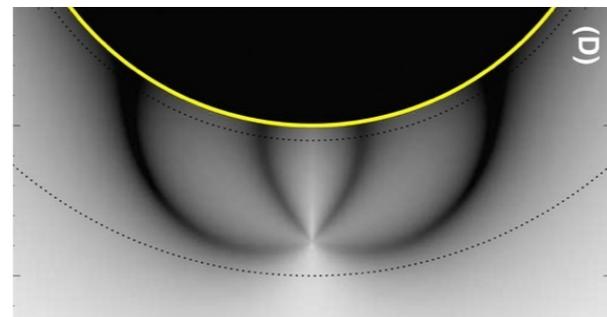
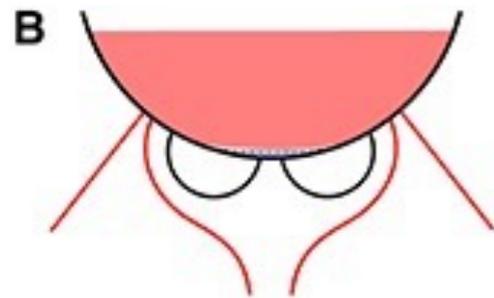
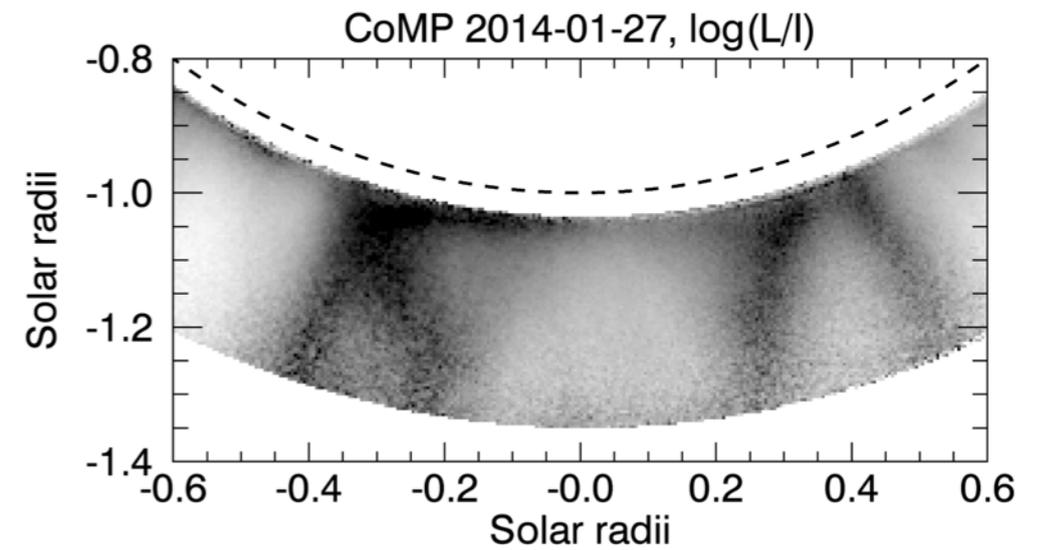
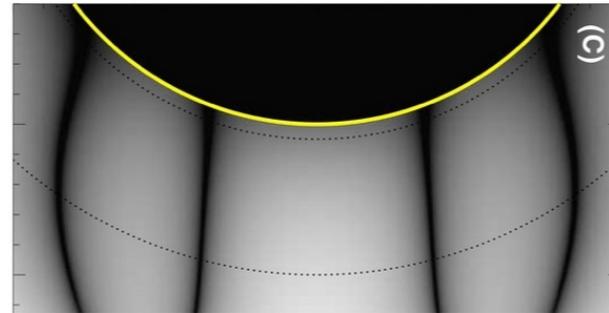
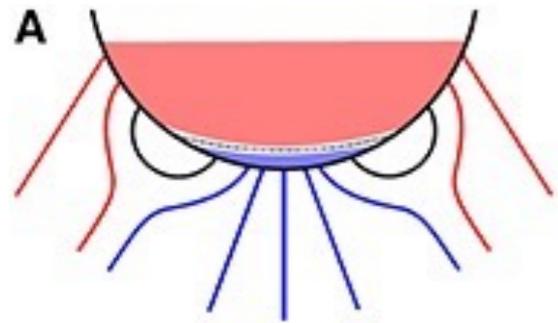
# STREAMER TO PSEUDOSTREAMER TOPOLOGY CHANGE

