3. Reviewer 3

We would like to thank the reviewer for the time and effort spent on reviewing this manuscript, and for his positive and constructive feedback. Please find below the details of the modifications we have introduced in response to the comments.

3.1. The methods employed in the manuscript are intended for civil protection and emergency services. It would be interesting that the authors recall the needs of these authorities in that field for the two flood types addressed in the manuscript : fluvial floods and flash-floods.

The needs of the end-users are similar across flood types, and we have added a sentence summarising the most important requirements in line 25ff (which described in detail by the added WMO reference):

> *"To enable an effective emergency response, the warning information needs to be accurate, easily interpretable, and disseminated in a timely manner to end-users such as civil protection authorities (WMO, 2018b)."*

A special requirement during flash floods is that the delay of the warnings must be extremely short, as the fast-evolving nature of such events leaves only little time to react. We have added the following sentence after line 35:

> *"The fast-evolving nature of flash floods require a quick computation and dissemination of the warnings to the end-users to maximise the time available for emergency response measures (e.g. evacuations or road closures)."*

3.2. The reading of the manuscript would be easier if the authors presented how these methods can be used in an operational and "real-world" context according to the type of flood.

To point out more clearly the use of the flood forecasts in the operational work of the end-users, we have added in the introduction before line 41 the following sentence:

> *"The hazard forecasts provide information of potential flood locations and magnitudes before the onset of the event and thus help to coordinate measures such as warnings or evacuations."*

Furthermore, regarding the past usage of EFAS RRA in operational settings, we have expanded the sentence in line 56ff to the following:

> *"As part of the European Flood Awareness System (EFAS), the RRA has been providing for a few years operational decision support to various end-users across the continent, who monitor the outputs on a daily basis for the coordination of response measures in case of emergencies."*

3.3. It is not clear if the assessment of flood impacts is performed from forecasts, simulations or observations.

To minimize external uncertainties for the purpose of this study, both methods use as inputs hydrometeorological observations (no forecasts), as pointed out in lines 123-125 and in Table 1.

3.4. It would have interesting to study the sensitivity of the obtained to forecast uncertainties, especially for flash-floods where these uncertainties are often very large.

Yes, it would indeed be very important to analyse how the larger uncertainties induced by the forecast propagate down to the impact estimates, but such a sensitivity analysis is unfortunately out of the scope of this study. To point towards this direction, we have added a remark on this in the conclusions. Lines 406ff will then read as follows:

> *"However, the uncertainty in forecasts for flash floods is typically higher than for fluvial floods when considering longer forecasting horizons (e.g. days), and the sensitivity of the impact outputs towards the increased uncertainty in the forecast inputs requires further investigation."*

3.5. As noticed by the authors, a fluvial flood and a flash flood display very different dynamics which could result in different applications conditions. How the authors deal with this point to estimate of a compound flood?

Although in this study, the impact estimates are presented summarised over the full event duration, in a real-time application, the compound impact estimates/forecasts would be computed time step by time step. For instance, ReAFFIRM computes the flash flood impacts every 15 minutes, while EFAS RRA the river flood impacts every 6 hours (see Table 1). The real-time compound impact output would be merged every 15 minutes, using the current ReAFFIRM outputs and the most recent (6-hourly) EFAS RRA outputs. In this way, the compound output would display the different dynamics of both flood types. The conclusions (lines 402-408) provide an outlook on the necessary steps for a real-time implementation of the compound flood impact estimation, taking into account differences between the flood types, e.g. with respect to the lead times.

REFERENCES

WMO: Multi-hazard Early Warning Systems: A Checklist. Outcome of the first Multi-hazard Early Warning Conference, Tech. rep., WorldMeteorological Organization, Cancún, Mexico, 2018b.