Strong rotation of an erupting quiescent polar crown prominence

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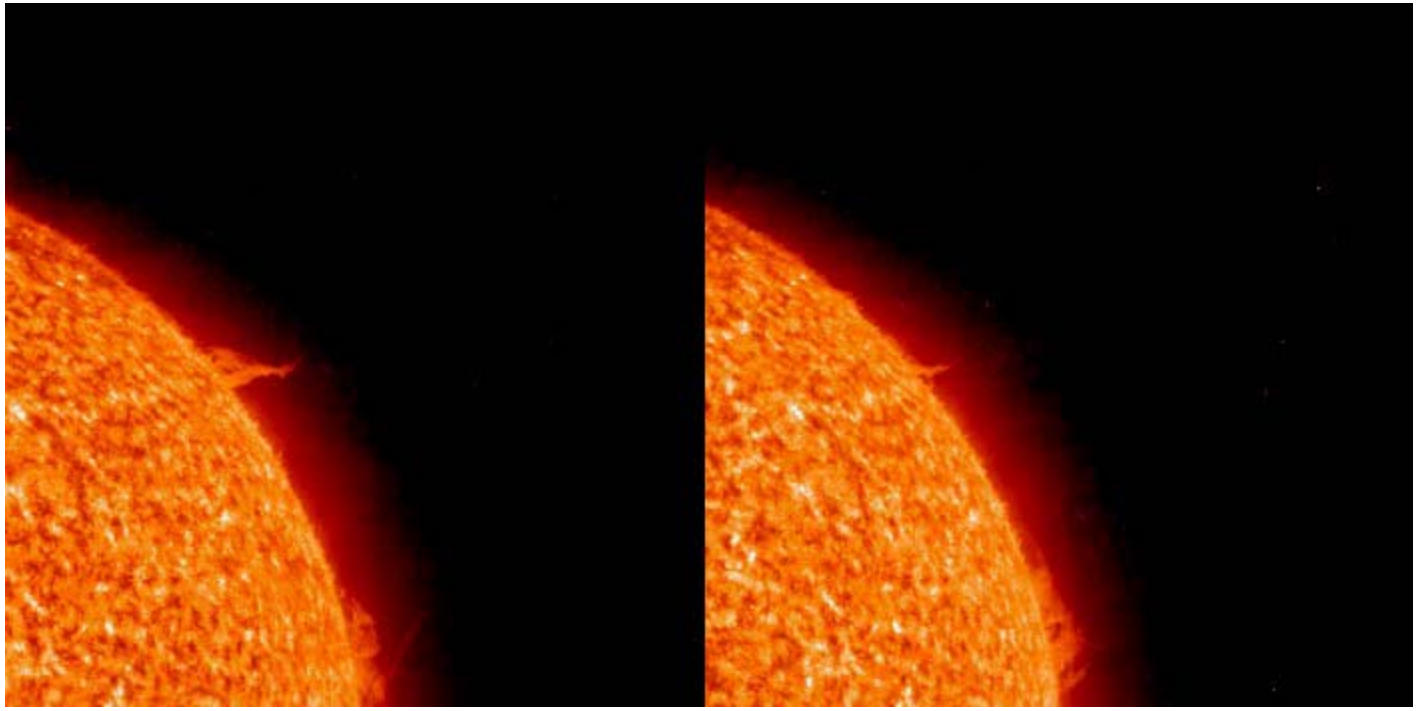
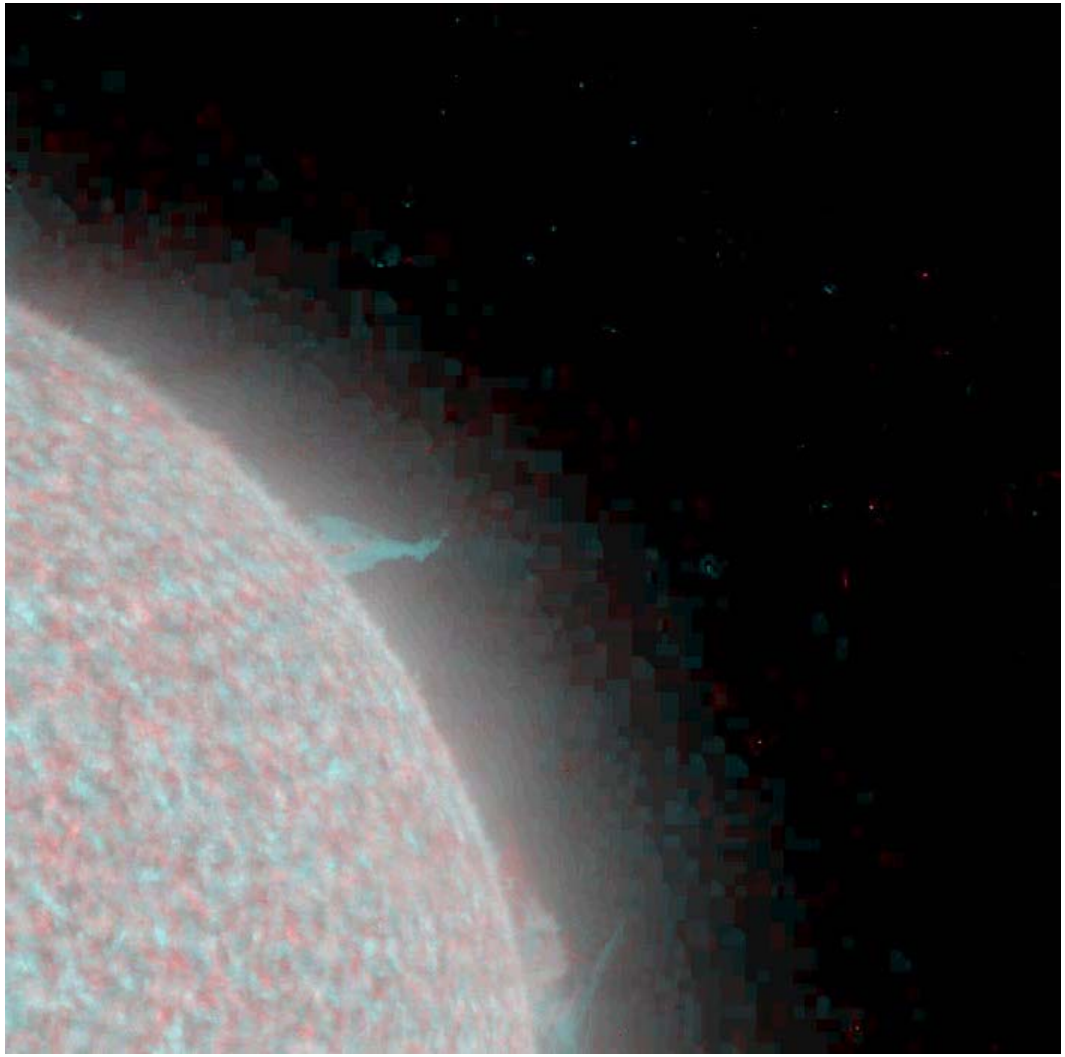
- On 6 June 2007, a quiescent polar crown prominence erupted over the northwest limb, and was observed at 304 Å by both STEREO spacecraft.
- The angular separation was 11°.6.
- By triangulating small filamentary features in the prominence, the time-dependent 3D structure can be derived.

