NUMERICAL MODELING OF ATMOSPHERIC EMISSIONS FROM WILDFIRES

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Tomsk Oblast is the richest forest area where the forest fund lands occupy a significant area of the region. In the forests, the following zones can be clearly traced, such as: the middle taiga zone, the southern taiga and the forest-steppe zone. Valuable trees of Siberian taiga are represented by cedar, spruce, fir, pine and larch.

In the course of vegetation burning, a large number of various components enter the atmosphere each year, which somehow affect the atmospheric processes and affect the ecological processes.

In order to determine the amount of carbon emissions to the atmosphere in forest fires, a mathematical model of the upper fire is used, based on the law of conservation of mass, momentum, species and energy.

Two systems of equations are used for the boundary layer of the atmosphere and the dome of the corona. The finite volume method is used to obtain discrete analogs. Here mathematical modeling is the conditions for the propagation of forest fires, which would allow obtaining a detailed picture of temperature and component field variations over time and allow determining the total amount of CO and CO_2 emissions in the atmosphere during the spread of forest fire.

As a result of the study, the following data were obtained: at the outbreak of ignition, CO2 emissions prevail, and with an increase in wind speed up to 5 m/sec – CO. CO_2 is produced by the combustion of products of gaseous and condensed pyrolysis, and CO is released together with pyrolysis products. Obviously, with increasing wind speed, some pyrolysis products do not have time to react and are performed from the area of elevated temperature.

The mathematical model makes it possible to describe various conditions for the propagation of corona forest fires taking into account various weather conditions, the state of forest combustible materials, which makes it possible to apply this model for prediction and prevention of fires. The proposed model gives a detailed picture of the change in the temperature and concentration fields of the components (O_2, CO_2, CO, etc.).

References

1. Grishin A.M. (1992). Mathematical models of forest fires and new ways to combat them. Nauka LTD, 408 p.
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