Observational Signatures of Magnetic Reconnection in the Extended Corona

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Abstract

Observational signatures of reconnection have been studied extensively in the lower corona for decades, successfully providing insight into energy release mechanisms in the region above post-flare arcade loops and below 1.5 solar radii. During large eruptive events, however, energy release continues to occur well beyond the presence of reconnection signatures at these low heights. Supra-Arcade Downflows (SADs) and Supra-Arcade Downflowing Loops (SADLs) are particularly useful measures of continual reconnection in the corona as they may indicate the presence and path of retracting post-reconnection loops. SADs and SADLs have been faintly observed up to 18 hours beyond the passage of corona mass ejections through the SOHO/LASCO field of view, but a recent event from 2014 October 14 associated with giant arches provides very clear observations of these downflows for days after the initial eruption. We report on this unique event and compare these findings with observational signatures of magnetic reconnection in the extended corona for more typical eruptions.

Observations in the Lower Corona (< 1.5 \( R_\odot \))

Voids and loops were previously reported\(^*\) ~10 years ago and have seen in LASCO for several more recent flares as well, hours after the initial event, but this region has not had a lot of attention due to signal processing constraints. However, in the extended corona, we are better able to observe the migrating reconnection sites instead of well after the reconnection has occurred. Now that we have clearer observations and understanding of these features in the lower corona, it is timely to refocus on the extended corona.

The “Giant Arches Flare”** is a prime candidate for probing continued energy release. This extremely long duration event may be the clearest example of continual reconnection in the outer corona in the wake of a coronal mass ejection to date.

Post-arcade loops extend beyond 1.5 \( R_\odot \), and both SADs and SADLs are present for at least 5 days after the initial eruption with observable initiation sites beyond 5 \( R_\odot \).

Observations in the Extended Corona (< 5 \( R_\odot \))