Effects of supra-arcade downflows (SADs) interacting with the post-flare arcade

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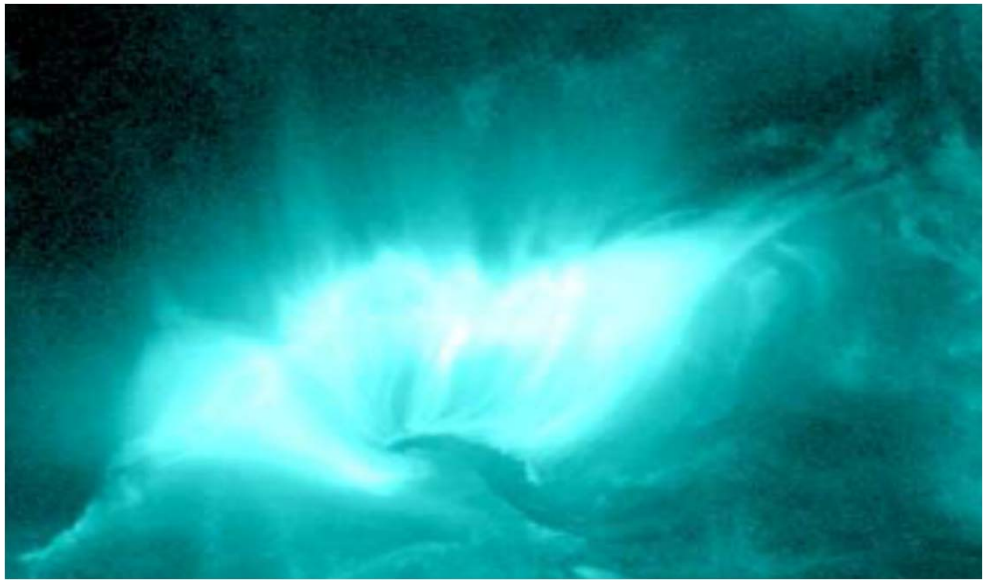
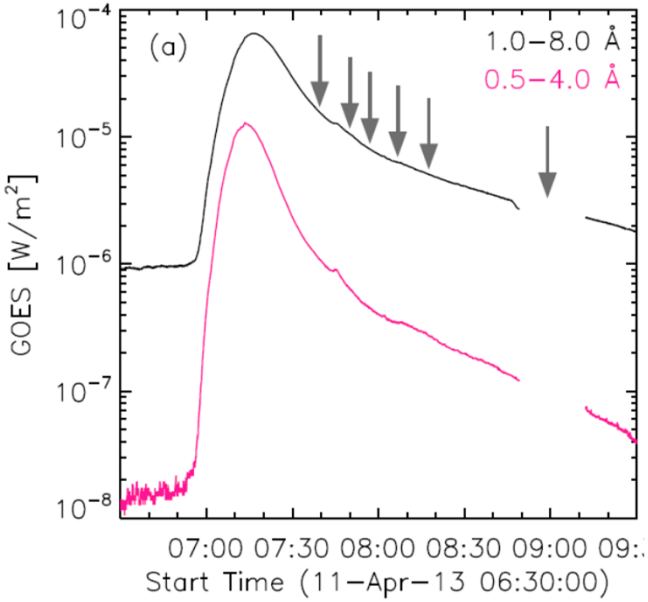
Introduction

- Supra-arcade downflows (SADs) are tadpole-shaped dark voids that descend through the cusp-shaped field lines of the current sheet.





- We investigate six clear episodes of SADs in the gradual phase of 11 April 2013 M-class flare.

- On-disk location enabled us to probe the effects of the interaction of SADs with the post-flare loop arcade and foot-points.