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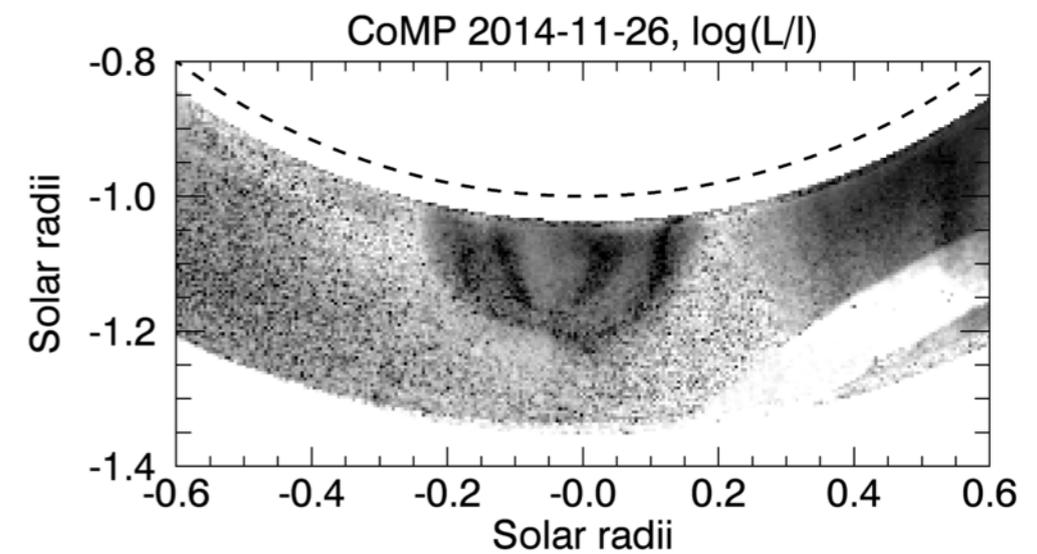
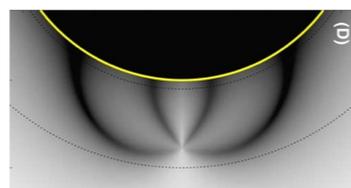
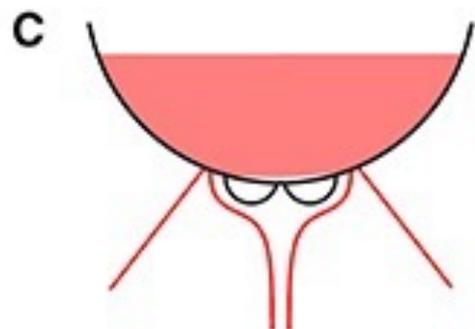
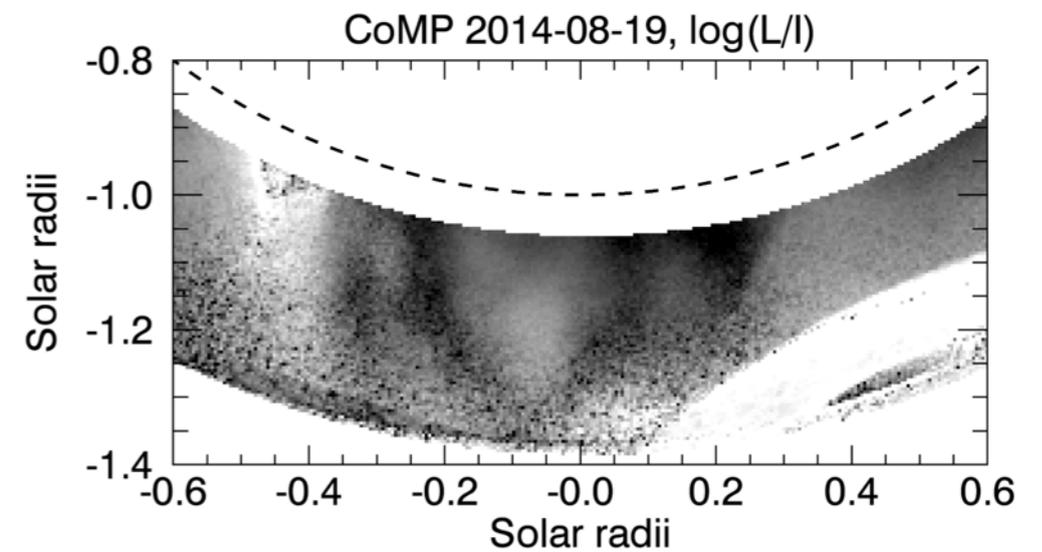
