

Experimental Study for Fluidized Mechanism of Pyroclastic Flow

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1. Objective of this study

Pyroclastic flow is a solid-gas two-phase current which is composed of pyroclastic materials, volcanic gases and air. The entrained gases play a significant role in the dynamics of the solid-gas flow such as fluidization. It is considered that the occurrence of the fluidization largely enhances mobility of pyroclastic flow.

Recently Roche et al. (2004) have carried out experiments on initially gas-aerated and gas-fluidized granular flows propagating into a horizontal channel. According to their experiments, two regimes, slumping and stopping, were observed after the lateral acceleration following release of the originally fluidized bed. From the analogy to high-Reynolds number gravity current in morphology of flow, they proposed that the flow in the slumping phase is approximated as inviscid newtonian fluid.

There are two interesting points in their experimental results. First, in most gravity current, another regime where inertia and buoyancy forces are balanced (inertia-buoyancy regime) is observed between the slumping and stopping regimes. However, this regime was not observed in Roche's experiment. Secondly, their experiments are characterized by the presence of stopping phase, whose duration time is not affected by initial conditions. We think that these features are one of the most important factors to determine run-out distance of pyroclastic flow. In this study, we design analogue experiments to investigate behavior of stopping phase and transition process from slumping to stopping regimes.

2. Experimental apparatus

The experimental apparatus is shown in the figure. It consists of a fluidization reservoir and a horizontal channel. The granular material is fluidized in the reservoir by introducing a uniform air flux from the bottom of the reservoir. The bed of granular material is released into a channel by means of a sliding gate, thus creating a flow that propagates along a horizontal, smooth surface. In the poster, we will report some experimental results by using this apparatus.

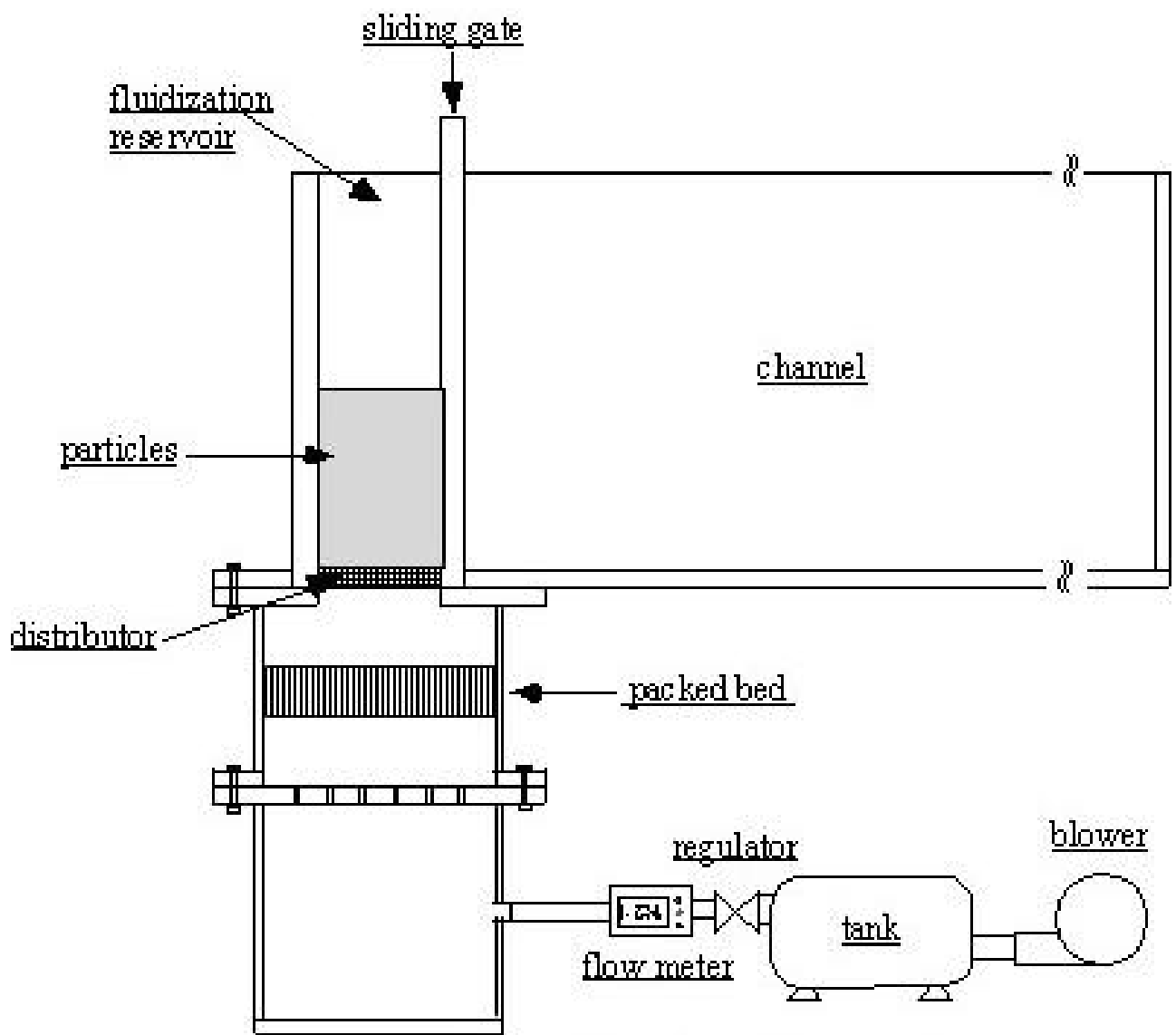


Figure Experimental apparatus.