A Multi-wavelength Observational Study of Eruption Processes of Active Prominences in the Solar Active Region NOAA 11261

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Abstract

A better understanding of the physics underlying the eruption of solar prominences can be achieved through the analysis of multi-wavelength observational data of prominences and their associated flares with high temporal and spatial resolution. We therefore examined (1) the temporal variation of morphology and plasma properties of two active prominences located in the solar active region NOAA 11261 using SDO/AIA EUV images, (2) the injection of magnetic helicity through the photospheric surface around the prominences using SDO/HMI line-of-sight magnetogram data, and (3) the time profiles of radio, EUV, and soft X-ray fluxes produced by the flares related to the prominence eruption. As a result, we found that: (1) a prominence (P1) was vigorously developed during the pre-eruptive phase (01:30-03:20 UT on 2011-Aug-04) along the magnetic polarity inversion line with small-scale EUV brightenings, temperature increases, plasma flows, and significant injections of positive (right-handed) helicity in and around P1; (2) P1 began to erupt and expand as a pre-flare occurred in the region underneath the western part of P1 at 03:45 UT; (3) P1 split into two parts: i.e., the western part rapidly erupted by producing a typical two-ribbon flare, while the eastern part coalesced into a pre-existing prominence (P2); (4) P2 became unstable due to the coalescence with the eastern part of P1, and it finally erupted with clockwise untwisting motions.

Keywords: Prominence destabilization, Prominence dynamics, Flares, CMEs, Magnetic helicity, Differential emission measure

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