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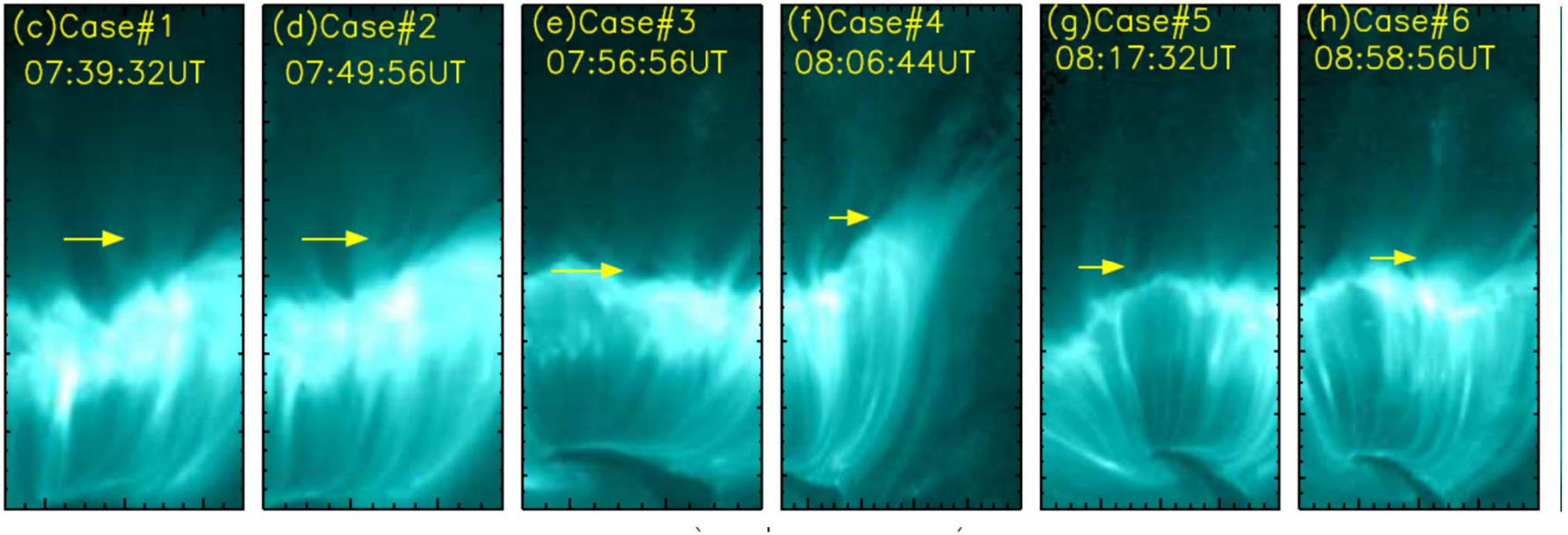

