

APPLICATION OF TWO-PHASE MODEL ON SEDIMENT TRANSPORT AT LOWER SEDIMENT CONCENTRATION

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Sediment transport in river, reservoir and lake not only brings trouble with production, but also with environment problems. Studying movement and distribution of sediment in the flow is precondition to solve the problem. Sediment transport has been studied by a lot of researchers, and a great deal of research results have been obtained, but it is not perfect whether in theory or actual application. So, it is necessary to further study movement and distribution of sediments in the flow. In last years, the two-phase flow theory, which combines turbulence model, was applied to the sediment transport, but infrequent. From this aspect, the application of two-phase mixture model for sediment transport will be studied in this paper. The model includes the following model equations: continuity equation of the two-phase mixture, momentum equation for the two-phase mixture, expression for relative velocity, volume fraction equation of the second phase.

A mixture model of two-phase flow to simulate sediment transport has been introduced as following, and the velocity distributions of flow and volume fraction of sediments were given when the flow carries sediments with two different diameters respectively. The theoretical result of the velocity distribution almost matched with experimental data. The distribution of sediment on the bottom of flume was analyzed qualitatively and satisfied with general rules. So, this model was considered reasonable to simulate sediment transport for low sediment concentration.

Sediment transport of Yazidang Reservoir were simulated with the model for one phase flow and the mixture model for multiphase flow. Sediment distributions in the reservoir and volume fraction at the outlet of sediments with different diameters were displayed. From the computational result, sedimentation is more obvious, as the capability of the flow carrying sediments becomes weaker, and sediments filled up easier when the diameter of sediments becomes bigger. In the forecasting figure of sediment distribution for Yazidang reservoir, that shows sediment on the bottom filled up near the inlet at a certain extent.