Impact of a snow avalanche against an obstacle. Formation of shock waves.

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Two different types of phenomena observed in the process of an interaction of snow avalanches with obstacles can be called shock waves. Shocks of the first type are similar to hydraulic jumps in water flows. They are just a sudden increase in the flow depth. "Hydraulic" jumps can occur in flows of various media, both compressible and incompressible. Compressibility does not play a great role in the phenomena.

Shocks of the second type are connected with compressibility of the flowing material. If the material meets an obstacle and can not escape anywhere, then it is forced to be compressed and its pressure increases significantly. The boundary between a compressed material and the undisturbed flow is a shock wave. Such shocks are called here compression shocks.

The pressure behind the shock that appears at an instant of the flow impact against an obstacle determines the maximum value of the force acting on the obstacle. Further the force decreases due to interaction of the shock wave with open boundaries of the flow. So the time interval during which the obstacle feels the maximum value of the force is rather short. Still it should be taken into account in calculations of avalanches impact pressure and interpretations of measurement data.

This paper deals with compression shocks in avalanche flows. In particular, we discuss possible equations of state for the flowing snow that can be assumed to calculate the pressure behind a shock wave. The work was partly supported by Russian foundation of basic research (05-01-00375).