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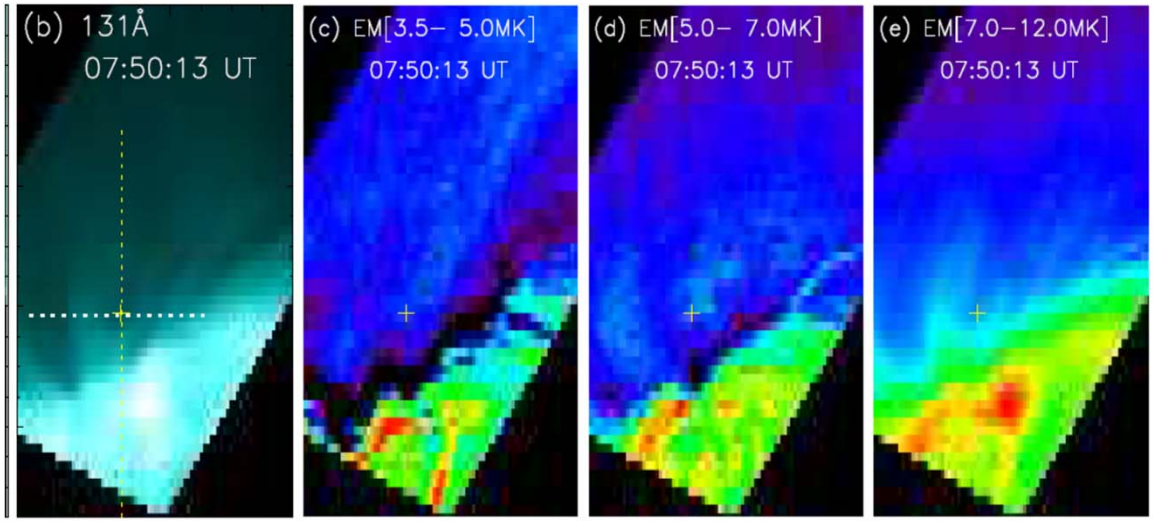
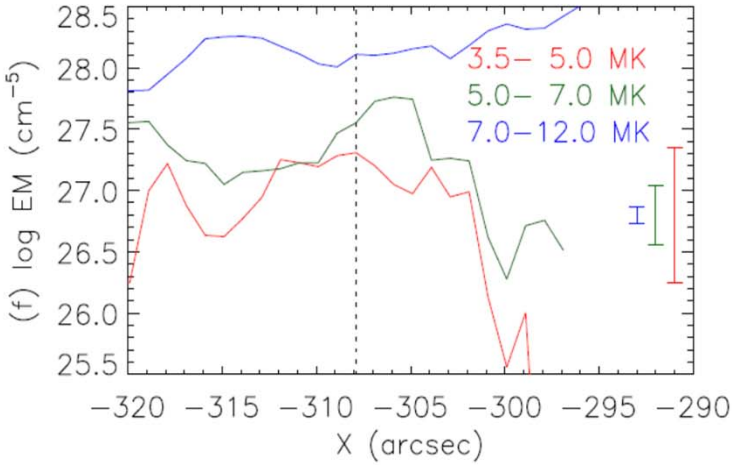
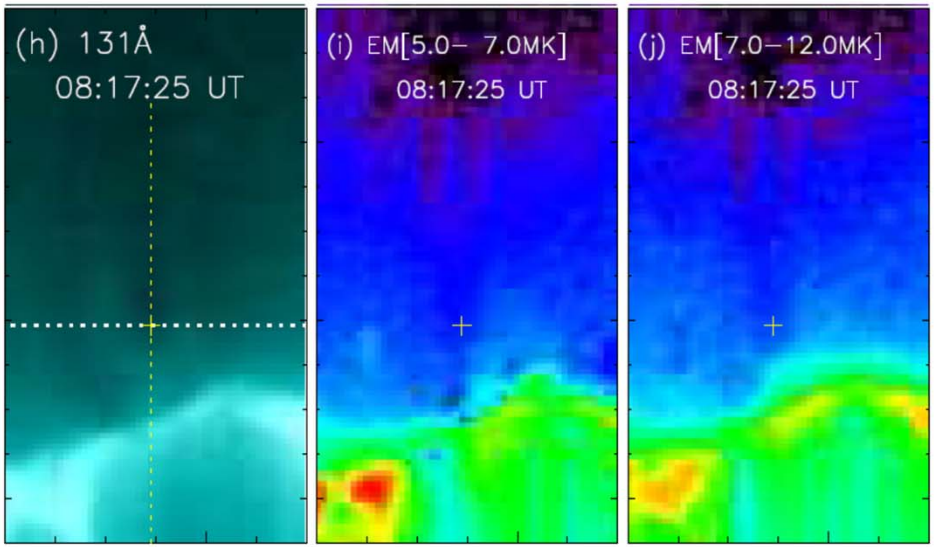
Thermal Characteristics

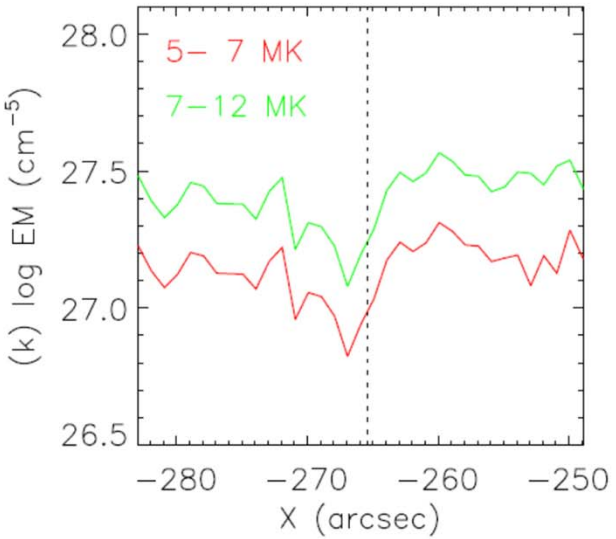
- SAD enclose plasma (enhanced EM) in 5—7 MK temperature range.