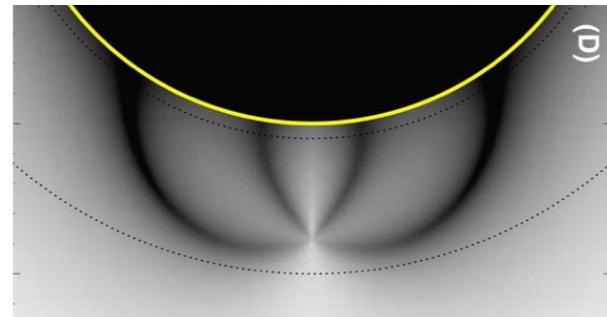
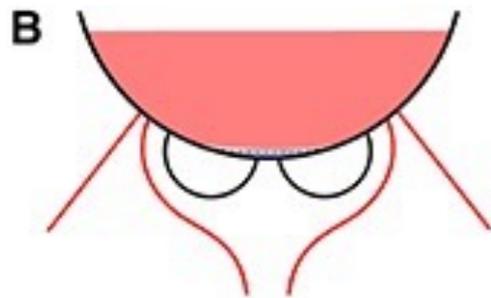
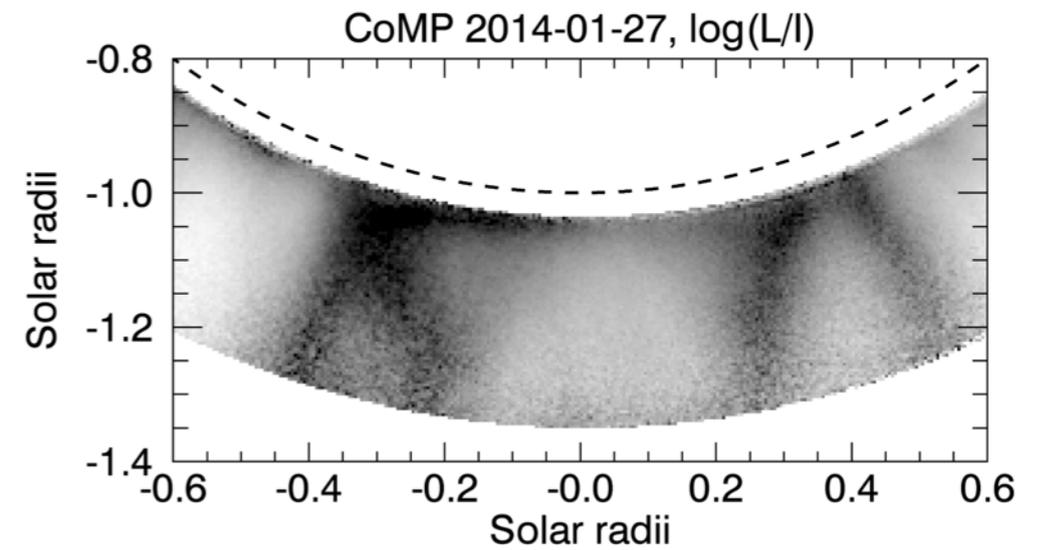
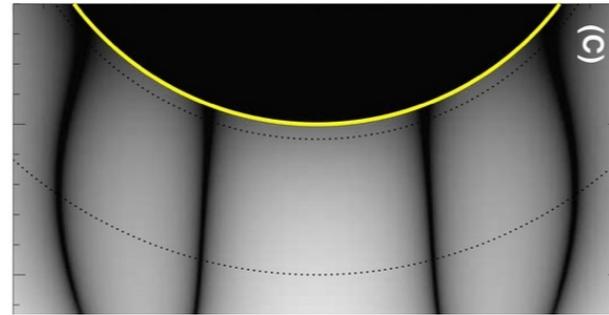
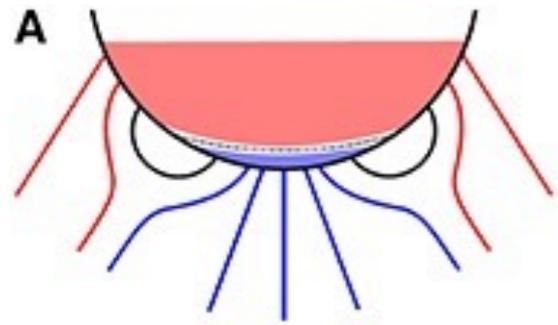


