Investigation of HXR footpoint motions in solar flares

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Abstract

The solar flare hard X-ray (HXR) sources in the solar surface are thought to be bremsstrahlung of energetic electrons that precipitate along the reconnected magnetic field lines and lose their energy via thick-target collisions in the chromosphere. Therefore, the motions of HXR footpoints can be regarded as the chromospheric signature of progressive magnetic reconnections in the corona. To understand the characteristics of such motions more systematically, a statistical survey of M- and X-class flares during 2002-2005 is investigated using RHESSI (Reuven Ramaty High Energy Solar Spectroscopic Image) observations. In addition, the images from TRACE (Transition Region and Coronal Explorer), EIT (Extreme ultraviolet Imaging Telescope), and global high-resolution Hα network, and the MDI (Michelson Doppler Imager) magnetograms are used to identify the flare-associated magnetic configurations. We investigated a total of 28 RHESSI flares. Based on the HXR footpoint motions, these flares can be classified into three fundamental types: (1) both footpoints move perpendicular to the neutral line and separately (Type I), (2) both footpoints move along the neutral line direction with opposite directions (Type II), and (3) both footpoints move along a neutral line in the same direction (Type III). Type I motion is observed frequently (~68%) and, in particular, appears in the later part of the flaring period. The combination of these three basic motions (i.e. Type II+I or III+I) is most often observed (~61%) in large flares. Specific events will be shown and discussed in this presentation.