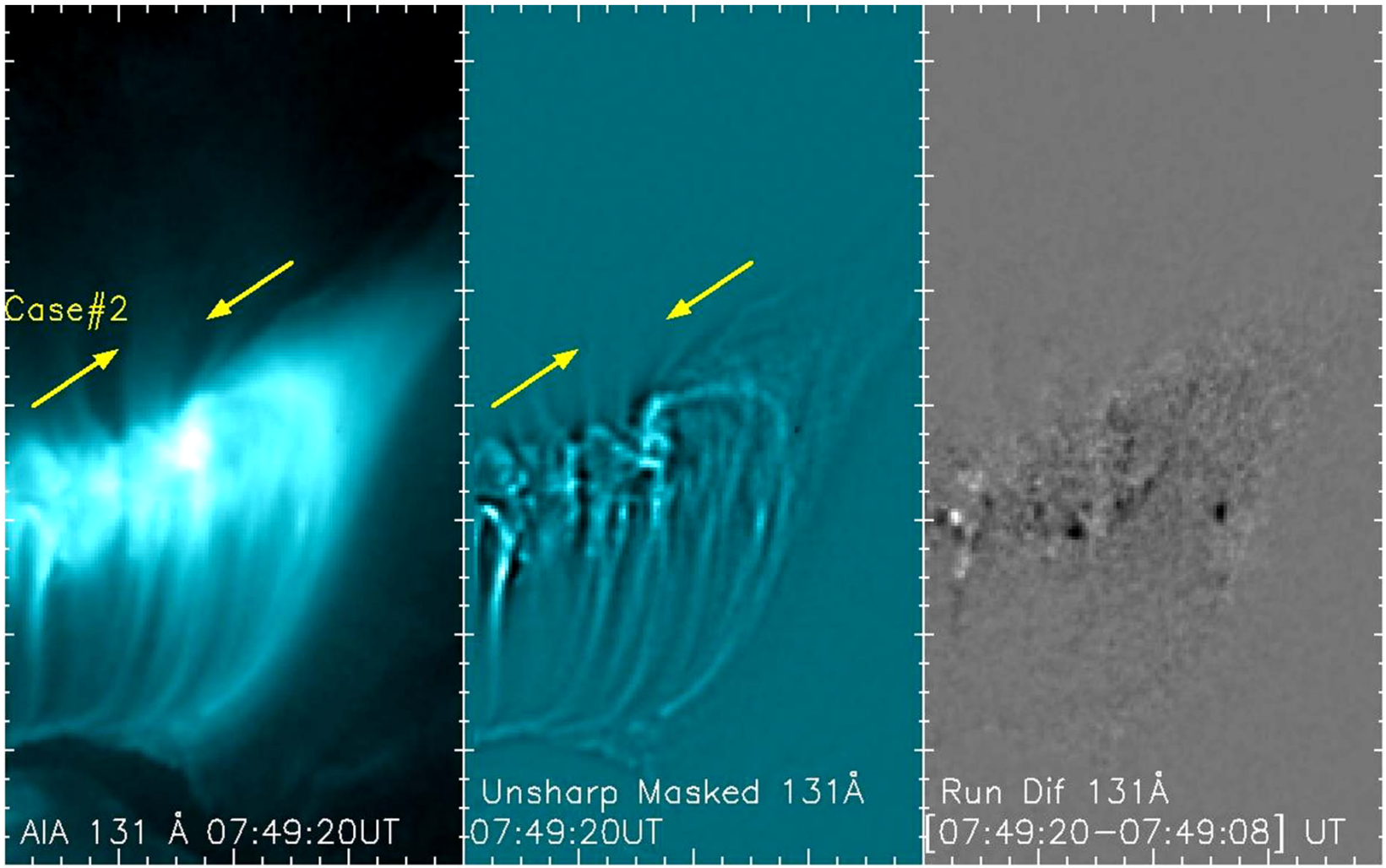
- Late in the gradual phase, SAD cases did not show such signature. Cooled down!





