

REVIEW

The cascading effect of wildfires on flood risk: A multi-hazard flood risk approach for Ebro River basin Spain

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The paper represents one of the first attempts at quantifying the wildfire-flood hazard interrelationship and evaluating its impacts including societal aspects. For this reason, I believe the contribution is scientifically valuable and deserves publication.

The authors effectively replied to the reviewers' comments and overall improved the manuscript. Nevertheless, **some minor but essential improvements are still required**, to better frame the work into the previous multi(-hazard)-risk literature.

1. The authors use extensively the expression "cascading", referring to, e.g., "the occurrence of cascading flooding after wildfires". At line 54, they explain that "cascading here means that the occurrence of wildfires preceding floods will trigger or amplify the risk of flooding".

Nevertheless, floods are not directly triggered by wildfires, so it is not proper to talk about cascading. I suggest referring to "standardised" multi-hazard interaction mechanisms classifications available in the literature. What the authors are referring to is a typical case of "disposition alteration" as named by De Angeli et al. (2022), in which "there is no direct triggering of one hazard by another or any simultaneous temporal occurrence. Still, the occurrence of the first hazard can influence the frequency or the magnitude of the second one". This mechanism is also introduced by Tilloy et al. (2019) with the name "change condition".

Ref:

De Angeli, S., Malamud, B. D., Rossi, L., Taylor, F. E., Trasforini, E., & Rudari, R. (2022). A multi-hazard framework for spatial-temporal impact analysis. International Journal of Disaster Risk Reduction, 73, 102829.
Tilloy, A., Malamud, B. D., Winter, H., & Joly-Laugel, A. (2019). A review of quantification methodologies for multi-hazard interrelationships. Earth-Science Reviews, 196, 102881.

2. The authors wrote that Versini et al. (2013) assessed flood risk, but then they affirmed that Versini et al. provided the hydrological probability of flooding, i.e. they did not assess risk but just

performed a probabilistic flood hazard assessment. I invite the authors to be careful to not mismatch hazard assessment and risk assessment.

3. If I understood well, the manuscript proposes advancements in three complementary directions:
 - 1) The modelling of the interaction mechanism between wildfire and flood, in terms of "disposition alteration" (see previous comment), for what concerns the hazard part
 - 2) The inclusion of socio-economic indicators, for what concerns the exposure and vulnerability dimensions
 - 3) The projection of future risk conditions

These different aspects of novelty might be highlighted more clearly in the introduction, which is currently mixing all these concepts.

Moreover, it is not so clear the innovation related to the second point. While the modelling of the interaction mechanism between wildfire and flood covers a current gap, the inclusion of socio-economic indicators in flood risk assessment has been already largely explored in the literature. The authors should provide more indications about the innovation of this specific aspect. E.g., is it innovative because it has never been done in that specific case study area?

4. I feel a bit uncomfortable with the proposed "classification" of risk parameters into hazard, exposure and vulnerability. Indeed, some of the factors that the authors label as "vulnerability" are hazard parameters. I am referring, for example, to the Saturated Hydraulic Conductivity. More specifically, this is the flood hazard parameter which is "altered" by the wildfire, representing indeed the interaction mechanisms between the hazards that the authors introduced as a novel aspect. This multi-hazard mechanism is not well captured by the graphical representation of Fig. 2. This is also because the Saturated Hydraulic Conductivity is seen as a vulnerability indicator rather than a hazard parameter.