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What do coronal dimmings tell us about magnetic connectivity and reconfiguration during the early stage of a solar eruption?

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Coronal dimmings are temporary regions of strongly reduced emission in extreme-ultraviolet (EUV) and soft X-rays caused by expansion and evacuation of plasma associated with coronal mass ejections (CMEs).
We seek to gain insight into observed features of coronal dimmings (location, dynamics, intensity distribution) as they relate to magnetic reconnection due to the associated flare. We analyze the X2.1 flare/CME event on September 6, 2011 by combining EUV observations of coronal dimmings from SDO/AIA with MHD simulations initiated by a non-force-free magnetic field extrapolation.
The extrapolation captures a 3D null point configuration overlying a highly sheared arcade, co-spatial with an observed sigmoid in 94Å. Prior to the flare, small but distinctly bipolar dimming regions are observed in 211Å logarithmic base-ratio images. These dimmings likely form due to rising magnetic loops reconnecting at the pre-existing 3D null point; the reconnection leads to the expansion and loss of previously confined plasma.
The simulated dynamics show the transfer of twist from the arcade to the overlying loops through reconnection, forming a flux rope. We find that simultaneous reconnections at the 3D null and an X-type geometry, newly formed between the flux rope and lower-lying arcades, can explain the observed flare ribbons.
Finally, reconnection at the 3D null transforms closed inner spine field lines into open field lines of the outer spine. Footpoints of these field lines appear to trace the dome as they correspond to a ring-shaped dimming region. Plasma loss along open field lines can potentially explain dimming regions of strongest intensity decrease.

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