

Active experiments in the ionosphere at altitudes of 140-360 km using a high- β sub-Alfven plasma jet

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The ionosphere, as a medium, extending from ~ 60 to 1000 km This is a complex inhomogeneous system consisting of charged and neutral particles immersed in a magnetic field and. The dynamics of the neutral gas of the ionosphere is described by the equations of a neutral liquid, the ionized gas - by the equations of the plasma dynamics in a magnetic field. Additionally, processes determined by the chemistry of ions and neutrals, as well as photochemistry. The report considers the phenomena accompanying the expansion of a plasma jet into the surrounding ionosphere. There are reproduced effects, that can occur in natural conditions, for example, during electrical discharges, during injection of the solar coronal mass, during explosive processes in astrophysics, as well as during some man-made disturbances. Phenomena accompanying the expansion of plasma into the surrounding magnetized plasma arise both during electric discharges and during man-made perturbations of the ionosphere and magnetosphere, during injection of the solar coronal mass, and also during explosive processes in astrophysics. Active experiments in the ionosphere using a sub-Alfvén plasma jet with high β made it possible to refine the phenomenology and physical mechanisms that determine the above geophysical processes. The report discusses the results and gives an interpretation of the following experimental data: the inertial expansion of the jet, taking into account the generated UV-IR radiation, the formation and dynamics of the diamagnetic cavity, the generation of plasma and electromagnetic waves, as well as the dynamics of the jet and background ions, taking into account the influence of the diamagnetic cavity. Since the processes occurring during the interaction of the plasma jet with the ionosphere differ in a large range of times: from microseconds to tens of seconds, their diagnostics require the involvement of a wide range of sensors located both near the interaction area - on board the rocket, and remotely - on the Earth's surface and on the satellite. . The report provides brief characteristics of sensors and instruments, which were used to measure these mechanisms in the field of gas dynamics, magnetohydrodynamics, measurement of electromagnetic fields, and particle dynamics.