Geophysical Research Abstracts
Vol. 21, EGU2019-2456, 2019
EGU General Assembly 2019

Conjoined Flux Ropes: A New Mechanism for Filament-Channel Formation at External Polarity Inversion Lines

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Solar eruptions always stem from filament channels (FCs), which are sheared/twisted coronal magnetic fields that reside above polarity inversion lines (PILs) of the photospheric magnetic field. The majority of FCs form at external PILs, i.e, at the periphery of, or in between, active regions (ARs). Since only few observations of FC formation exist, the mechanisms that are creating these structures are still debated.

In this presentation, we suggest a new mechanism for the formation of FCs at external PILs. In our scenario, FCs are created via reconnection between emerging and pre-existing magnetic fields during the formation of ARs. They consist of so-called conjoined flux ropes (CFRs), i.e. of two flux ropes that reside end-to-end along the external PIL of the AR, possess opposite twist, and connect to a common spiral null point. We present evidence for our scenario from both observations and numerical simulations, and we discuss the potential role of CFR-FCs for coronal jets and CMEs.