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Origin of a Hot Channel in a Simulated Solar Eruption

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Hot channels with 10 MK temperature are found to be the core structures in the early stage of major solar eruptions from active regions. Although indirect evidences indicate helical magnetic flux ropes (MFRs) as the magnetic structures of hot channels, the formation and heating mechanism of hot channels are still elusive. With the new semirelativistic MHD solver of MPI-AMRVAC 3.0, we simulate the collisional shearing within a bipolar magnetic field up to 600 G with radiative cooing, thermal conduction, and empirical coronal heating. We find a 10 MK hot channel forms during the collisional shearing due to resistive heating. The hot channel is fully hosted by a MFR and later erupts producing flare loops/ribbons and a CME. Torus instability is responsible for driving the eruption. Bright circular ribbons around two feet of the MFR corresponds to the slipping reconnection and footpoints drifting. Synthetic images show many features in agreement with observations.

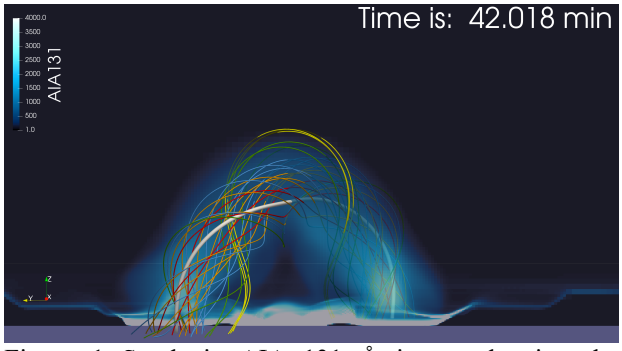

Figure 1 Synthetic AIA 131 Å image showing the erupting hot channel overlayed with magnetic field lines of a MFR.