Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-261-SC2, 2016

Hydrology and Earth System Sciences
Discussions

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

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Received and published: 14 July 2016

Thank you for reading and posting comments to my manuscript, your suggestions and doubts are very appreciated and will contribute to improving the quality of the manuscript. I would also like to thank you for informing me about the recent publication of your manuscript, which, as you pointed out, investigates the pedestrians' instability for supercritical flow regimes. Your work fills a gap in the state of art, which helps the better understanding of the physical phenomenon. Therefore, it deserves to be quoted in my manuscript, whose state of art was preceeding the publication of your work. However, I would like to highlight that the experiments on people's instability in floodwaters in case of walking or standing subjects are quite different in terms of mechanical assumptions and hydrodynamic buondary conditions. I will try to reply point by point to your comments.

- Lever arm: The length of the foot (d) was assumed as lever arm of the resisting moment in order not to underestimate the ability of a subject of adjusting its posture when it feels a stress. Obviously, selecting a 'rigid' lever arm for an object, which is flexible and has many degrees of freedom is an hard task. With reference to the inset of Fig. 1, if the flow comes from right to left we expect (as argued by the previous experimental tests) that the subject will move towards the incoming flow with a consequent displacement of its center of mass. The magnitude of this displacement is extremely variable and the full length of the foot was preferred to other possible lever arms in order to introduce a sort of simplifying simmetry for the two opposite flow directions. I plan to modify the inset picture of Fig.1 to better explain this assumption and also to add a more precise discussion in this topic. About the numerical simulations, some tests have been carried out also for a flow coming from left to right (with reference to the inset of Fig.1), confirming the negligible influence of flow direction in the estimated hydrodynamic forces.

- Numerical model: The 'laminar' settings of the code do not simulate a laminar flow, which would be of course not physically meaningful, they simply avoid to model turbulence effects with a predefined closure model. With this assumpton the drag coefficients evaluated on a circular cilinder differed from the literature values in the same Reynolds number range of approximately 5-8%. The 'laminar' assumption was thus considered acceptable since the selection of non appropriate coefficients for the closure models would bear similar errors in the force estimation. A further work should consider both experimental and numerical experiments to correctly calibrate and tune the turbulence coefficients.

- Line 31 p12: I will definitely modify this sentence and quote your paper.

- Line 20 and 24 p25. As above, thank you for your experimental activity and results about friction and role of non-hydraulic parameters, the paper will be quoted there. Let me mention again the difference in hydrodynamic boundary conditions between standing and walking subjects. The numerical model and dimensionless parameter

introduced only the case of an upright standing subject and no conclusions can be drawn at the moment on the case of a walking subject, which should be modelled numerically by an extremely complex coupled CFD-CSD model. However I would be glad to use the experimental data you plotted in Fig. 9 (high hazard-medium hazard) of your paper together with the corresponding heights of the subjects in order to improve the final discussion of the manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-261, 2016.