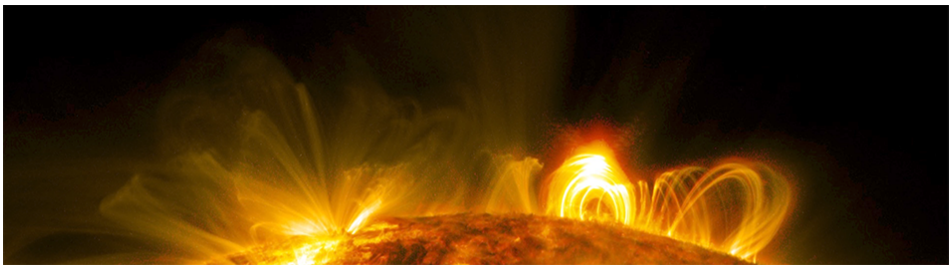

Contribution ID: **30** Type: **Invited talk**

Variability of the Reconnection Guide Field in Solar Flares

Monday, 15 November 2021 09:00 (30 minutes)

Solar flares may be the best-known examples of the explosive conversion of magnetic energy into bulk motion, plasma heating, and particle acceleration via magnetic reconnection. The energy source for all flares is the highly sheared magnetic field of a filament channel above a polarity inversion line (PIL). During the flare, this shear field becomes the so-called reconnection guide field (i.e., the non-reconnecting component), which has been shown to play a major role in determining key properties of the reconnection including the efficiency of particle acceleration. We present new high-resolution, three-dimensional, magnetohydrodynamics simulations that reveal the detailed evolution of the magnetic shear/guide field throughout an eruptive flare. The magnetic shear evolves in three distinct phases: shear first builds up in a narrow region about the PIL, then expands outward to form a thin vertical current sheet, and finally is transferred by flare reconnection into an arcade of sheared flare loops and an erupting flux rope. We demonstrate how the guide field may be inferred from observations of the sheared flare loops. Our results indicate that initially the guide field is larger by about a factor of 5 than the reconnecting component, but it weakens by more than an order of magnitude over the course of the flare. Instantaneously, the guide field also varies spatially over a similar range along the three-dimensional current sheet. We show that the temporal evolution of the guide field has a profound impact on the number and structuring of plasmoids in the reconnecting current sheet. We discuss the implications of our results for understanding observations of flare particle acceleration.

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