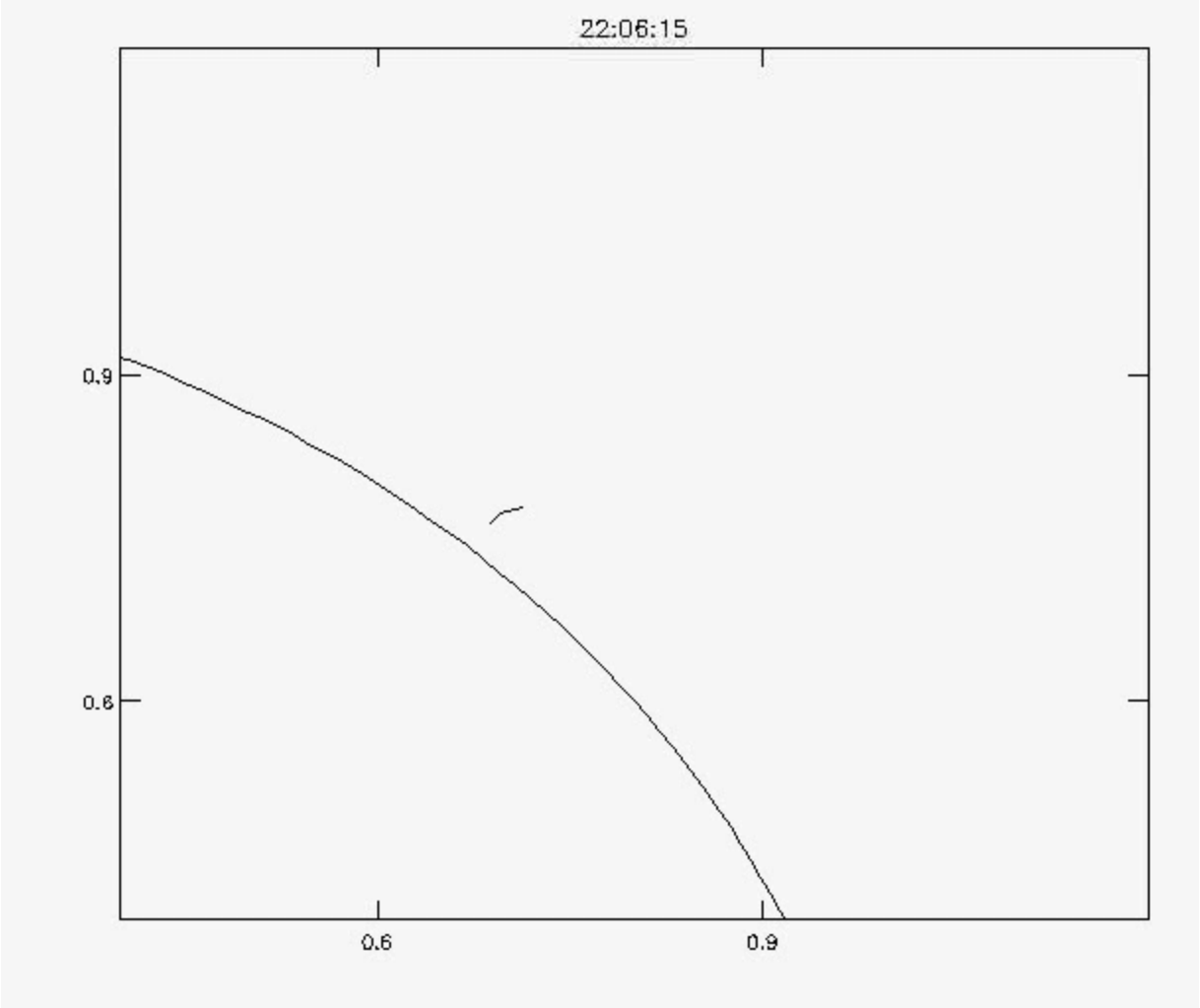


Ahead Behind

- Same data shown as anaglyph movie.

