NUMERICAL SIMULATION OF THE INITIAL STAGE OF HIGH-SPEED PLASMA JET DYNAMICS IN ACTIVE GEOPHYSICAL ROCKET EXPERIMENTS "FLAXUS" AND "NORTH STAR" [[1]](#footnote-1)\*)

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Active geophysical rocket experiments were evaluated in the 1990s. The task was to study the interaction of the plasma jet with the ambient magnetized ionospheric plasma. The experiments allow verifying the theoretical models of plasma streams dynamics.

Institute of Geosphere Dynamics has produced Explosive type generators (ETG) for "FLUXUS-1(2)" and "NORTH STAR" active experiments. The first experiments took place at 140 km. In the "North Star" experiment two injections occur at 340 and 270 km. Some plasma jet parameters were determined in the ground field experiment.

A clear understanding of results as well as verification of theories requires evidence on the exact plasma parameters. Unfortunately, the flight diagnostic tools were unable to record the initial stage of plasma jet exhaust. Thus we set up the inverse problem of plasma jet parameters recovering from the measurements. It includes the temporal dependencies of velocity, density, and temperature at the outlet of ETG. The aforementioned parameters are determined by means of the numerical simulation which, in turn, is evaluated within the radiative gas-dynamics framework. The flow of the solution is as follows. At first, we use ground-based experiments data to recover initial jet parameters. Then we modify these parameters using the light curves evidence in visible and IR bands from the flight module in the "FLUXUS" experiment. This correction includes filter transmission properties. The final steps are the numerical simulations of plasma jet dynamics under the recovered scenario and the comparison of simulated Al plasma radiation (spectra, flux density, etc) with flight, ground-based, and orbital (MSX satellite) observations.

We observe encouraging agreement between experiments and numerical simulation results within the first 100 s.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Lt/ru/EI-Loseva.docx) [↑](#footnote-ref-1)