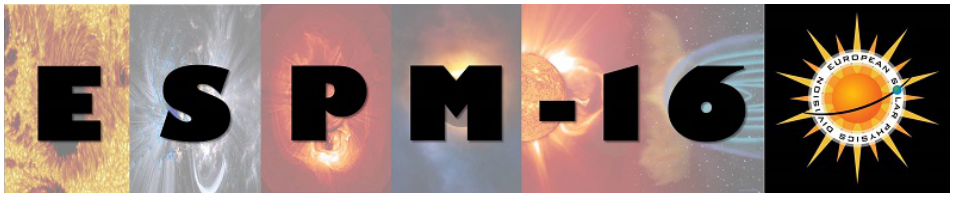

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Magnetohydrodynamic simulation of magnetic reconnections at three-dimensional magnetic nulls and quasi-separatrix layers

Wednesday, 8 September 2021 14:26 (13 minutes)

Three-dimensional (3D) magnetohydrodynamic simulation is performed to explore the process of magnetic reconnection at the 3D magnetic nulls and quasi-separatrix layers (QSLs). The initial magnetic field is constructed analytically by superposing uniform vertical magnetic field on a linear force-free field. The initial field is characterized by the presence of a pair of 3D nulls along with quasi-separatrix layers. The topology of the 3D null, complete with the spine-axis and the dome-shaped separatrix surface, is similar to the ones expected in the solar corona. The simulated evolution documents the movement of the field lines of the separatrix surface to be different than the field lines located in the vicinity of the surface. This generates favorable contortion in the field lines to develop current sheets, which are localized to the separatrix surface — giving rise to the torsional fan magnetic reconnections at the 3D nulls. Additionally, the reconnections are also found to occur at the QSLs. However, the strength of the currents near QSLs is smaller than the strength at the fan surfaces of the 3D nulls, which indicates the reconnections near QSLs to be less energetically efficient than the 3D nulls.

Student poster?

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