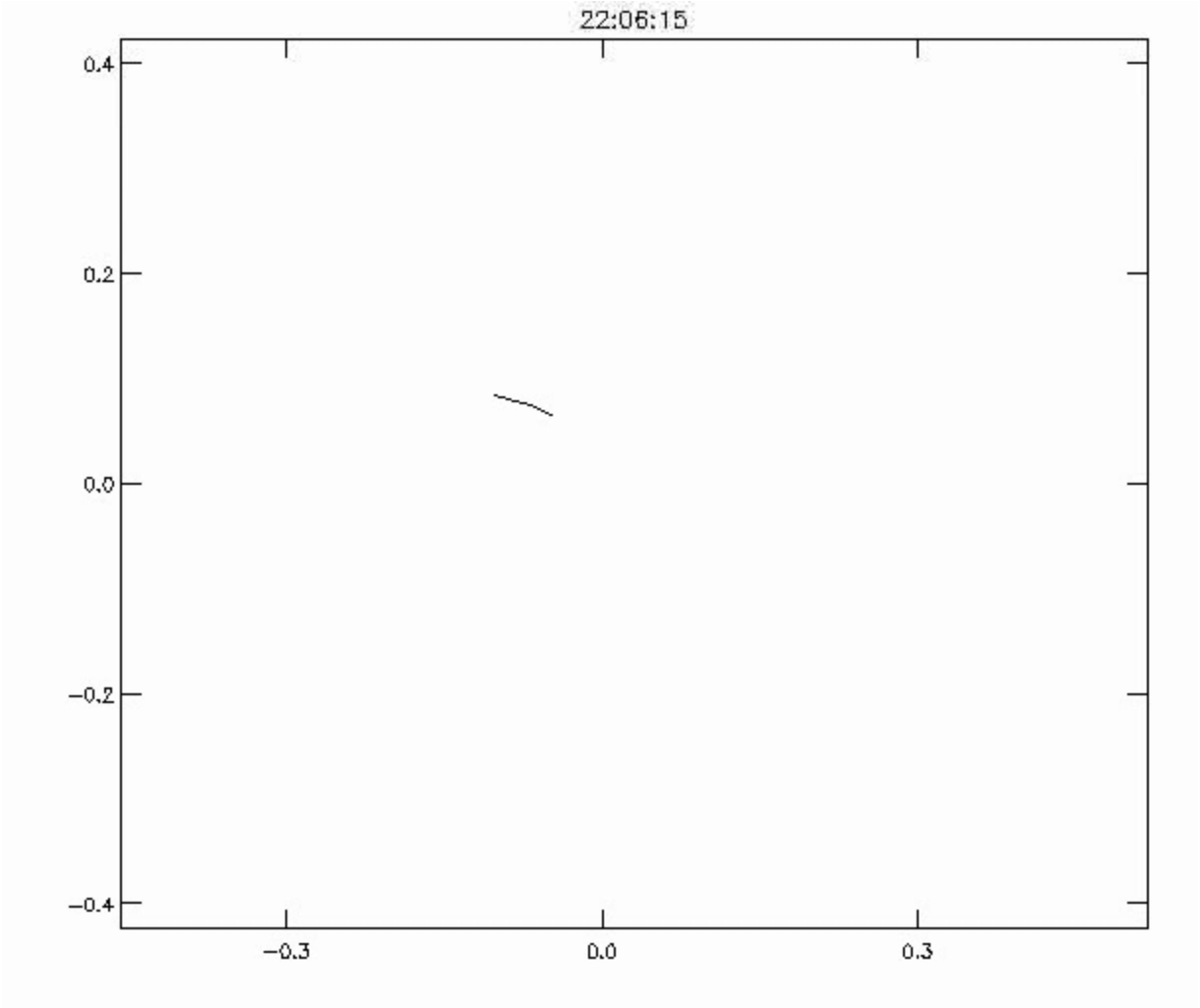


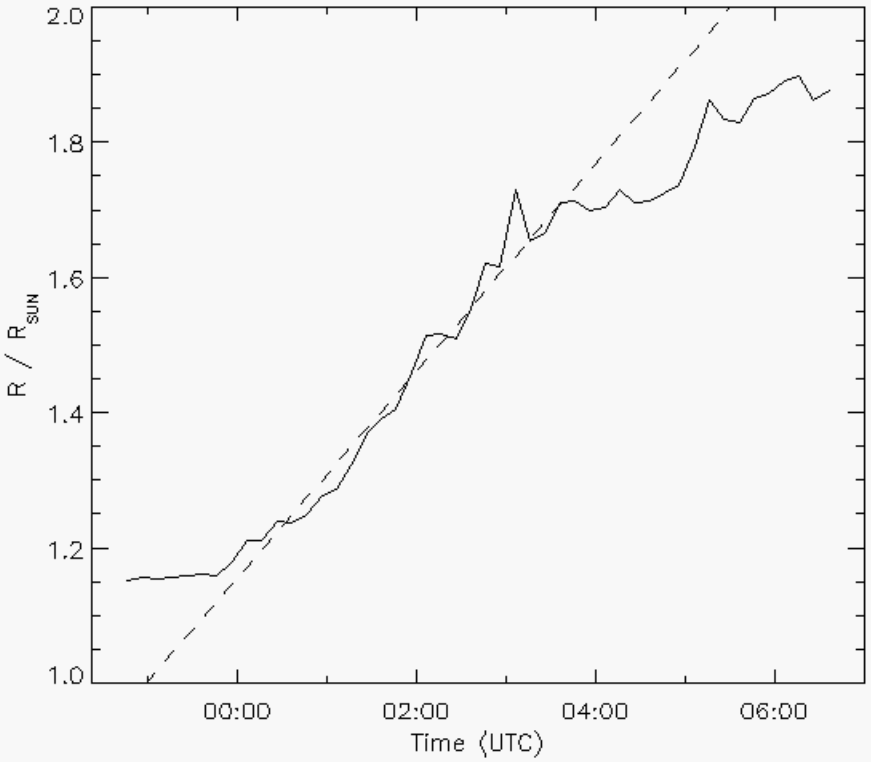
- This movie shows the derived prominence structure as seen from STEREO-Behind.



