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CREATION OF SPOTS ON MELTING SNOW — A SIMPLE MATHEMATICAL MODEL

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ABSTRACT

Snow that fell in winter melts in spring. Usually, the speed of snow melting on a given surface is uniform. This causes the thickness of the snow layer to be a decreasing function of time but a constant function of spatial variables. However, in special conditions, even in the case when the initial layer of snow is more or less uniform on the surface, after some time the melting speed and at the same time the thickness of the snow are different in different areas. This leads to the formation of spots on the snow.

Such a phenomenon can be observed in areas where there is high dustiness and the snow that fell in winter contains a large admixture of dust.

The presented work contains a proposal for a new mathematical model of the reaction-diffusion type, which describes the described phenomenon well.

Of course, the model has one, zero, stationary point. However, an appropriately defined measure of the diversity (in space) of snow thickness can increase or decrease over time before reaching a stationary state.

The results of a computer simulation of this model are presented. It is shown that for different values of the model parameters, spots on the snow appear or do not appear during melting.

Further analysis of the model should lead to the determination of the conditions under which the diversity measure increases and snow spots appear.

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REFERENCES

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