New Aspects of a Lid-Removal Mechanism in the Onset of a SEP-Producing Eruption Sequence

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We examine a sequence of two ejective eruptions from a single active region on 2012 January 23, using magnetograms and EUV images from SDO/HMI and SDO/AIA, and EUV images from STEREO. Cheng et al. (2013) showed that the first eruption's (``Eruption 1") flux rope was apparent only in ``hotter" AIA channels, and that it removed overlying field that allowed the second eruption (``Eruption 2") to begin via ideal MHD instability; here we say Eruption 2 began via a ``lid removal" mechanism. We show that during Eruption-1's onset, its flux rope underwent ``tether weakening" (TW) reconnection with the field of an adjacent active region. Standard flare loops from Eruption 1 developed over Eruption-2's flux rope and enclosed filament, but these overarching new loops were unable to confine that flux rope/filament. Eruption-1's flare loops, from both TW reconnection and standard-flare-model internal reconnection, were much cooler than Eruption-2's flare loops (GOES thermal temperatures of ~9 MK compared to ~14 MK). This eruption sequence produced a strong solar energetic particle (SEP) event (10 MeV protons, >10^3 pfu for 43 hrs), apparently starting when Eruption-2's CME blasted through Eruption-1's CME at 5---10 R_s. This occurred because the two CMEs originated in close proximity and in close time sequence: Eruption-1's fast rise started soon after the TW reconnection; the lid removal by Eruption-1's ejection triggered the slow onset of Eruption 2; and Eruption-2's CME, which started ~1 hr later, was three times faster than Eruption-1's CME.