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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Hydrodynamics of pedestrians' instability in floodwaters" *by* Chiara Arrighi et al.

Anonymous Referee #2

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The authors introduce an interesting topic that has been addressed by several authors before through an experimental point of view. In the paper there is basically a numerical modelling considering a 3D approach, and some hypothesis associated to it.

Some comments of the authors concerning the scatter observed in the experimental studies, must be clarified. Most studies consider different types of individuals to test their problems against urban floods. And it is perfectly logical this scatter, and consider to define hazard criteria as a the lower bound values, not the highest ones. Authors for instance take part of the data of the studied developed by Karvonen, oriented to define hazard criteria, not for the normal people living in the urban area, but for rescue services, people much more trained and strong than aged people or teenagers. So to propose any function including this kind of data, could be biassed not to the normal people. Same comments concerning the message about the tests developed by Foster

and Cox, including babies. So it is logical that limiting conditions are not the same for everybody, babies and rescue services, and the scatter must be observed as it is in the real tests. It would be interesting if authors include all the data concerning the previous test developed by other authors (Abt, Takahashi, etc), and their statement that "... scatter can be reducedâĂŤ" considering their parameter is fully right or not.

Authors have made their choice considering just one orientation, person parallel to the flow. In flood events most of the problems are associated to the crossing of flooding streets. In those cases some of the distances considered in the analysis would be quite different, making more dangerous this condition and not the considered in the paper.

Concerning the application of the 3D code, I would like to get some more details. Authors indicate that no turbulence model has been considered. Especially for local effects, turbulence closures are needed to reproduce properly what really happens. The reason why the authors say they do not consider a turbulence model is not clear for me. Results must be checked with a turbulence model and compare if results change or not. Authors calculate few seconds. Is it fully stable flow? Some authors indicate problems when turbulence models are introduced and forces are calculated, and the process leads to some instabilities. Data about CPU time is welcome for the tests made

And another point not fully clear to me is the consideration of the lift force. Authors make the distinction between the buoyancy and lift force (ec. 1). But next they consider density equals between water and humans. What if not? More physical explanations concerning the final orientation are these forces would be welcome. And more interpretation of the results considering the huge variation of drag and lift coefficients is welcome too. Shape of the "person" tested is the same, so for instance drag coefficient can change with a ratio close to ten, for different rates of submergence. At the beginning seems reasonable, but when the shoes/ foot are covered, increase of submergence affects only to legs, so shape is almost the same.

The authors present a variation of the Lift force with Froude number, showing a first decrease, then an increase and another decrease. Can they introduce some physical explanation to this point?

Errata: Page 13, line 9, there are two consecutive “this”.

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