Our work supports that continuous flux cancellation contributes to the eruption of the filaments.

These observations show that these filament eruptions are in agreement with the standard model for a CME. AIA images were downloaded for 3-5 hours at a cadence of 1m. We used Extreme Ultraviolet (EUV) images from the Atmospheric Imaging Assembly (AIA), and magnetograms from the Heliospheric and Magnetic Imager (HMI), both on board the Solar Dynamics Observatory (SDO), to study filament eruptions and their photospheric fields. We examine whether flux cancellation occurs before filament eruptions. We find that continuous flux cancellation was present at the PIL for many hours prior to each eruption. We present two examples of filament eruptions in detail and find the following: (a) the pre-eruption filament holding core field is highly sheared and appears in the shape of a sigmoid above the PIL; (b) at the start of the eruption the opposite arms of the sigmoid reconnect in the middle above the site of (tether-cutting) flux cancellation at the PIL; (c) the filaments first show a slow-rise, followed by a fast-rise as they erupt. We conclude that these two filament eruptions result from flux cancellation in the middle of the sheared field, and thereafter evolve in agreement with the standard model for a CME/flare filament eruption from a closed bipolar magnetic field (flux cancellation (van Ballegooijen and Martens 1989 and Moore and Roumeliotis 1992) and runaway tether-cutting (Moore et. al 2001)).

We studied ten filament eruptions by using data from SDO/AIA and SDO/HMI, including the two filaments that might occur due to flux emergence or cancellation along the PIL at the site of reconnection between two opposite elbows of a sigmoid field holding the filament.

We used Extreme UltraViolet (EUV) images from the Atmospheric Imaging Assembly (AIA), and magnetograms from the Heliospheric and Magnetic Imager (HMI), both on board the Solar Dynamics Observatory (SDO), to study ten different filament eruptions and their photospheric magnetic fields. The eruption presents and studies the analysis of two filaments, an intermediate filament that erupted at 02:15 UT on May 4, 2013 (B 9.0 class flare) and a quiet filament that erupted at 16:54 UT on January 26, 2016 (B 9.0 class flare). We used AIA images of wavelengths 304 Å (He ii, 5.0 x 10^5 K), 171 Å (Fe XII & XXIV, 1.6 x 10^5 K & 2.0 x 10^5 K) and 94 Å (Fe XVIII, 6.3 x 10^4 K). AIA provides full sun-disk images with a high spatial resolution (0.6'' pixel^-1) and high temporal cadence (125s). We used magnetograms from HMI with a spatial resolution of 0.5'' and high temporal cadence (45s). The images and magnetograms were downloaded from the Joint Science Operations Center (JSOC) website. The datasets were processed by the High Energy SolarSoft. The AIA images were downloaded for 3-5 hours at a cadence of 1m. We primarily used 304 Å and 193 Å AIA images because they are the best wavelengths for observing filaments. We used 94 Å AIA images because they are the best for observing the coronal arcade. The HMI magnetograms were downloaded for 8-12 hours at a cadence of 5m. The EUV images were co-aligned with respect to the HMI magnetogram images and solar rotation was removed from the images. We created several movies to study the dynamics of each filament region and their related magnetic field features. We found that isolated magnetic cancellation and plotted either the negative or the positive canceling flux.

Discussion

We studied ten filament eruptions by using data from SDO/AIA and SDO/HMI, including the two filaments featured here.

• Our work supports that continuous flux cancellation contributes to the eruption of the filaments. Both filaments first show a slow-rise, followed by a fast-rise as they erupt.

• The slow rise for the May 4, 2013 filament starts at 01:53, and the fast rise starts at 02:15 UT.

• The slow rise for the January 26, 2016 filament starts at 16:00 UT, and the fast rise starts at 16:58 UT.

• Both of the two filaments exhibit a highly sheared core field in the shape of a sigmoid above the PIL, with reconnection occurring above the middle of the site of flux cancellation over the PIL.

These observations show that these filament eruptions are in agreement with the standard model for a CME/flare filament eruption in that they erupt from a closed bipolar magnetic field. They appear to progress via flux cancellation (van Ballegooijen and Martens 1989 and Moore and Roumeliotis 1992) followed by runaway tether-cutting reconnection (Moore et al 2001)).

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