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Geoscientific Model Development Discussions

Interactive comment on "faSavageHutterFOAM 1.0: Depth-integrated simulation of dense snow avalanches on natural terrain with OpenFOAM" *by* Matthias Rauter et al.

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The authors present an implementation of a model for rapid mass movements similar to the established Savage-Hutter model in the open-source continuum fluid dynamics software OpenFOAM. From the concept such an approach is somewhere between using highly developed specific models (which are mostly not free and not open source) and developing an own code from the scratch. My own 2015 paper already cited was a first approach in this direction, and the promising results of the recent manuscript illustrate that such concept could indeed become an interesting alternative in the future.

The biggest part of the implementation has already been published very recently in the

paper in Comp. Fluids. What is new here is the application to real topographies and the implementation of particle entrainment for snow avalanches. I feel that these new components indeed merit a publication in GMD.

The paper is well written in my opinion, and I enjoyed reading it. Unfortunately I did not find enough time to get as deep into the theory as the first reviewer did and can provide only a few suggestions where the presentation could be improved.

(i) As a principal problem, it was impossible to me to understand the brief review of the theory without the much longer paper in Comp. Fluids. However, I do not know whether there is a way to get around this problem, but maybe the authors can think about it.

(ii) In the beginning I got stuck at the way how the fundamental equations (Eqs. 1-3) have been extended by particle entrainment, in particular why only the first equation is affected. I think it is correct this way using the momentum-flux version of the shallow water equations, but maybe a bit more explanation on this might help.

(iii) How does the "non-physical" parameter u_0 affect the results, in particular the question how close the avalanche comes to rest?

(iv) As a detail of the implementation, I did not get how the regularisation of Eq. 12 similar to Eq. 9 works.

I hope that these suggestions help in improving the accessibility of the paper for those readers who are not so familiar with the theory.

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