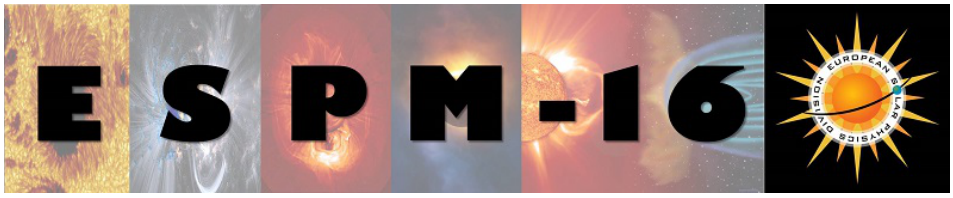

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Impact of Hall MHD on the evolution of three-dimensional complex magnetic structures

Tuesday, 7 September 2021 09:52 (13 minutes)

Observations have revealed the diffusive nature of solar coronal plasma in the form of solar flares, coronal mass ejections, jets–manifestation of magnetic reconnections (MRs). The onset of reconnection in a perfectly conducting plasma like the solar corona requires the generation of small scales in consequence of large scale dynamics, eventually leading to a locally reduced characteristic length scale of the magnetic field variability. At such small scales, the standard magnetohydrodynamics is not valid and the Hall-magnetohydrodynamics (Hall MHD) takes over. Hall MHD gives the faster reconnection as well as resolves the details of dynamics at small scales. To explore the reconnection in Hall MHD, we have successfully extended the computational model EULAG-MHD to include the Hall forcing and reported the evolution of three-dimensional (3D) coherent magnetic structures recently. Simulations of evolution of a magnetic flux rope from solar corona like sheared magnetic arcades in the presence and absence of the Hall forcing have revealed that the rope evolves through intermediate complex structures, ultimately breaking locally because of reconnections in the presence of Hall forcing. Interestingly, the breakage occurs earlier in the presence of the Hall term, signifying faster dynamics leading to magnetic topologies favorable for reconnections.

Student poster?

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