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Solar Flares and Magnetic Reconnection: Observations and Theory of the Elongation of Two-Ribbon Flares MILTON ARENCIBIA, PAUL CASSAK, West Virginia University, JIONG QIU, DANA LONGSCOPE, Montana State University — Solar flares release enormous amounts of energy, up to 10^{25} J over timescales ranging from hours to a few seconds. Magnetic reconnection - the process through which magnetic fields in plasmas break and reconnect releasing energy - governs these events. One class of flares, two-ribbon flares, is characterized by the appearance in pairs of bright ribbons on the surface of the Sun that separate, interpreted as regions where material confined to reconnected magnetic field lines precipitate onto the solar surface and emit x-rays. Observations have revealed that ribbons, in addition to moving apart from each other, also elongate, thought to be related to the spreading of the reconnection site. 3D numerical simulations of magnetic reconnection have revealed that localized reconnection spreads in the direction normal to the reconnection plane either unidirectionally or bidirectionally depending on the strength of a guide magnetic field along the same direction. Observations also reveal that ribbons elongate either unidirectionally or bidirectionally with a similar dependence on the guide field, confirming the connection with the numerical results. We will further investigate the physics of two-ribbon flare spreading via a numerical parametric study.

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