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Thermodynamic MHD Simulation of the Bastille Day Event

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The "Bastille Day" event on July 14, 2000 is one of the most extensively studied solar eruptions. It originated in a complex active region close to disk center and produced an X5.7 flare, a fast halo CME, and an intense geomagnetic storm. We have recently begun to model this challenging event, with the final goal to simulate its whole evolution, from the pre-eruptive state to the CME's arrival at 1 AU. To this end, we first produce a steady-state MHD solution of the background corona that incorporates realistic energy transport ("thermodynamic MHD"), photospheric magnetic field measurements, and the solar wind. In order to model the pre-eruptive magnetic field, we then insert into this solution a stable, elongated flux rope that resides above the highly curved polarity inversion line of the active region. Finally, we produce an eruption by imposing photospheric flows that slowly converge towards the polarity inversion line. In this presentation we describe our method, compare the simulation results with the observations, and discuss the challenges and limitations involved in modeling such complex and powerful eruptions.