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A new model for boundary layer flows interacting with particulates in land surface on complex terrain

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In the present work we develop the method describing transport of particulates in atmospheric boundary layer over complex surface. This method is directed to overcome the difficulties of traditional methods, described above. Besides it practically expands the opportunity of predictions of transportation of solid particles onto cases when it is impossible to use the approximation of passive scalar or in changes of impurity character in particular domains of cloud. Our model also permits to analyze phenomena, which are driven by complex topology of the flow above obstacles and can describe processes on interface between cloud of solid particles and pure atmosphere. In our model we use Nigmatulin equations [6] describing two-phase medium “gas-particles” by equations of ideal gas with variable equation of state. Effective equation of state for such medium depends upon characteristic size and concentration of spherical particles and in the limit of absence of solid phase is converted to usual equations of the ideal gas. Practically, the task to analyze transport particles in atmosphere is reduced to solving equations of ideal gas with variable in space and time equations of state. It provides the opportunity of describing the loaded and pure atmosphere by the same set of equations with different thermodynamic properties. In fact it means that this system of equations can be applied for modeling a boundary of clouds of solid particles and pure atmosphere. The use of the system of equations of ideal gas with a variable equation of state provides a direct dependence of hydrodynamic flow velocity upon concentration of solid phase. Practically, it means that there is a possibility of overstepping the limits of applicability of passive impurity approximation.