# STREAMER TO PSEUDOSTREAMER TOPOLOGY CHANGE

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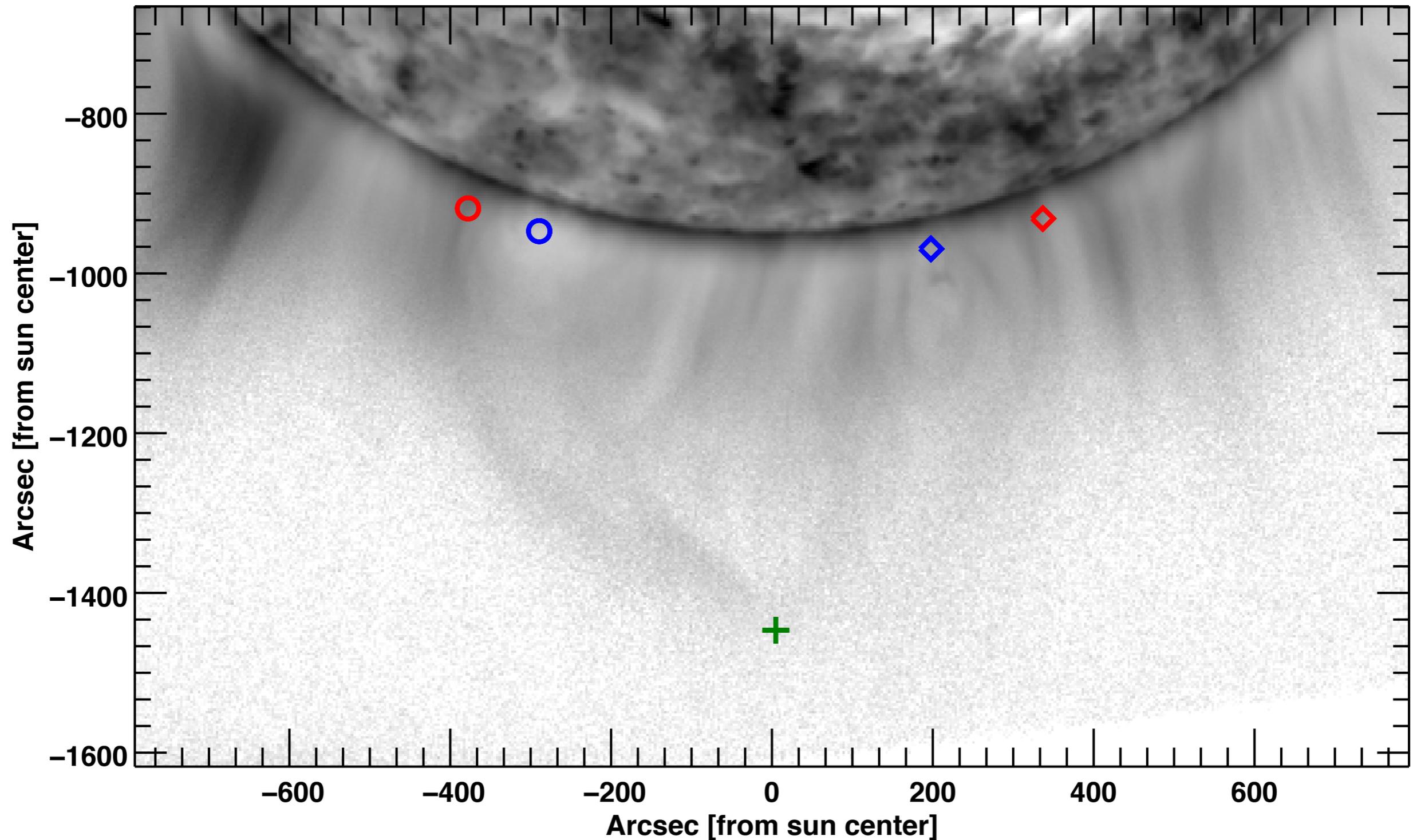


# STREAMER TO PSEUDOSTREAMER TOPOLOGY CHANGE



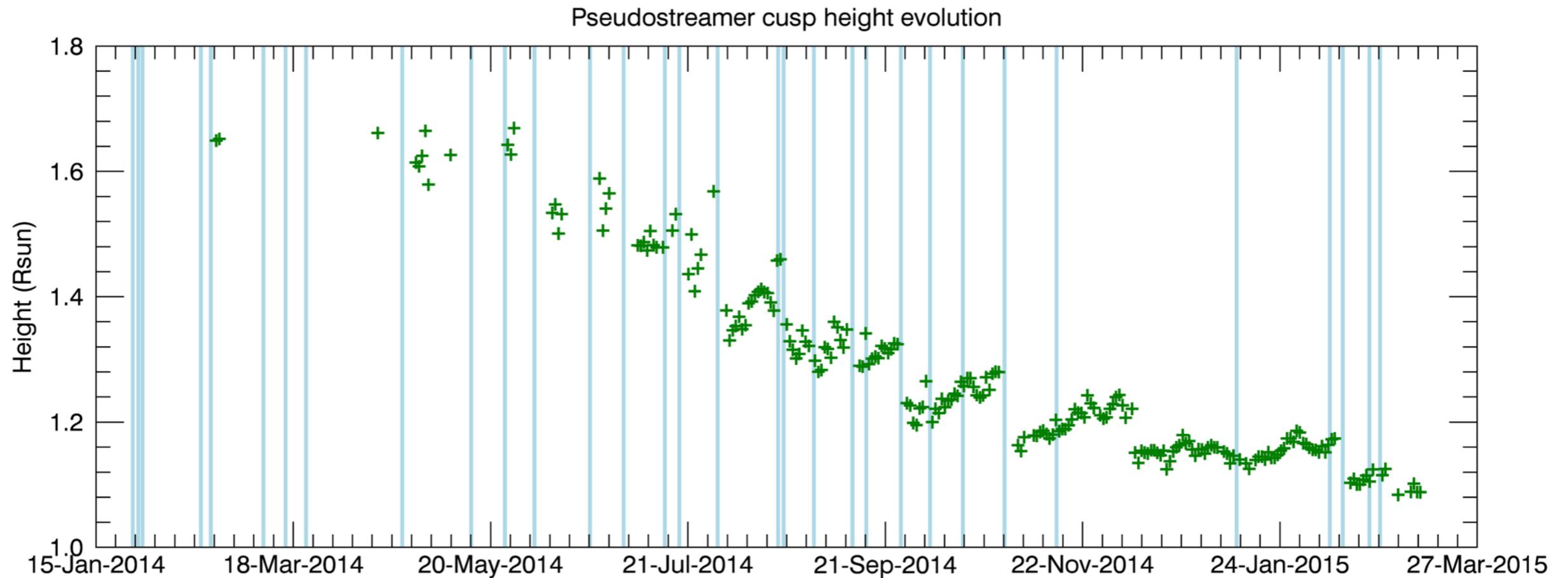
# TRACING THE CORONAL STRUCTURE EVOLUTION

