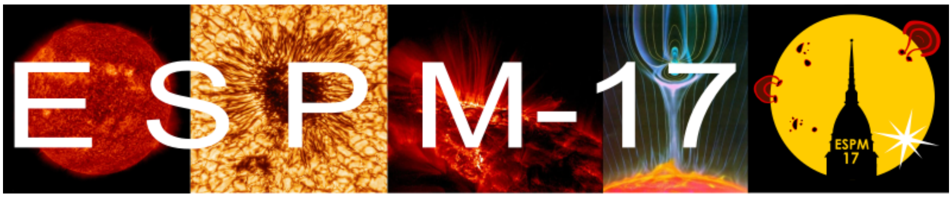

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Solar Eruptions Triggered by Flux Emergence Below or Near a Coronal Flux Rope

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Observations have shown a clear association of filament/prominence eruptions with the emergence of magnetic flux in or near filament channels. Magnetohydrodynamic (MHD) simulations have been employed to systematically study the conditions under which such eruptions occur. These simulations to date have modeled filament channels as two-dimensional (2D) flux ropes or 3D uniformly sheared arcades. Here we present MHD simulations of flux emergence into a more realistic configuration consisting of a bipolar active region containing a line- tied 3D flux rope. We use the coronal flux-rope model of Titov et al. (2014) as the initial condition and drive our simulations by imposing boundary conditions extracted from a flux-emergence simulation by Leake et al. (2013). We identify three mechanisms that determine the evolution of the system: (i) reconnection displacing foot points of field lines overlying the coronal flux rope, (ii) changes of the ambient field due to the intrusion of new flux at the boundary, and (iii) interaction of the (axial) electric currents in the pre-existing and newly emerging flux systems. The relative contributions and effects of these mechanisms depend on the properties of the pre-existing and emerging flux systems. Here we focus on the location and orientation of the emerging flux relative to the coronal flux rope. Varying these parameters, we investigate under which conditions an eruption of the latter is triggered.

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