



## Mathematical model of a powder snow avalanche

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A powder snow avalanche of finite length and width is considered as a 3D cloud of dense fluid moving down an incline in an ambient lighter fluid. The shape of the cloud is approximated by a half-ellipsoid with varying dimensions. The model is a generalization of the model proposed by Kulikovskii and Sveshnikova who considered a 2D cloud, i.e. a cloud in the shape of a half-elliptic cylinder. A 3D model takes into account lateral spreading of an avalanche. The equations for calculation of the front and the centre-of-mass velocities of the cloud, mean density, the cloud height, width and length are formulated. The entrainment of ambient air and snow from the slope, as well as sedimentation of the snow particles are taken into account. The forces are gravity, Archimedes force, bed and upper surface friction and the pressure gradient along the avalanche surface arising due to its overflow by air. Motion inside the avalanche is also taken into account. The test calculations are made to describe the possible regimes of motion and to estimate the values of the model coefficients. A comparison with the experimental data and calculations of Beghin and Olagne (1991) is given.