

## O2.J801 A Laboratory Model for the Parker Spiral and Solar Wind

*Tuesday, 9 July 2019 18:00 (15 minutes)*

See the full abstract here <http://ocs.ciemat.es/EPS2019ABS/pdf/O2.J801.pdf>

In 1958, Eugene Parker first predicted the existence of the supersonic solar wind [1], which was subsequently verified by early spacecraft missions [2]. He also theorized how this solar wind interacts with the dynamo-generated magnetic field of the Sun - carrying the magnetic field lines away from the star, while their foot-points are frozen into the corona and twisted into an Archimedean spiral by stellar rotation. This magnetic topology is now known as the Parker spiral and is the largest magnetic structure in the heliosphere. The transition between magnetic field corotating with a star and the field advected by the wind is thought to occur near the so-called Alfvén surface - where inertial forces in the wind can stretch and bend the magnetic field. According to the governing equations of magnetohydrodynamics, this transition in a magnetic field like the Sun's is singular in nature and likely highly dynamic. However, this region has yet to be observed in-situ by spacecraft or in the laboratory, but is presently the primary focus of the Parker Solar Probe mission [3, 4]. Here we show, in a synergistic approach to studying solar wind dynamics, that the large scale magnetic topology of the Parker spiral can also be created and studied in the laboratory. By generating a rotating magnetosphere with Alfvénic flows, magnetic field lines are advected into an Archimedean spiral, giving rise to a dynamic high-current sheet that undergoes magnetic reconnection and plasmoid ejection. These plasmoids are born near the Alfvén surface, at the tip of the helmet streamer cusp, and carry blobs of plasma outwards at super-Alfvénic speeds, mimicking the dynamics of unstable coronal helmet streamers, which fuel much of the slow solar wind [5].

\*The author would like to acknowledge DOE, NSF, and NASA for their support throughout this investigation.

### References

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**Presenter:** FOREST, C. (EPS 2019)

**Session Classification:** BSAP