A method for solving equations of the turbulent atmospheric diffusion

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Abstract: In this presentation, we consider the problem in the frames of the meso scale range of the gas impurities distribution in the atmosphere: calculation of the gaseous impurity moderate quantity discharge, which density is higher than the air density, and the problem of discovery of the 'active' gas concentration distribution in the atmosphere. The concentration of distribution is modeling by the turbulent diffusion equation, which consists of two functions, accordingly describing the 'heavy' and the 'active' gas qualities.
The concentration of distribution is modeled by the following equation [1,2]:

$$\frac{\partial c}{\partial t} + V_x \frac{\partial c}{\partial x} - V_z \frac{\partial c}{\partial z} + (\alpha_1(t) + \alpha_2(t))c = \frac{\partial}{\partial x}(K_x \frac{\partial c}{\partial x}) + \frac{\partial}{\partial y}(K_y \frac{\partial c}{\partial y}) + \frac{\partial}{\partial z}(K_z \frac{\partial c}{\partial z}) + f(x, y, z, t). \quad (1)$$

In the subjacent surface, we have condition

$$(K_z \frac{\partial c}{\partial t} + V_z c)\Big|_{z=z_0} = (v_s c)\big|_{z=z_0}. \quad (2)$$

Here, t – time; C-concentration; V_x, V_y, V – the gas velocity components; K_x, K_y, K_z - turbulent diffusion coefficients in case the impurity discharge source is pointed nature having the coordinates.
Problem (1) - (2) is solved by splitting Marchuk method. Distribution of concentration is obtained at the initial stage of the process. A comparison numerical results with the results of other authors is given.

Keywords: mathematical modeling, turbulent diffusion, concentration distribution, active gas, meso scale range of discharge, free atmosphere.

References:

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