Analytical and numerical modeling of non-stationary flow of the bottom part of the ascending swirling gas flows

Kazachinsky A O[@] and Krutova I Yu

Snezhinsk Physics and Technology Institute of the National Research Nuclear University Moscow Engineering Physics Institute, Komsomolskaya Street 8, Snezhinsk, Chelyabinsk Region 456776, Russia

[@] a.kazachinskij@gmail.com

There is a number of largely destructive natural phenomena such as tornadoes and tropical cyclones. The bottom part of the ascending swirling flow is constructed analytically and numerically. For the gas dynamics system of equations allowing for gravity and Coriolis force the Cauchy characteristic problem with initial conditions on the $z = 0$ horizontal plane is considered. Herewith the value of the vertical component of the gas velocity vector is $w = 0$, that is gas does not flow through the $z = 0$ plane. In the case of general spatial isentropic currents, the $z = 0$ impermeable plane is the contact characteristic of multiplicity of 2. For the considered problem with the initial data at $z = 0$ to have a single solution, one should establish the two auxiliary conditions on the other surface. Let us consider the radial component of the gas velocity vector $u = -\text{const}$ on a non-zero radius cylinder, and the circumferential component is $v = 0$. The decision of the problem is constructed in the form of the interval in powers of z. For a numerical solution, a modified characteristic method is used where the grid is set before the start of the counting.