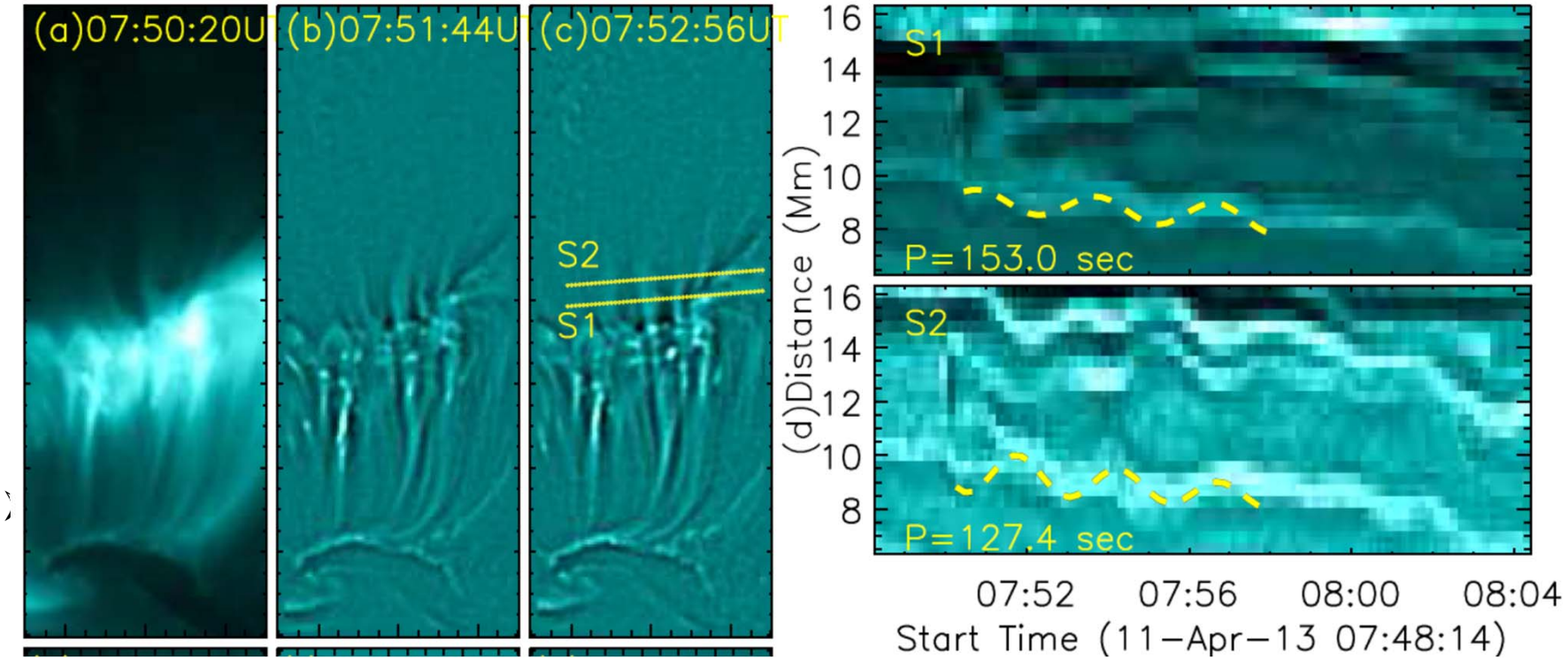
Perturbations due to SAD's interaction

- Transverse oscillations exhibited by supra-arcade rays in response to the passage of SAD cases.



