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Mathematical modeling of radioactive waste transfer under the influence of wind

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This paper presents a mathematical model for describing heat and mass transfer processes and predicting the distribution of velocity, temperature, and concentration of radioactive contaminants propagating under the influence of wind. This model is based on the analysis of known experimental data on the radioactive waste repository in Kirghizia (Kara-Balta) and using concepts and methods of mechanics of reactive media, as well as approaches in existing models of environmental pollution. Dust, containing radioactive particles, can rise under the influence of air currents and is transported to considerable distances. It is assumed that 1) the flow has a developed turbulent nature, the molecular transfer is neglected, 2) the density of the gaseous phase does not depend on the pressure because of the low flow velocity in comparison with the speed of sound, 3) the subsidence of particles obeys the Stokes law. We consider the problem for two coordinates: a horizontal component perpendicular to the earth's surface. In addition, the assumption of a two-dimensional configuration can be justified, given that the length of contaminated sites can be quite large. To describe convective transport, we use the Reynolds equations for turbulent flow. The area from which the pollutants rise is modeled as a flat source of radioactive impurities.

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