- This movie shows the derived prominence structure as seen from heliographic longitude 128° and latitude 38°, i.e. from above (**orthographic view**).

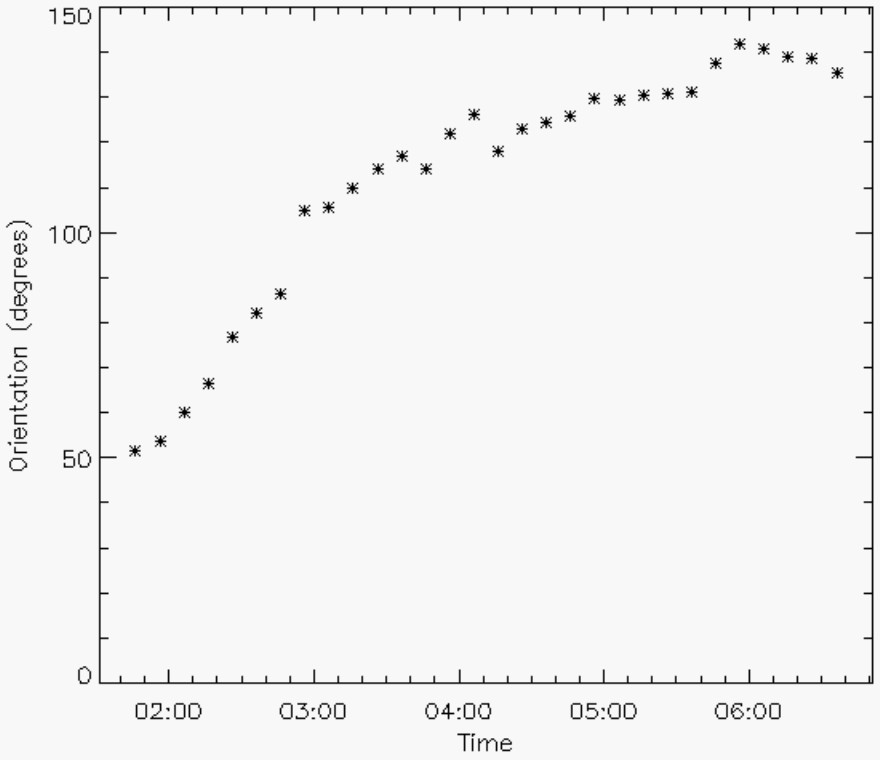
- The prominence structure is more compact when seen from above, i.e. a vertical sheet.
- The prominence spine rotates counter-clockwise as it erupts.
- The northern end of the prominence disappears before the eruption is complete.



