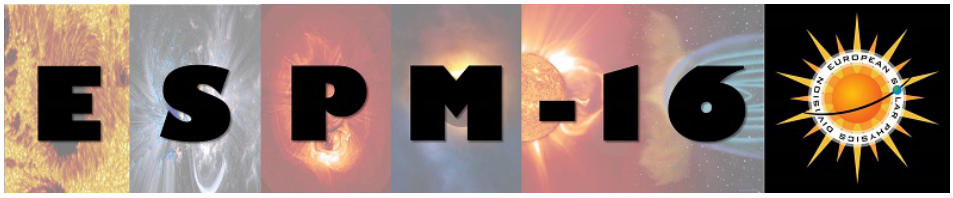

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Direct evidence for magnetic reconnection at the boundaries of magnetic deflections with Parker Solar Probe (PSP): on the origin and dissipation of "switchbacks" in the solar wind

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The first encounters of PSP with the Sun revealed the presence of ubiquitous localised magnetic deflections, often called "switchbacks", in the inner heliosphere. Two main class of theories have emerged in order to explain the formation of these structures: the formation by processes occurring deep in the solar atmosphere or directly in the solar wind. The origin of switchbacks is currently unknown but their omnipresence, however, shows that they could play an important role in the dynamics and heating of the solar wind.
We present the first direct piece of evidence for magnetic reconnection occurring at the boundaries of three switchbacks crossed by PSP at a distance of about 45 radii to the Sun. Analysing the magnetic field and plasma parameters from the FIELDS and SWEAP instruments, we found that these three structures show typical signatures expected for reconnection exhausts at their boundaries. Given the wealth of intense current sheets observed by PSP, reconnection at switchback boundaries appears to be rather rare. However, as the switchback boundaries accommodate currents, one can conjecture that the geometry of these boundaries offers favourable conditions for magnetic reconnection to occur. Such a mechanism would thus contribute in reconfiguring the magnetic field of the switchbacks, affecting the dynamics of the solar wind and eventually contributing to the blending of the structures with the regular wind as they propagate away from the Sun. This is consistent with the current statistical studies showing that there are less switchbacks encountered further away from the Sun.

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