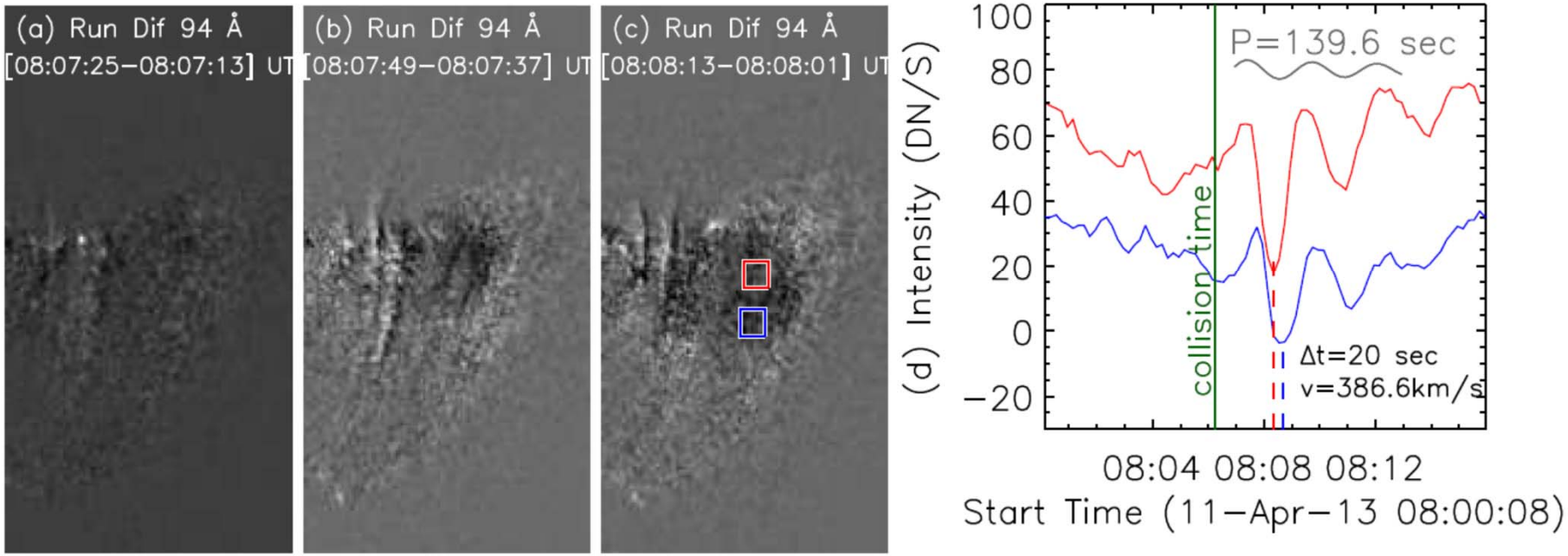
Perturbations due to SAD's interaction

- Transverse oscillations exhibited by supra-arcade rays in response to the passage of SAD cases, Osclln period: 120-160s.