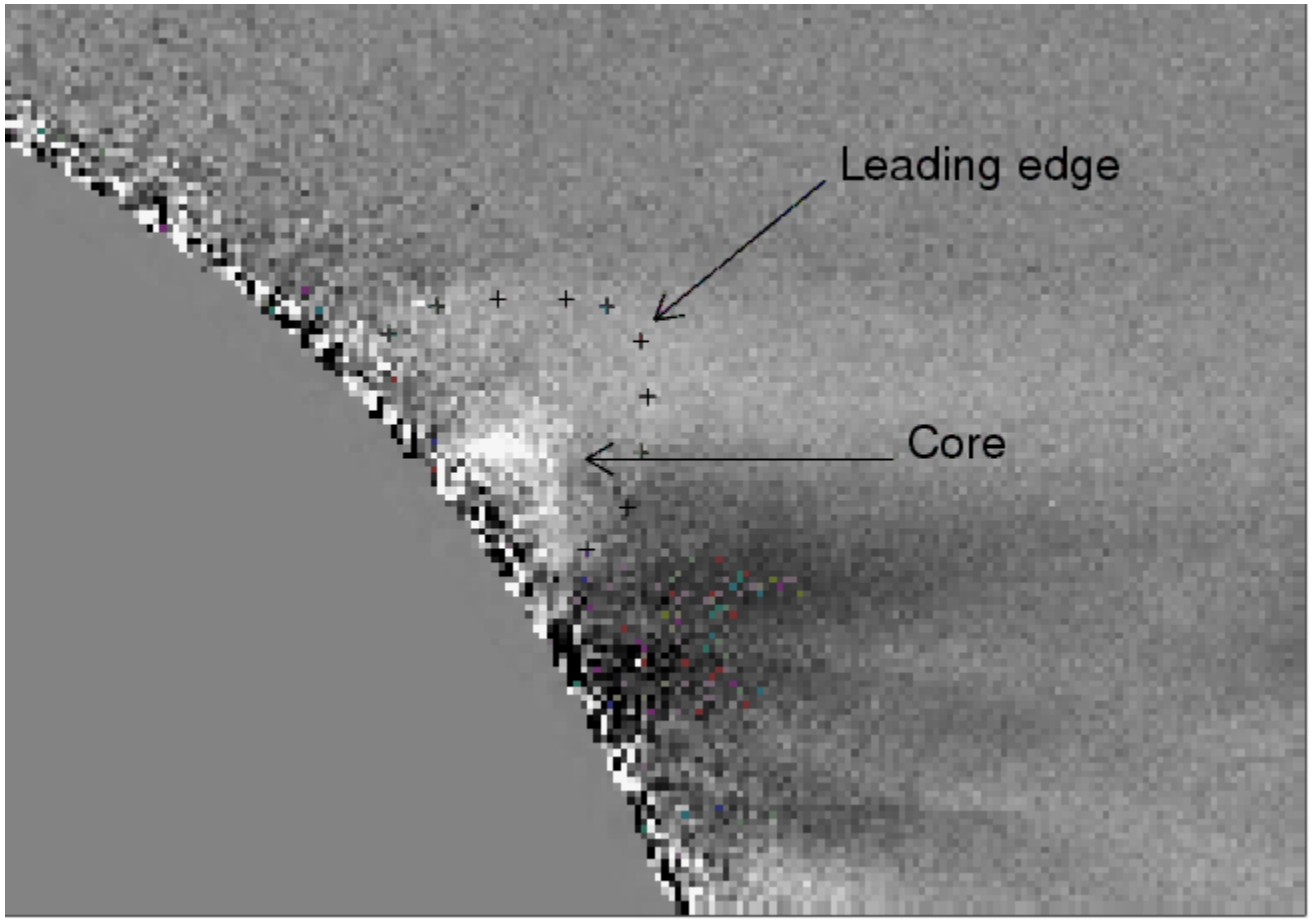


- Initial rise rate of 30 km/s.
- Apparent slowdown after 4:00 UT due to disappearance of the northern part of the prominence.
- Weak CME seen in coronagraph data.

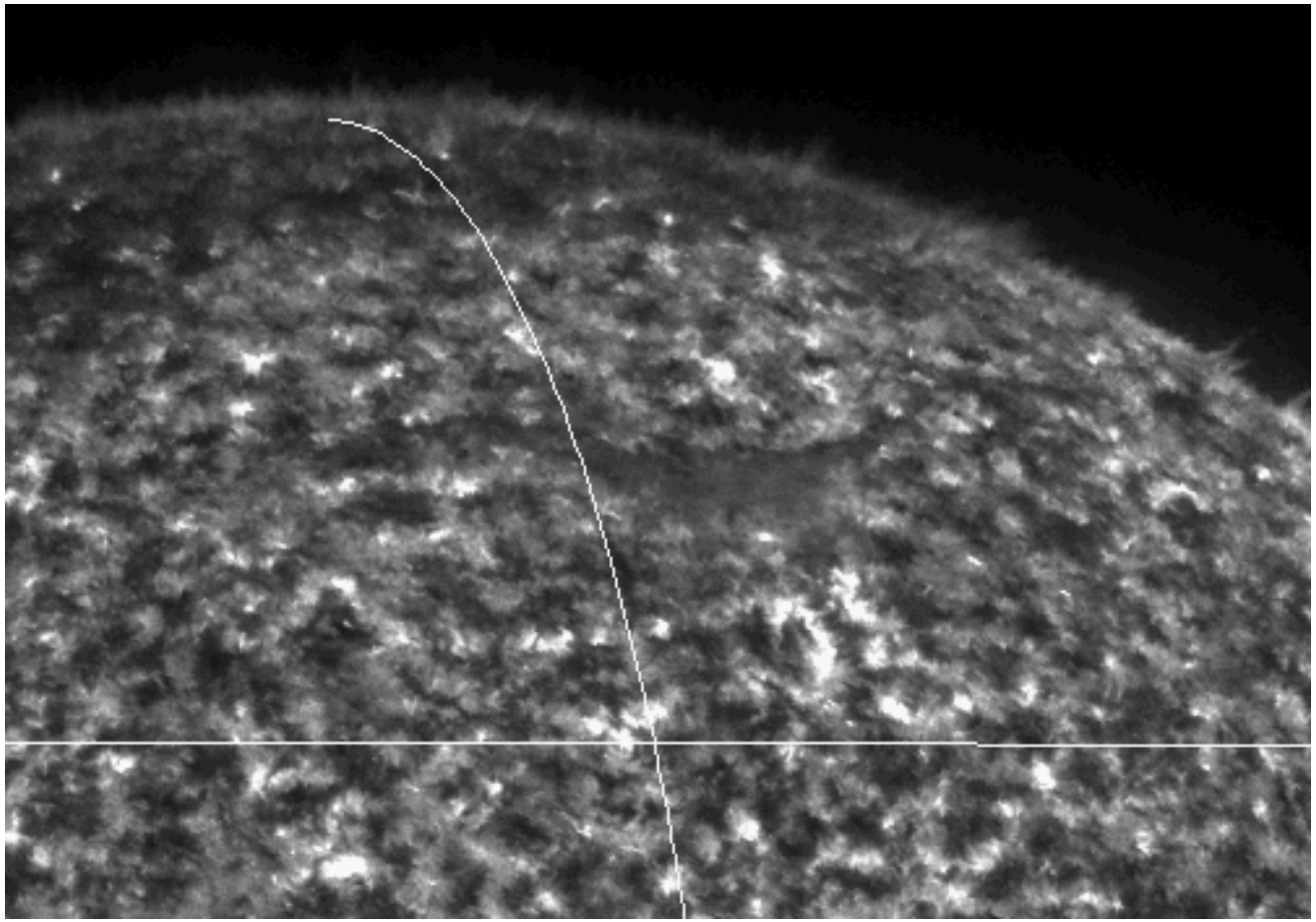
- Rotation of at least 90° degrees.
- Additional rotation likely before 2:00 UT.
- Original orientation expected to be closer to 0°, based on filament observations from several days before.



