Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2019-132-RC1, 2019

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A methodology based on numerical models for enhancing the resilience to flooding induced by levee breaches in lowland areas" *by* Alessia Ferrari et al.

Anonymous Referee #1

Received and published: 20 June 2019

I enjoy reading the paper by Ferrari and co-authors. It presents a method aimed at improving the resilience of lowland areas that are subject to flooding caused by possible levee failures. The method is simple, as it consists of composing a database of flooding dynamics caused by a (large) number of simulated levee breaches a priori, which allows knowing with good accuracy the flooding dynamics in case of a real levee failure by choosing the simulated event that is most similar in terms of breach locations (and possibly flood magnitude).

I can confirm from my experience that such an information could be extremely useful for civil protection purposes. I am thinking of the case of a town that ten years ago

was completely flooded about a day and a half after the occurrence of a levee failure, without undertaking significant countermeasures due to the lack of knowledge about flooding propagation in that area.

The text is clear and generally well written. The English could be slightly improved in term of readability with a careful proofreading.

It could be worth adding some discussion on the role of the drainage network that typically dissects rural anthropogenic lowlands. Drainage networks, which comprise ditches and channels of gradually increasing size, as well as small obstructions, were proven to affect the flow dynamics at a local scale, encompassing flood formation, the speed of the submerging wave and the flow direction (Hailemariam et al., 2014; Viero et al., 2014; Viero and Valipour, 2017). On the other hand, it must be recognized that the present study deals with the simulation of major flood events, as those caused by levee breaches generally are, and it is reasonable to assume that relatively small landscape features produce negligible effects in such cases.

Finally, I suggest stressing that such a database should be updated when significant modifications affect the landscape and, particularly, the topography of the floodable area, particularly for embankment construction and/or removal, as they can change the flood dynamics dramatically and, often, in unexpected fashions (e.g., Viero et al„ 2019).

ADDITIONAL REFERENCES

Hailemariam, F.M., Brandimarte, L., Dottori, F., 2014. Investigating the influence of minor hydraulic structures on modeling flood events in lowland areas. Hydrol. Process. 28, 1742–1755. doi:10.1002/hyp.9717

Viero, D.P., Peruzzo, P., Carniello, L., Defina, A., 2014. Integrated mathematical modeling of hydrological and hydrodynamic response to rainfall events in rural lowland catchments. Water Resour. Res. 50, 5941–5957. doi:10.1002/2013WR014293

Viero, D.P., Valipour, M., 2017. Modeling anisotropy in free-surface overland and shallow inundation flows. Adv. Water Resour. 104, 1–14. doi:10.1016/j.advwatres.2017.03.007

Viero, D.P., Roder, G., Matticchio, B., Defina, A., Tarolli, P., 2019. Floods, landscape modifications and population dynamics in anthropogenic coastal lowlands: The Polesine (northern Italy) case study. Sci. Total Environ. 651, 1435–1450. doi:10.1016/j.scitotenv.2018.09.121

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2019-132, 2019.