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About possible impacts on the Sun – Earth connections of intermittent plasma jets and magnetic barriers

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We discuss some new phenomena, which should influence on the Sun-Earth interaction chain, basing on comparison of the Cluster, Interball, Polar and Geotail data.

One of most powerful structures, regulating flow, mass and energy balance of the solar wind (SW) interaction with magnetospheric obstacle, are concentrated in ram pressure plasma jets. They represent the ram pressure enhancements in several times over that of SW in the shocked magnetosheath (MSH) plasma of several tens of minutes duration, which often skew a magnetopause (MP) with much less magnetic pressure in front and just behind the MP. We demonstrate a class of the jets without direct driving by SW, which often can't be accelerated by a magnetic reconnection, while can drive a secondary reconnection at the MP. We show a Cluster case with the tremendous jet, flowing at $\sim$ 10 degrees to –X GSE axis, supersound, highly super-Alfvenic, which cannot be stopped by a magnetic field behind cusps, and thus penetrating through plasma mantle in the distant tail. Cross-correlation between Clusters, Interball, Polar and Geotail spacecraft shows transverse jet scale of several thousand km and parallel scale up to few RE. The jets looks to be universal means for quasi-steady MSH flow balance ($\sim$ 30%), removing of the momentum excess in MSH after the SW flow drops, and for removing plasma in front of approaching boundaries.

One of a mechanism for the jet acceleration is the Alfvenic collapse- predicted by MHD infinite rise of piled-up magnetic field lines in 3D transverse flow disturbances.

The rising magnetic pressure can become dominating even in the regions with dominant ion pressures, providing an effective interface between moving MSH and stagnant cusp plasmas. We discuss implementation of the Alfvenic collapse also for the boundaries at convective cells on the Sun surface.

Finally we suggest that such powerful intermittent phenomena as the jets and collapsing barriers should be systematically studied for accounting of the mass, momentum and energy flows in the chain of the Sun-Earth interactions.

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