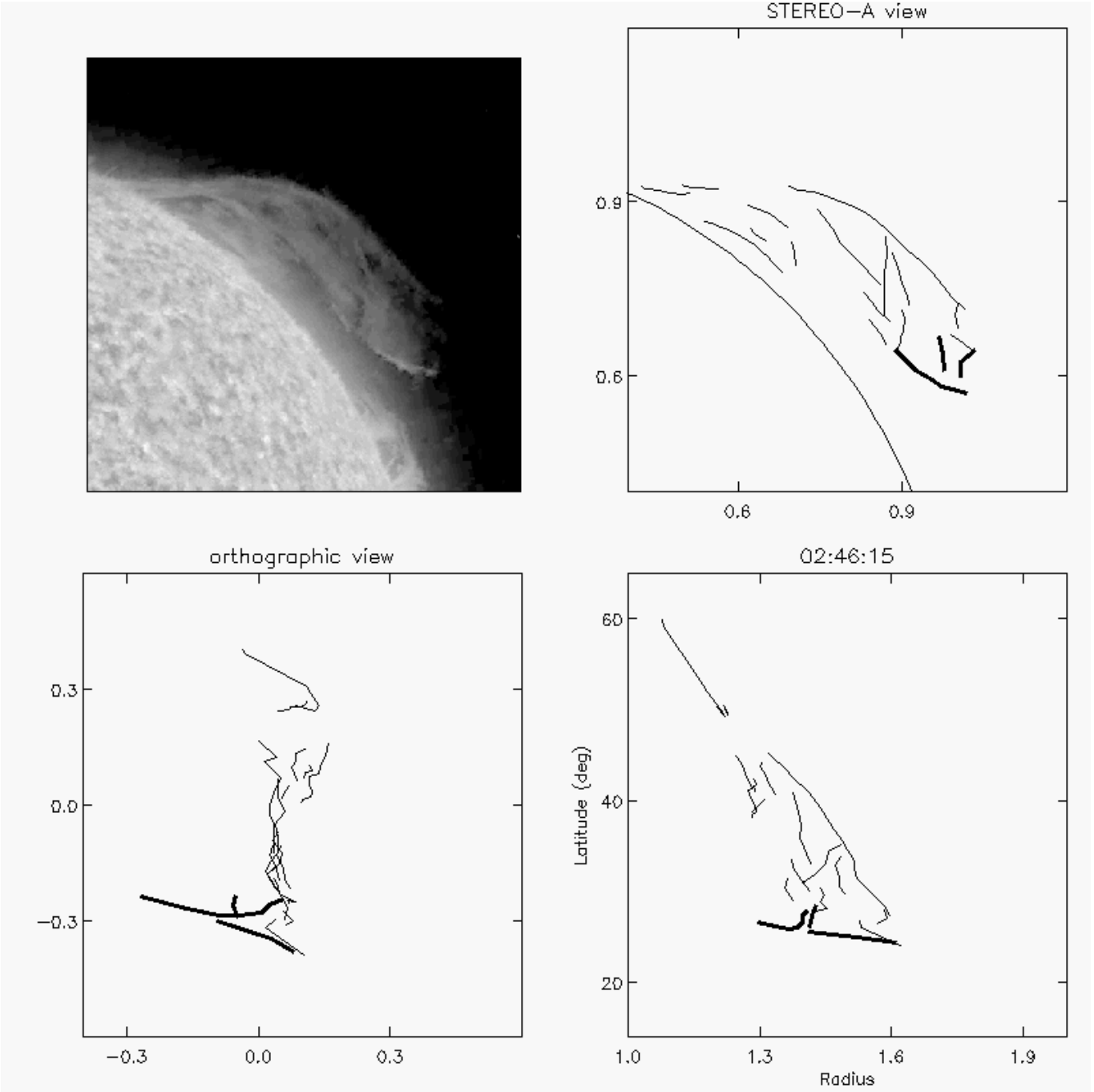
- Image seen in COR1-A showing 3-part structure.
- Prominence core quickly fades away—not seen in COR1-B.
- Weak CME in CDAW catalog. Seen in SEEDS, ARTEMIS, but not CACTus.
  - COR1 catalog only describes “spitting”.