2014-06-12T01:11:22 SWAP 17.4 nm (inverted colortable)



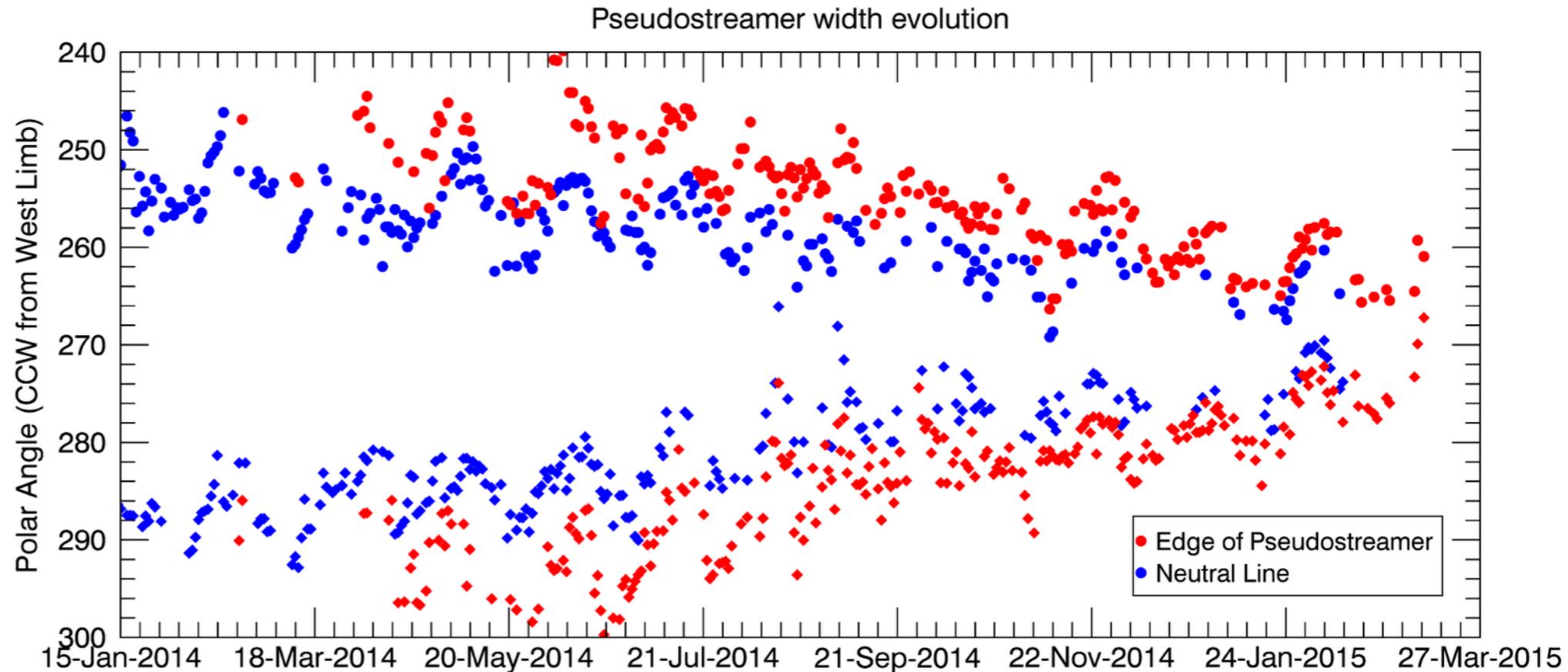
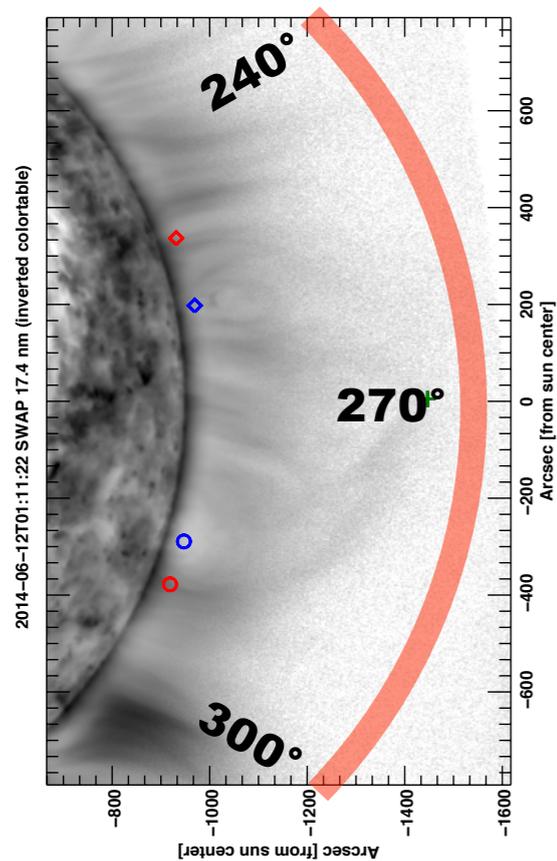
# STRUCTURE EVOLUTION - HEIGHT

