Nat. Hazards Earth Syst. Sci. Discuss., 2, C1269–C1270, 2014
www.nat-hazards-earth-syst-sci-discuss.net/2/C1269/2014/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A two-phase model for numerical simulation of debris flows" *by* S. He et al.

S. He et al.

lixinpo@imde.ac.cn

Received and published: 2 July 2014

The authors would like to express deep appreciation again to the editors and the reviewer for your useful comments on our manuscript entitled "A two-phase model for numerical simulation of debris flows". The authors thus revised the manuscript carefully and explained the questions presented by the reviewer. The following are the necessarily responses for the comments in detail: (1) Debris flows are typical fluid-granular flows and three classical two-phase models were presented by Iverson (1997), Pitman (2005) and Pudasaini (2012). Iverson's model which is based on the mixture theory ignored the interactions between the solid phase and fluid phase, is really a one phase model. Pitman (2005) proposed a real two phase model in which buoyancy and drag

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

force are considered, but the viscosity is ignored in this model. In Pudasaini's model, buoyancy, drag force and a virtual mass are considered, and a non-Newtonian viscous stress is used to model the fluid phase. As we know, the interaction forces between solid and fluid phase of a two phase flow includes buoyancy, drag force, the virtual mass force, lift force, Basset force, interfacial pressure force as well as the turbulent Reynolds stress. However, it is too complex to consider all the interactions in one model. It is reasonable to select one or two of the most remarkable quantities according to the characteristics of the targeting debris flow. Erosion can change the solid volume fraction of the flow and a non-Newtonian model is more suitable under this condition, while if erosion is trivial Newtonian flow model can be used. Furthermore, real debris flow can be very viscous (mud flow) or can be very fluidlyïijĹwater-rock flowïijĽ, to simulate this two different debris flow with general model is very difficult. (2) The model in this paper provided some modifications based on the forementioned three classical models, and furthermore a high-resolution finite volume scheme based on the Roe-type Riemann solver is programmed to solve the equations. (3) In the paper, some improvements both on the model and algorithm are provided. However, too much material cites references of Pitman (2005) and Pudasaini (2012) without modification in writing of the paper. This will be revised in potential revisions.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 2151, 2014.