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# Conditioning of magnetosheath - magnetosphere coupling during low Alfven Mach number solar wind

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In the near-Earth environment, strong bulk plasma accelerations are frequently taken to be the diagnostic of magnetic reconnection. Here we report new and unambiguous spacecraft observations and corresponding magneto-hydrodynamic (MHD) simulation of strong bulk plasma acceleration in the terrestrial magnetosheath during low Alfven Mach number solar wind, which is demonstrably not associated with magnetic reconnection. We illustrate this effect with Cluster spacecraft data that show plasma acceleration to speeds up to 1040 km/s in the magnetosheath, while the ambient solar wind speed is only 650 km/s. Based on a comparison with a global MHD simulation of the magnetosphere, we show that the acceleration results from enhanced magnetic forces exerted on the plasma by "stiff" magnetic flux tubes. The MHD simulations demonstrate that the acceleration is asymmetric and largely the result of the magnetic pressure gradient force, showing that this effect is not a simple analogy to a "slingshot effect". Thus, alike magnetic reconnection, this mechanism can produce strong plasma acceleration in near-Earth environment. It influences magnetosheath - magnetosphere coupling through its impact on the occurrence of the Kelvin-Helmholtz instability and the shape of the magnetopause. Due to its large-scale properties, complete characterization of this mechanism will require multi-spacecraft and multi-mission based studies. Low Alfven Mach number solar wind is often characteristic of coronal mass ejections (CME). This mechanism is expected to affect the development of CME-driven geomagnetic storms by conditioning magnetosheath - magnetosphere coupling.