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Study of formation of solar coronal jets by 3D MHD simulations JOSHUA LATHAM, Princeton University, ELENA BELOVA, MASAAKI YAMADA, Princeton Plasma Physics Laboratory — Spheromak stability concepts are used to explain solar physics events, namely solar coronal jets emerging from half-dome shaped magnetic structures on the surface of the sun. These structures are observed to remain stable for a long time, before suddenly erupting in a coronal jet, releasing their stored energy through the magnetic reconnection. 3D MHD simulations are used to study the stability properties of the spheromak line-tied to a conducting surface. A stability threshold is calculated for the tilt instability in asymmetrically line-tied conditions, depending on the elongation and the fraction of the line-tied flux of the spheromak. A high-resolution non-linear simulation demonstrates a current sheet formation between the spheromak tilted closed field lines and the ambient magnetic field at the top of the dome. This leads to reconnection and the plasma jet release from the dome. Numerical results support a model of coronal jet eruptions where the structure grows through flux emergence on the solar surface, tilts, reconnects, and erupts. The strong effect of line-tying in the simulations also suggests that in order for eruptive coronal jets to occur there must be magnetic reconnection on the bottom of the spheromak, between the magnetic dome and the solar surface.

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