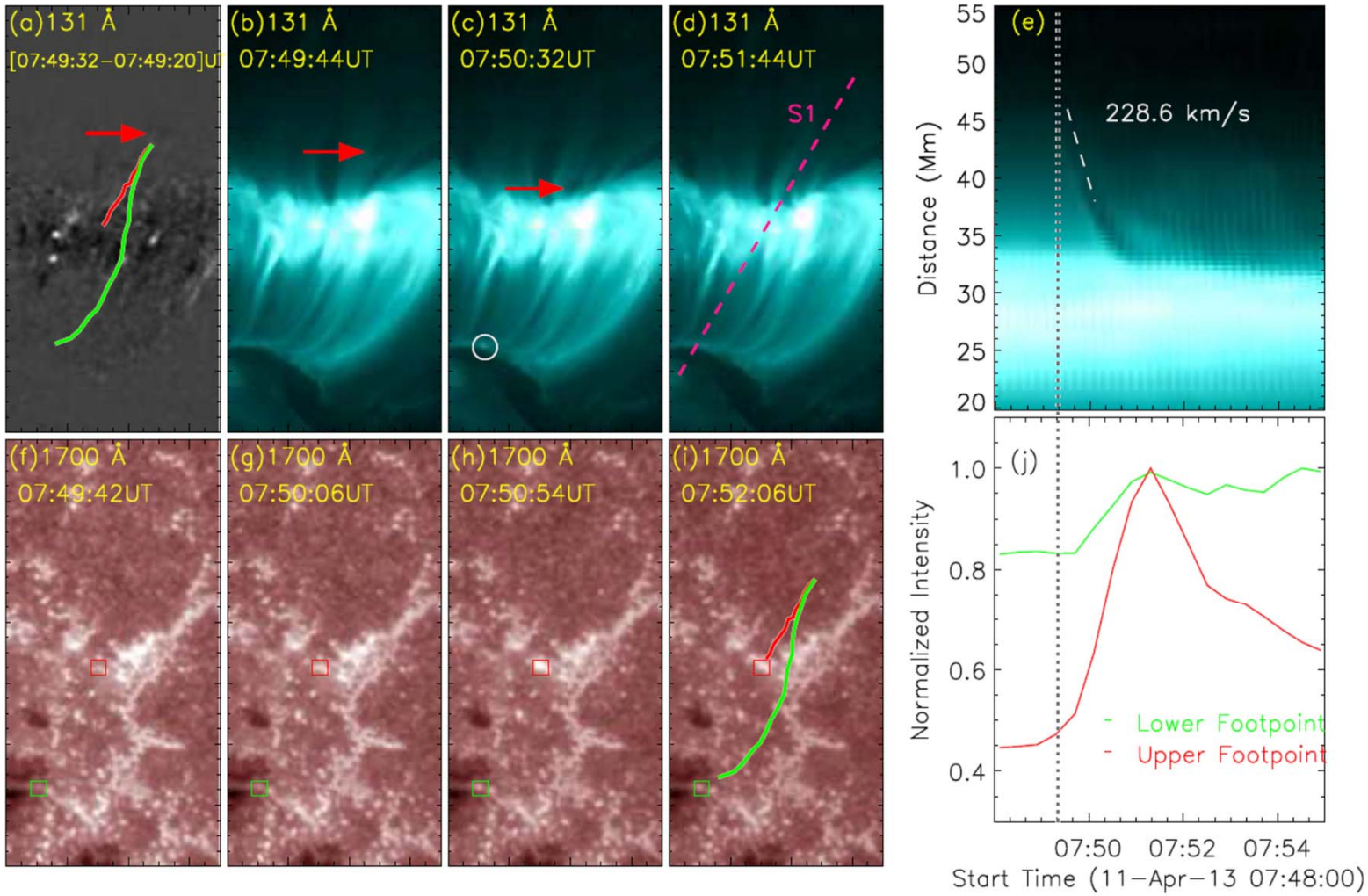
Perturbations due to SAD's interaction

- Propagating EUV intensity oscillations exhibited by the post-flare loop-arcade generated due to the SAD's collision, Osclln period: ~150s, Propagation Speed ~ 400 km/s.



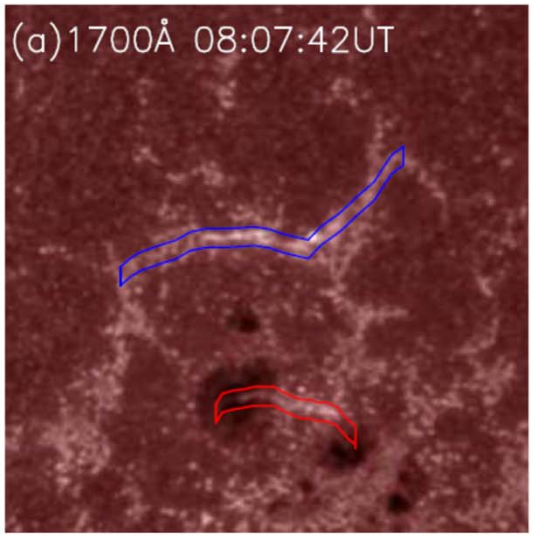
Perturbations due to SAD's interaction

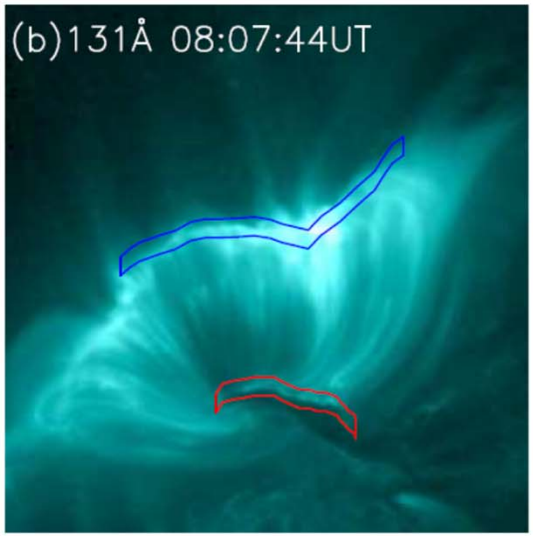
- EUV and UV enhancements at the loop top and foot-points due to SAD's interaction with the supra-arcade rays. Speed ~ 2200 km/s.