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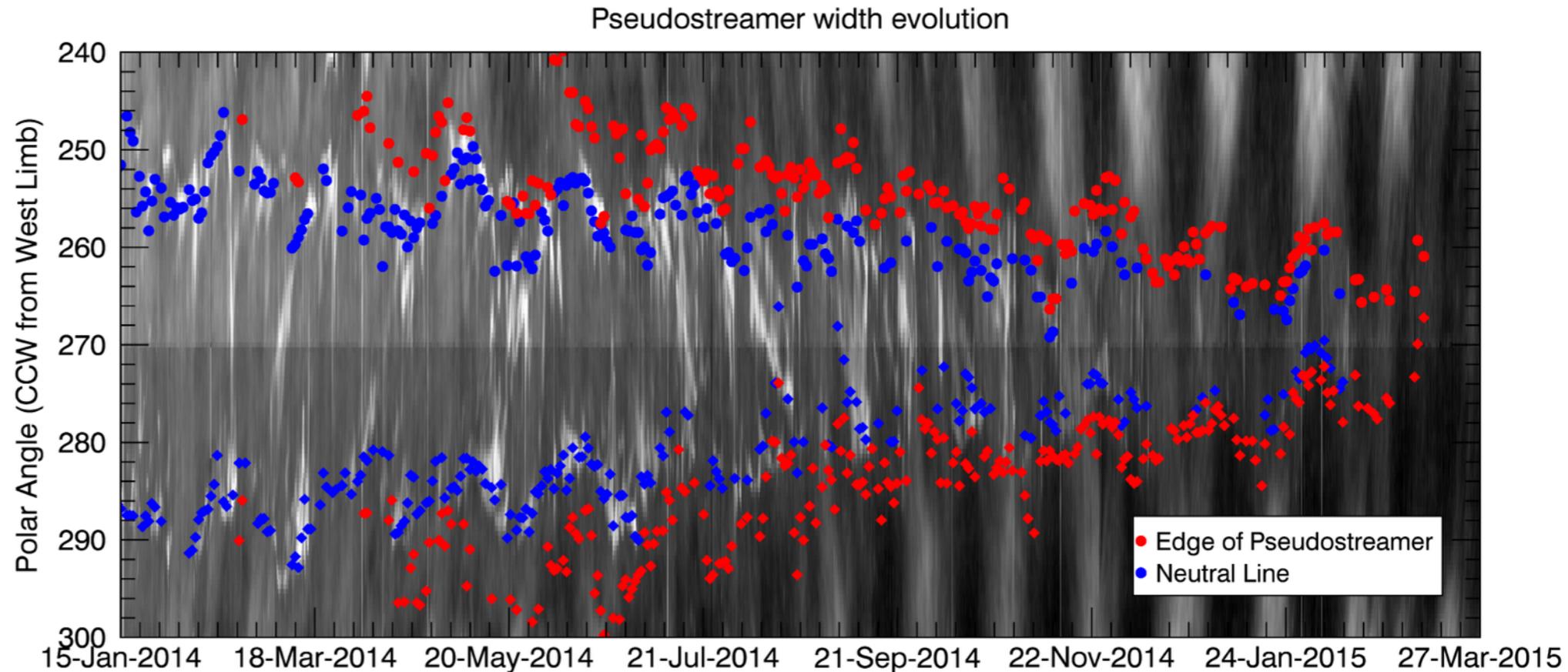
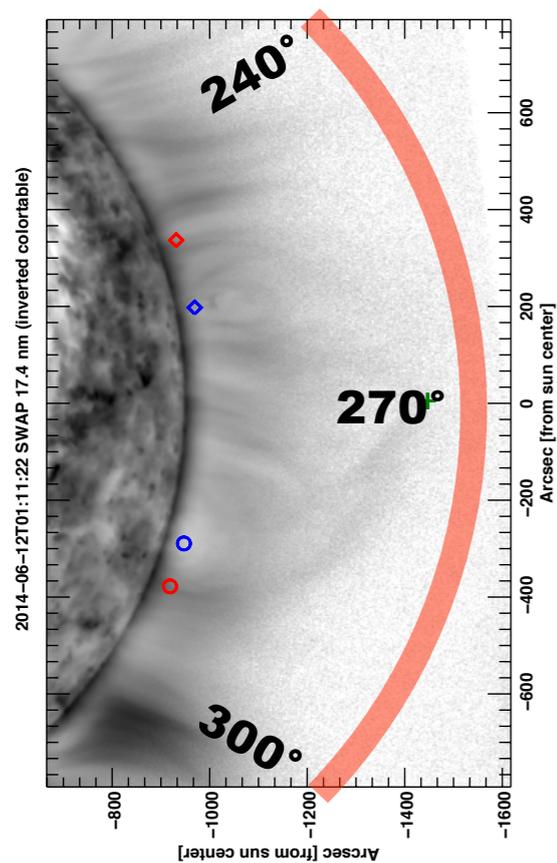
- The pseudostreamer shrinks over the course of the year.
- Eruptions are common, after which the structure reforms.

