MULTI-WAVELENGTH DIAGNOSTICS OF THE FAILED ERUPTION OF A HELICAL KINK-UNSTABLE PROMINENCE

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Multi-wavelength diagnostics of the prominence eruption provides an opportunity to unravel the sequence of processes leading to its instability and eventual triggering. In this paper, we investigated prominence eruption of October 14, 2012 recorded in Hα, EUV, and X-ray wavelengths. This event was observed as a filament eruption accompanied with a flare by STEREO B. The prominence show the evidence of twist converting to writhe in the EUV observations, and particularly, a kinked structure in the AIA 131 Å and 94 Å images as it evolved. The twist of the prominence was estimated to be at least $3\pi$ (1.5 turns) which reached up to the threshold of the kink instability. This indicates the predominant cause of the prominence eruption to be the accumulated magnetic twist which progressively drove the magnetic configuration to be kink-unstable. The largest rising speed was estimated to be 228 km/s which subsequently displayed a sudden rapid acceleration (2715 m/s²) associated with the flare. Moreover, a cusp shaped structure, observed in AIA 131 Å and 94 Å images along with the co-spatial high-energy X-ray emission, as recorded from RHESSI revealed the representative location of magnetic reconnection. Followed to this, the erupted material undergone deceleration with the maximum value 391 m/s², which is even larger than the free-fall speed on the Sun or the local solar gravity acceleration. Such intriguing prominence evolution suggests that the prominence was pulled back by an inward magnetic tension force which resulted in a failed eruption.