The excitation conditions of magnetospheric convection by the electric current generated in the bow shock

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The solar wind undergoes the greatest change of its parameters during the passage through the bow shock front. Its density in this case increases by the factor of four, and gas and magnetic pressure increase more than by an order of magnitude. In this paper we re-examine the consequences of the fact of electric current generation at the bow shock front that we considered at an earlier date, and the dependence of the direction of this current on the sign of IMF Bz-component. The first consequence is the closure of the aforementioned current through the magnetosphere. It was found that this process is a two-stage one. Initially, the electric field penetrates and establishes in the medium a new convective regime. After that, depending on the degree of flow inhomogeneity, a plasma density distribution can be established, which corresponds to the electric current equal to the external current. The new steady state, to which the new convection velocity field and the new plasma pressure field correspond, is established within the time of the order of the transit time taken by the magnetosonic wave to propagate through the entire system.

Also a linkage between the power dissipated inside the magnetosphere and the parameters of plasma convection existing therein is shown.