# STRUCTURE EVOLUTION - WIDTH



- Pseudostreamer appears in March 2014 and shrinks in width over time.
- The center of the neutral line is  $\sim 5$  degrees from the rotational axis.

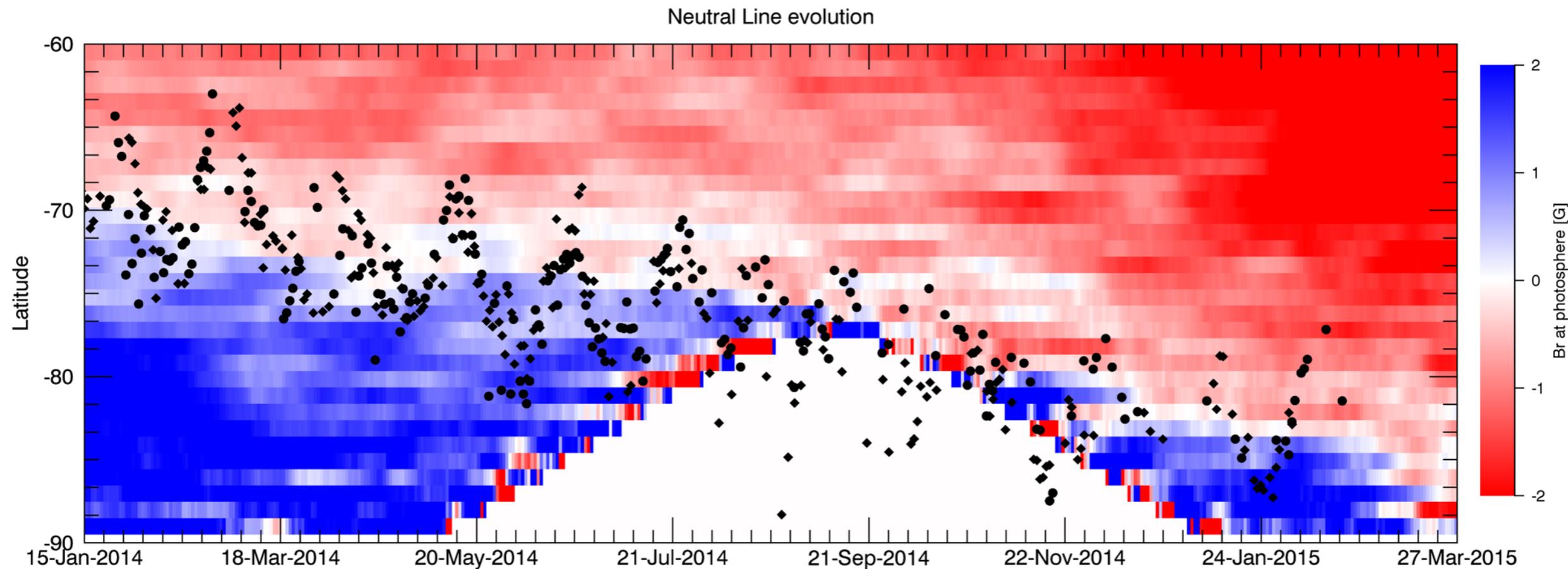
# STRUCTURE EVOLUTION - WIDTH



AIA 304 background data from Karna et al 2015, DOI:10.1088/0004-637X/810/2/124

- Pseudostreamer appears in March 2014 and shrinks in width over time.
- The center of the neutral line is  $\sim 5$  degrees from the rotational axis.

