The Role of Interchange Reconnection in CMEs/Eruptive Flares

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Magnetic reconnection in the solar atmosphere is generally accepted to be the underlying driver of most solar explosive phenomena. Therefore, the topology of the coronal magnetic field is central to understanding the onset and development of major eruptions, such as CMEs/eruptive flares, and to determining the resulting space weather. Of particular importance to space weather and to LWS are the impulsive Solar Energetic Particles (SEP) that are associated with eruptive events. These impulsive SEPs are believed to be accelerated by the flare reconnection of the standard eruptive flare model. A long-standing problem, however, is that such particles should remain trapped in the closed corona and the ejected plasmoid; whereas, flare-accelerated particles frequently reach the Earth long before the CME does. We present a model that can account for the injection of flare-accelerated particles onto open magnetic flux tubes connecting to the Earth. This work uses high-resolution 3D MHD numerical simulations performed with the Adaptively Refined MHD Solver (ARMS). Our model is based on the well-known breakout topology, which has a coronal null point and a multi-flux system for the coronal magnetic field. The model includes an isothermal solar wind with open-flux regions. Depending on the location of the open flux with respect to the null point, we find that interchange reconnection between the open flux and the CME flux can have major effects on the development of the eruption. In particular, interchange reconnection can allow energetic particles to escape. We discuss the implications of our work for LWS observations.