Multi-wavelength observations of the failed eruption of a filament and associated M6.2 flare

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Abstract

We present multi-wavelength observations of the failed eruption of a magnetic flux rope that occurred in active region NOAA 10646 on 2004 July 14 using TRACE, RHESSI, and NoRH observations. The earliest signatures of pre-flare coronal activity are observed in EUV 171 Å images and X-ray observations up to 25 keV in the form of sequential brightening of three coronal loops, overlying the filament. The onset of the filament eruption is accompanied with the impulsive rise of HXR and MW emissions. The impulsive phase is characterized by three prominent peaks observed simultaneously in HXR and MW profiles which are spatially and temporally associated with the fast rise of the magnetic flux rope. Following the flare maximum, the eruption slowed down and was subsequently stopped by the overlying field lines at a height of $5 \times 10\hat{}4$ km. Our observations indicate that the flare emission is caused due to the reconnection of the rising flux rope and the surrounding low-lying magnetic loops. We discuss a possible scenario to elucidate HXR and MW sources associated with different phases of the rising flux rope which finally failed to erupt and discuss its implications for models of solar eruptions.

Keywords: solar flares, solar prominences, solar eruptions, magnetic reconnection

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