Sheath - Underestimated Interplanetary Driver of Magnetospheric Disturbances

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Solar wind (SW) structures are geoeffective if they have southward component Bz of interplanetary magnetic field (IMF). Such SW types are following disturbed interplanetary phenomena: (1) interplanetary CME (ICME), including magnetic cloud (MC) and Ejecta, and (2, 3) two types of compression regions - corotating interaction region (CIR) before high speed stream (HSS) and Sheath before fast ICME. The most part of researches does not make selection between ICME and corresponding compression region Sheath before it. This approach results in the errors of obtained parameter relations and mistakes of space weather prediction because the contribution of Sheath in magnetospheric activity is underestimated. It is necessary to pay attention to two facts. (1) Sheath can contain high value of magnitude and southward component of IMF. For example, on 19 December, 1980 the southward component of IMF Bz was about 30 nT. (2) Sheath has more large efficiency of the magnetic storm generation than ICME. In particularly, at the same value of IMF Bz component Sheath generates about 50% higher magnetic storms than ICME [Nikolaeva et al., 2013; 2014]. We present several statistical results of study of Sheath both with interplanetary shocks and without them. Our results show that properties of Sheath mainly depend on the velocity of ICME and interaction with Sheath results in deformation of ICME. The work was supported by the Russian Foundation for Basic Research, project 16-02-00125 and by Program of Presidium of the Russian Academy of Sciences.

References:

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