# COMPARISON TO PHOTOSPHERE MEASUREMENTS

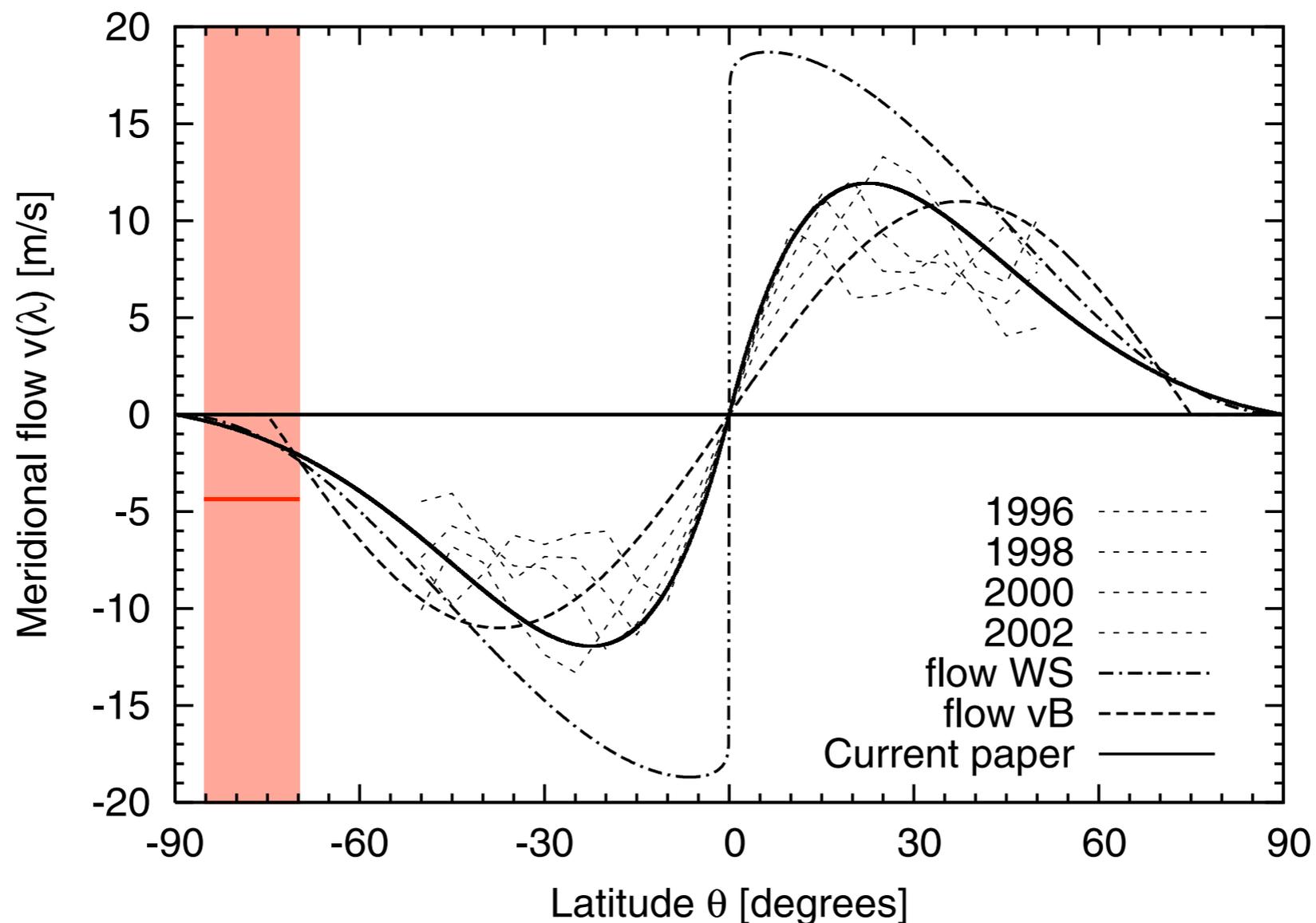


- The neutral line tracks well with the magnetogram data.
- Neutral line moves poleward at  $\sim 4.5$  m/s over the course of a year.

# NEUTRAL LINE MOVEMENT

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- Measured poleward speed of  $\sim 4.5$  m/s.
- Consistent with meridional flow speeds at high latitudes.
- Combination of meridional flow and diffusion ( $\sim 600$  km<sup>2</sup>/s).



# CONCLUSIONS

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- The south pole had a simple axisymmetric field reversal.
- The coronal field structure can be used to trace the field reversal.
- The *corona and heliosphere* reversed polarity a year before the *photosphere*.

