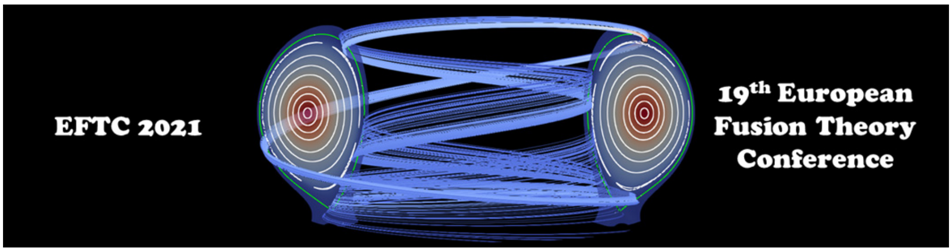

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Solar coronal heating and wind acceleration: Insights from Parker Solar Probe

Wednesday, 13 October 2021 15:40 (30 minutes)

The solar wind carries a broadband of fluctuations in density, velocity and magnetic fields that, at the large scales, have been interpreted in terms of an ongoing magnetohydrodynamic turbulent cascade. Alfvénic fluctuations have indeed been commonly observed in the solar wind since the first in-situ measurements, and they are thought to provide a possible mechanism to heat the solar corona at temperatures in excess of one million degrees and to accelerate the solar wind. Parker Solar Probe (PSP) was launched in August, 2018. It will be the first spacecraft to fly into the sun's corona, to within about 10 solar radii from the sun's surface, with the goal to understand what heats the corona and accelerates the solar wind. Early measurements from PSP have already provided a glimpse of the "young"solar wind in regions never explored before. Closer to the sun, the wind appears to be permeated by magnetic field lines which are strongly perturbed, to the point that they produce local inversions of the radial magnetic field, known as switchbacks. The corresponding signature of switchbacks in the velocity field is that of local enhancements in the radial speed (or jets) that display the typical velocity/magnetic field correlation that characterizes Alfvén waves propagating away from the sun. Switchbacks are thus an extreme case of the Alfvénic fluctuations that dominate the solar wind energy spectrum further away, and may be the remnant of coronal processes leading to solar wind formation –although their origin is still open to debate. After reviewing the main properties of Alfvénic fluctuations and switchbacks in the solar wind, we will address how their stability and evolution is affected by nonlinearities, kinetic effects and solar wind expansion. We will discuss what are the implications for models of switchback generation, and we will conclude by outlining remaining open issues.

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