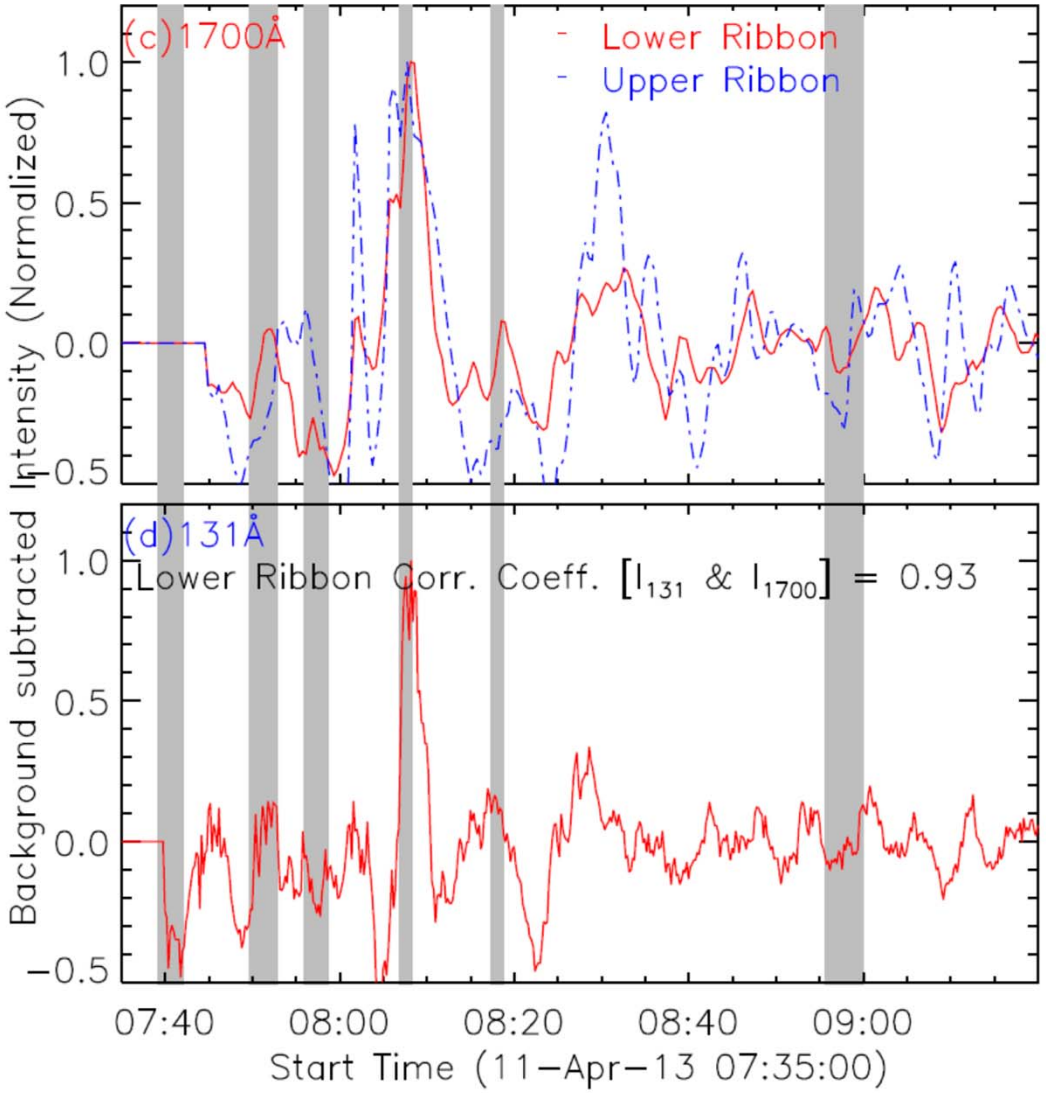


Perturbations due to SAD's interaction

- Emission at the ribbon location due to the SAD's interaction with the post-flare loop-arcade. Quasi-periodic Pulsation~ 10 Min Speed ~ 2200 km/s.







Conclusion

Awasthi+Liu+Gou, Submitted to ApJ

- SAD cases that occurred close to the flare-maximum contained 5—7 MK hot plasma.
- Besides known effects (transverse waves in the supra-arcade field lines) Interaction of void with post-flare loop arcade revealed:
  - i. EUV intensity perturbations propagating across the arcade with a speed ~400 km/s.
  - ii. UV Foot-point brightenings in immediate response to the SAD's interaction with cusp-shaped loops (speed ~ 2100 km/s).
  - iii. Quasi-periodic UV brightening at foot-point in response to SAD occurrence rate, indicates its contribution in the often observed quasi-periodic nature of flare emission.