

Velocity and Sediment Concentration Distributions of Turbidity Currents

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Abstract. In this work, we present a mathematical model to describe the distribution of the velocity and the particle concentration of the turbidity currents. The turbidity current is described by the Navier-Stokes equations with the use of Boussinesq approximation to approximate the effect of sediment concentration on the flow, the diffusion/dispersion equation for the sediment transport, and k- ϵ turbulence model for the problem closure. The model is simplified by a roof-like configuration which allows a steady equilibrium state of the flow. The numerical solution of the distribution of the velocity, the sediment concentration, the turbulence energy, and the dissipation rate are obtained by the finite-difference numerical scheme. The study shows that the entrainment capacity of sediment due to turbulence and the dampening characteristic of turbulence is related with Richardson number and non-dimensional settling velocity. The model is capable of capturing the fundamental characteristics of the turbidity current which provides a vital base state for the analysis of morphodynamics generated by the turbidity current.

Keywords: turbidity current