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Initiation of Coronal Mass Ejections and the Associated Solar Flares

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What role magnetic reconnection plays in the initiation and evolution of the CME eruptions is still not clear. In a recent work by Zhu et al. (2020), we conducted a statistical study of 42 CME-flare events. We found a significant correlation between CME acceleration and flare reconnection in various aspects, suggesting that flare reconnection is key to acceleration of both fast and slow CMEs and may dominate the acceleration of fast CMEs. We also analyzed time lags of the peak CME acceleration relative to flare reconnection rate, and found that, on average, acceleration-led events have a smaller reconnection rate, and are likely driven by ideal instabilities. To further probe what mechanism triggers the eruption, in this study, we focus on the early-stage evolution of CMEs, flare reconnection, as well as hard X-ray bursts, using a subset of CME-flare events well observed with high temporal and spatial resolutions by SDO, STEREO, and RHESSI. We examine the temp-spatial relationship between the CME acceleration and flare signatures in the low corona, and compare onsets of CME acceleration and flare reconnection in these events.

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