
Evolution of the 3D topology of active region 11158 during 4 days

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Abstract

The active region (AR) 11158 has produced several large flares during its lifetime. Based on the high productivity of flares in this AR, we hypothesize that the large-scale magnetic topology has not changed drastically in this period. With the cylindrical equal area (CEA) data from Solar Dynamical Observatory (SDO) / Helioseismic and Magnetic Imager (HMI), we can get the magnetic field in the corona by nonlinear force-free field (NLFFF) extrapolation using Wiegelmann's method. We calculate the squashing degree factor Q in the volume refer to the equation proposed by Pariat & Démoulin (2012). The result does show that there are large-scale quasi-separatrix layers (QSLs) which cross each other during most of the time. We also see some small-scale QSLs related to the X2.2 flare happened on 2011 February 15, which manifest different magnetic connectivity between the flux rope and the arcade around. With SDO/AIA, we confirm that QSLs at the photosphere coincide with flare ribbons, suggesting that energetic particles impact the chromosphere following field lines inside the QSLs.

Keywords: Active Regions, Topology, QSLs

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