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Photospheric and coronal sources of the solar wind observed by PSP and Solar Orbiter: topological links, spatial and temporal periodicities

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Parker Solar Probe (PSP) and Solar orbiter have made a number of important discoveries in its exploration of the inner heliosphere/outer corona. Their observation of ubiquitous large amplitude Alfvénic fluctuations, regardless of solar wind speed, in all wind streams except for narrow areas surrounding the heliospheric current sheet, together with large s-shaped inversions of the magnetic field, called switchbacks, begin to call into questions standard ideas of solar wind acceleration. Initial Parker Solar Probe results have shown that slow Alfvénic solar wind intervals appear to be a frequent, if not standard, component of the nascent solar wind inside 0.5 AU. In addition to the strong presence of Alfvénic fluctuations propagating away from the Sun, such intervals also display the huge oscillations - switchbacks, where the Alfvénic fluctuation is accompanied by a fold in the radial magnetic field and a corresponding forward propagating radial jet. Switchbacks often come in patches, separated by short intervals depleted with fluctuations, and periods without switchbacks may also show a striking quiescence, with the magnetic field remaining mostly radial and very small amplitude velocity and magnetic field fluctuations. These observations pose a series of questions on the origins of the solar wind and the role of coronal structure, as well as of the evolution of fluctuations within the solar wind. Here we discuss how the sources of the solar wind measured in situ are related to photospheric and solar magnetic network structures.

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