Summary of Presentation for the Metcalf Travel Award

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Presentation Title Hot Spine Loops and the Nature of a Late-Phase Flare

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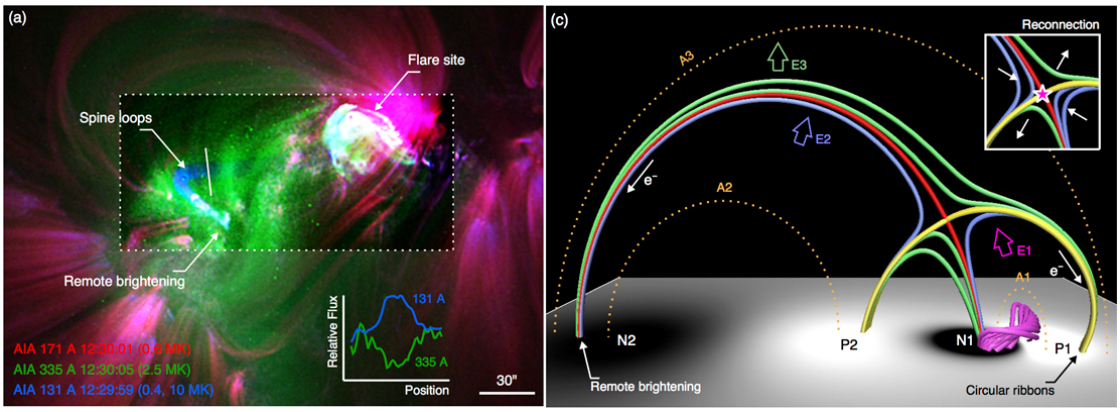
Abstract

The fan-spine magnetic topology is believed to be responsible for many curious emission signatures in solar explosive events. A spine field line links topologically separate flux domains and possibly their evolutionary trends, but direct observation of such structure has been rare. Here we report a unique event observed by the Solar Dynamic Observatory (SDO) where a set of hot coronal loops (over 10 MK) that developed during the rising phase of the flare connected to a quasi-circular chromospheric ribbon at one end and a remote brightening at the other. Magnetic field extrapolation suggests these loops are tracers of the evolving spine field line. The sequential brightening of the ribbon and the increasing volume occupied by the hot loops suggest that continuous slipping and null-point type reconnection were at work, transferring flux from below the fan dome to the exterior. This event also features an extreme-ultraviolet (EUV) late phase - a second emission peak observed in the warm EUV lines (about 2-7 MK) hours after the X-ray peak. The initially confined process transitioned to a fluxrope eruption near the flare peak; the removal of the overlying field led to post-flare arcades that spanned the entire active region. Slow cooling of these large arcades naturally explains to the sequential delay of the late-phase peak in increasingly cooler EUV lines. Our result demonstrates the crucial nature of magnetic coupling between systems of different scales - minor topological changes may lead to violent explosions on a much larger scale.



Xudong Sun is a post-doctoral researcher at Stanford University. He got his B.Sc. degree from University of Science and Technology of China in 2005, and Ph.D. from Stanford in 2012 under the supervision of Drs. Todd Hoeksema and Phil Scherrer. His dissertation work mainly focuses on the observation and modeling of the solar magnetic field, on both global and active region scale. He has been involved in the HMI data pipeline development, and was a resident observer at the Wilcox Solar Observatory during 2009-2012.