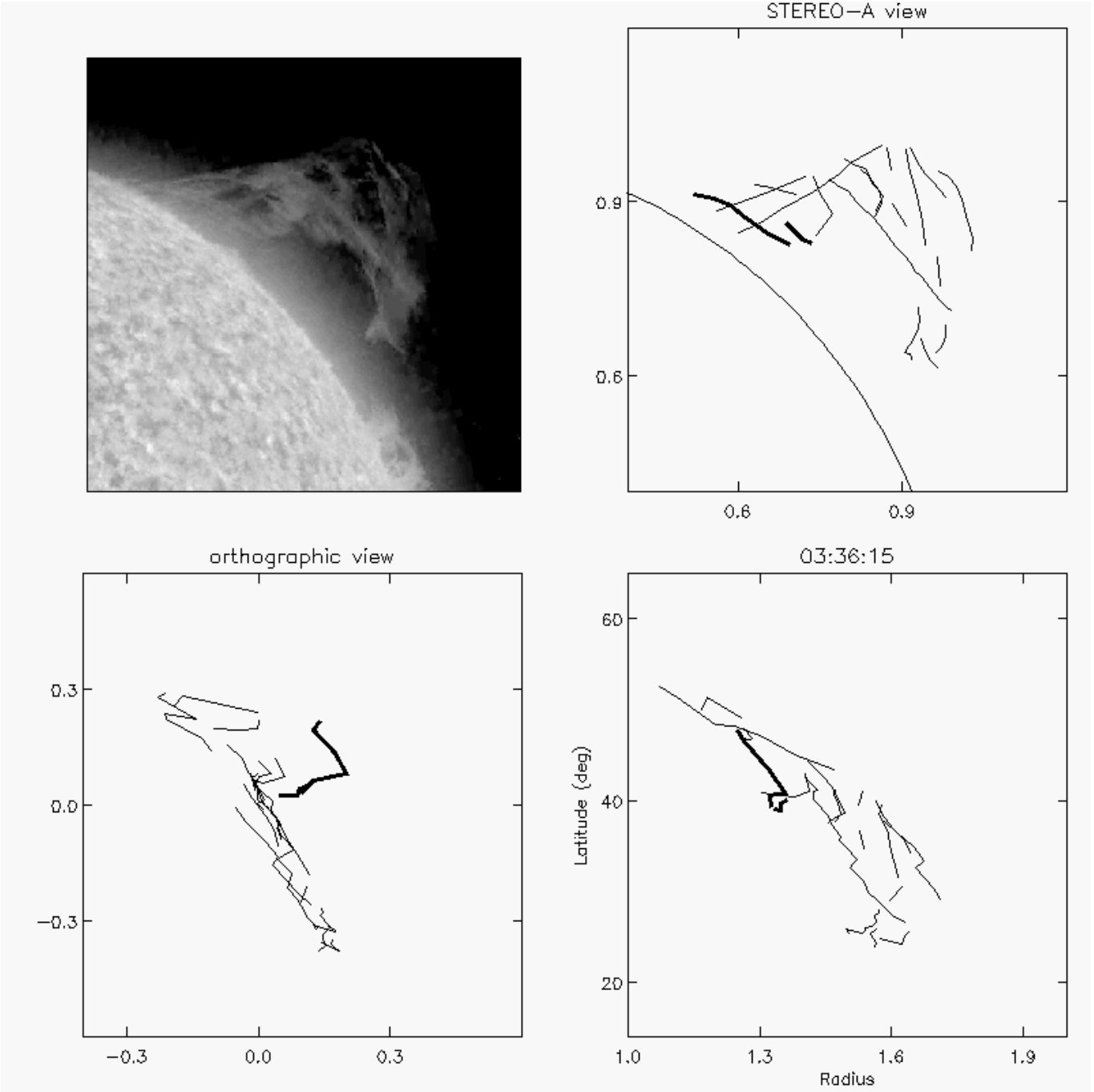
- Image of filament from 29 May 2007 as seen by STEREO-Ahead. Close to constant latitude, with local variations.
- Longitude and latitude of orthographic view overplotted. Prominence moved south during eruption.



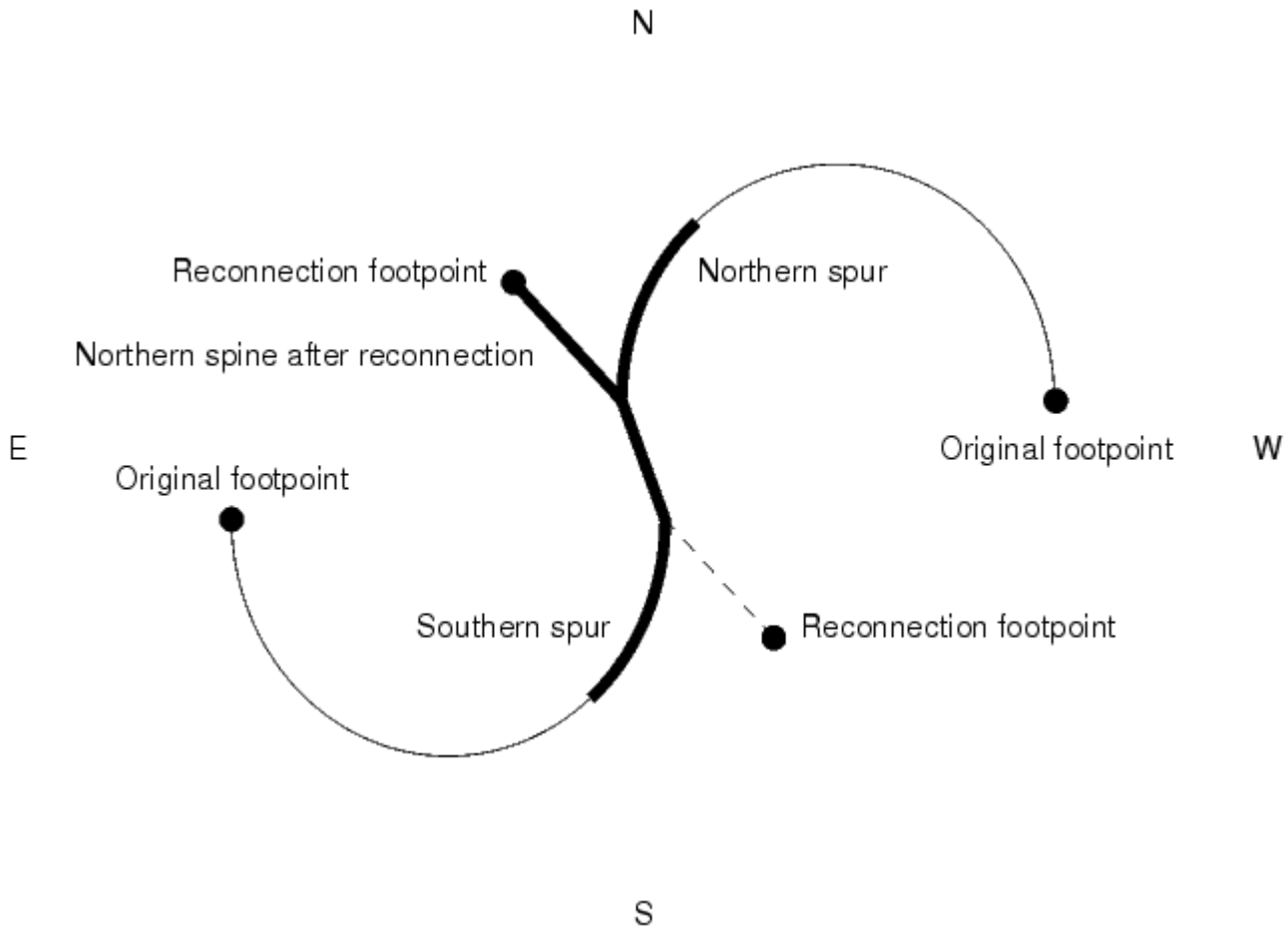
- Two structures (“spurs”) are seen coming out of the spine of the promince.
- The “southern spur” is seen between 2:26 and 3:16 UT.
- It comes off at an acute angle from the southern end of the spine at a constant altitude.



