Space Science Seminar
Tuesday, 2018 August 28
10:30 a.m.
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Magnetohydrodynamic Simulations of Solar Corona Initiated with Extrapolated Non-Force-Free Magnetic Fields

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Host: Dr. Qiang Hu (Sponsored by CSPAR)

The magnetohydrodynamics of the solar corona for the active region NOAA 12192 is simulated numerically. The simulation is initialized with an extrapolated non-force-free magnetic field using the vector magnetogram of the active region, which was obtained from the solar photosphere. Particularly, we focus on the magnetic reconnections (MRs) occurring close to a magnetic null point that resulted in the appearance of circular chromospheric flare ribbons on 2014 October 24 around 21:21UT, after the peak of an X3.1 flare. The extrapolated field lines show the presence of the three-dimensional (3D) null near one of the polarity-inversion lines—where the flare was observed. In the subsequent numerical simulation, we find MRs occurring near the null point, where the magnetic field lines from the fan plane of the 3D null form an X-type configuration with underlying arcade field lines. The foot points of the dome-shaped field lines, inherent to the 3D null, show high gradients of the squashing factor. We find slipping reconnections at these quasi-separatrix layers, which are co-located with the post-flare circular brightening observed at chromospheric heights. This demonstrates the viability of the initial non-force-free field, along with the dynamics it initiates. Moreover, the initial field and its simulated evolution are found to be devoid of any flux rope, which is congruent with the confined nature of the flare.

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