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Experimental Study on the Variations of Head Velocity in Turbidity Currents

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Abstract

One of the most mechanisms of sediment transport within reservoirs is turbidity current. In this paper variations of the inlet densimetric Froude number and inlet Reynolds number on the head velocity of turbidity currents have been studied experimentally. Head velocity was measured using a video camera. The results of the experiments show that by increasing inlet Reynolds number the head velocity increases whereas by increasing inlet densimetric Froude number the head velocity decreases.

Keywords: inlet Reynolds number, turbidity current, head velocity, inlet densimetric Froude number

Introduction

Turbidity currents are effective factors of sediment transport in reservoirs and oceans. Turbulence suspends sediments in turbidity currents (Simpson, 1997). The intensity of current turbulence depends on parameters like: flow discharge, bed slope, sediment concentration and bed material. Turbidity currents consist of two different parts: 1) head, which is unsteady with pressure gradient as driving force. The difference of density between head and ambient fluid is major cause for pressure gradient, 2) body, which is assumed steady with gravitational force as driving force. Many researchers investigated the behavior of different parts of gravity currents. Parsons and Garcia (1998) investigated the similarity of gravity current fronts experimentally. Altinakar et al. (1990) studied influence of small slope on behavior of turbidity current head. Baas et al. (2005) investigated spectral analysis of the coherent flow structures in turbidity current. Alahyari and Longmire (1996) studied structure of a gravity current head. Allen (1971) considered mixing at turbidity current head. Buckee et al. (2009) used laser doppler anemometry (LDA) to compute profiles of mean velocity for saline density