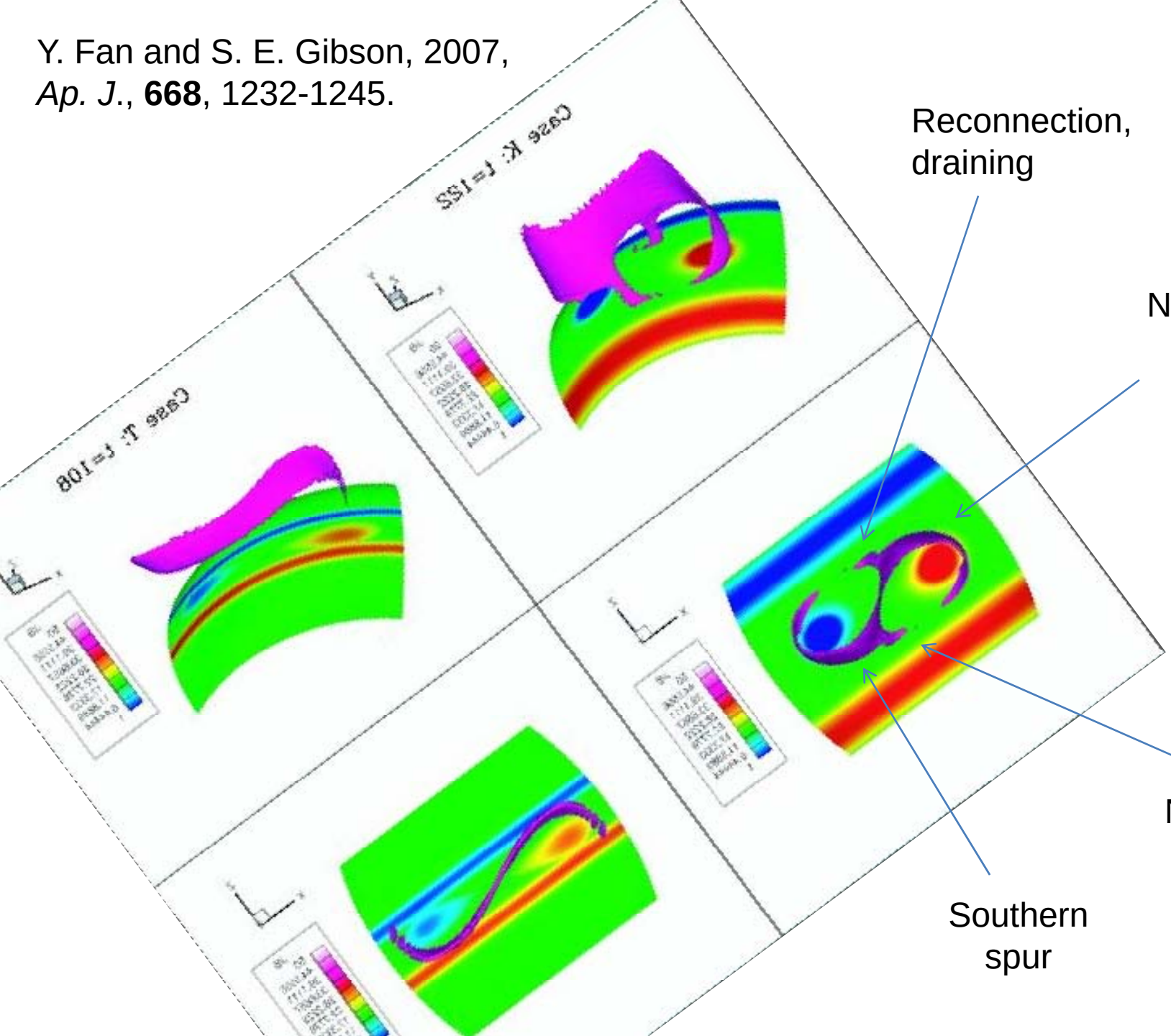
- The “northern spur” is seen between 2:36 and 4:06 UT, but may have existed earlier.
- It comes off at an angle from the midpoint of the spine.
- The northern part of the spine is connected back to the surface, and both northern branches are drained through these field lines.



- Cartoon showing assumed geometry.



Y. Fan and S. E. Gibson, 2007,
Ap. J., **668**, 1232-1245.



Reconnection, draining

Northern spur

Not seen

Southern spur

Interpretation & Conclusions

- Demonstrated use of triangulation for deriving detailed structure of erupting prominences in (early) STEREO data.
  - Also expect to be able to use the technique near 180° separation.
- Prominence rotated by *at least* 90° as it erupted, possibly more.
- Northern spur interpreted as evidence of reconnection. Spur is left-behind original spine of the prominence, while new spine forms to the east via reconnected field lines.
- Southern spur also formed through reconnection, but reconnected field lines not seen. Spur is left-behind portion of original spine.
- Two northern branches drained through reconnected field lines. Only southern part of prominence erupts.
- Prominence moves southward as it erupts. Weak CME seen in coronagraphs consistent with final southern location.
- Initial rise and rotation via helical kink instability. Reconnection causes further rotation.
- Observations consistent with model “K” of Fan and Gibson (2007).