REVIEW

“An attempt to deal with flash floods using a probabilistic hydrological nowcasting chain: a case study” by F.Silvestro, N. Rebora and G. Cummings

This article presents a nice “what if” hindcast of a flash-flood event that occurred in a mountainous, Mediterranean catchment. To perform the hindcast the authors use a tool, which uses rain-gauge adjusted radar precipitation estimates and radar-based ensemble precipitation forecasts as input to the semi-distributed rainfall-runoff model DRiFt. In general the article is well written and well structured. It is short and straight forward, however more information on the methods used need to included in the text (see Comments).

The authors show that the suggested flash-flood ensemble nowcasting tool would have helped to predict the presented case with a lead time of approximately 3-5 hours. But also, that this forecast wouldn’t have changed anything, as nobody would have watched the forecasts during the evening/night.

So their system theoretically worked for this particular case. However two main points arise:

- It appears to the reader that the study catchment is extensively monitored (120 rain gauges in the region, discharge observations, C-band Doppler radar). Then why not use all the data and analyse all the cases covered by the data and say something more about the proposed system and its performance?

  It is suggested, that the authors include such an overall analysis (or explain why they don’t do it).

- As the authors describe nicely, the “communication” is the crucial or week point in this forecasting chain (as in most other systems too). The main finding of this case study is not so much that the proposed system would have worked, but that it wouldn’t have helped anything all the same, as nobody was following the forecasts during the evening/night. The forecast isn’t worth anything if it is first seen when the event passed. So what were the consequences of this analysis? Is there any SMS alert to the hydrologists/forecasters in charge? Did the communication ways shorten? Can the operational forecasts be accessed online by the forecasters? And is the presented system implemented operationally now? If yes, how are the experiences, if not, why not?

  Please add this information in the conclusion or outlook for example.

  Also add a sentence to the abstract, describing this problem: As you showed the problem is not the forecast itself but its accessibility/distribution/communication/authority.

Comments:

Introduction/General: The authors describe their aim well. However they are very sparse with references referring to similar work done in this field . A careful literature review should be done by the authors.

7499L9-11/7501L8-11: The authors describe the storms affecting the catchment (and also the region) as more persistent then normal thunderstorms, due to the orographic conformation (and therewith orographic forcing). Therefore, I would expect that the conditions leading to such persistent storms are fairly similar every time. As there are many meteorological stations in the region, which have a high temporal resolution it would be possible to use also other meteorological variables like wind to detect critical situations. Additionally there is a radar nearby the catchment. The authors should consider the work done by Panziera et al. (2011) on "NORA - Nowcasting of orographic Rainfall by means of Analogues" and the application of it to flash flood early warning by Liechti et al. (2013).

7499L3-4: I would change this sentence. NWP can not predict the kind of event described in the article with the lead time needed for operational flash flood forecasting. However, NWP, like for example COSMO-2, which assimilates radar rainfall data, and which should also be available for the study region, can forecast the location more accurate then at the 10^3-10^4 km^2 the authors state.

7499L11-19: References.

7499/00L27-01: I agree that this can not be done by NWP driven systems alone, but there are other studies that demonstrate the power of radar data for this type of problem.

7500L5-8: … impossible with a hydrological model running at hourly time steps. If it was possible to run the model at the temporal resolution of the meteorological data (5-10 min as stated on p.7501) the lead time would be about 3h (t_b) – which is in the order of the forecast system presented in this study(p.7507).

7500L11: unpredictable: if the persistent storms are caused by the orographic setting (as described in chapter 2) they are not unpredictable, they most probably follow a certain rule (better use unexpected).

7501L25-28: please provide a map of the situation

7502L16-18: Nowcasting model PhaSt: Only one sentence is spent on the model. Short and concise is ok, but please give some basic information about the procedure (last two radar fields as input, number of members …) in the text and not only put the reference.

7502L19-21: The hydrological model DRiFt: Also here the authors spend only one single sentence on the hydrological model. They give reference but for the reader it would be useful to have some minimal information about spatial resolution, temporal resolution, number of parameters …

7502L28: Why do you use only the last two hours and not all three hours? Please explain.

7503L10/11: For the reader it would be convenient if you gave some basic properties of the models mentioned (eg. spatial resolution, lead time, forecast interval, probabilistic or deterministic …)

7505L15-20: It comes not clear for the reader if there was an SMS alert sent in the case described by the authors or not. And if not, why not.

7507L1-3: Does this mean that the forecasters do not have online access to the forecasts when they are not at work? This does not come clear here.

- I can't find any information about the discharge measurements. Please add this to the measurement systems.
- RIME (Fig. 2) is not explained in the text. Please add.

Minor comments:

7498L14/15: probably change "is here presented" to "is presented here"

7499L9-11: change order of sentence and split it in two: "In terms of intensities and localization, events of the type described in this study are similar to the common thunderstorms. However, …

7499L14: a huge amount of damage (singular)

7501L1: replace "range of mountains" with "mountain range".

7501L1-2: I would change the sentence to the following: "The Apennines is a range of mountains with ~~heights~~ elevations between 1000 and 1700m a.s.l. that rapidly decrease to sea level with relatively ~~high~~ steep slopes."

7501L4: (~~the characteristic lag time of the basin is usually~~ defined as the temporal distance between the centre of mass of the hydrograph and the centre of mass of the mean hyetograph)

7501L14: These two factors, the proneness of the Region to flash flood occurrence and …

7502L1+7: use PHNF instead of framework

7502L2: ~~observed~~

7502L20: … uses the rain-gauge adjusted radar precipitation estimates and the rainfall fields generated by PhaSt as input …

7503L2: the Liguria Region

7503L5+7504L16: damage (singular)
http://www.oxforddictionaries.com/definition/english/damage?q=damage

7503L9: As usual, the following model were used: …

7503L8: I would delete the brackets ().

7504L5: check "behaviour" and "behavior" for consistancy

7504L26: rainfall observations → be more precise → eg. rain-gauge adjusted radar precipitation estimates

7505L2: either “for easy” or “to ease”

7507L5: rather use unexpected instead of unpredicted/unpredictable

7507L26

Table 1: write in caption what is taken as input data, → rain-gauge adjusted radar precipitation data

References

Liechti, K., Panziera, L., Germann, U. and Zappa, M., 2013. The potential of radar-based ensemble forecasts for flash-flood early warning in the southern Swiss Alps. Hydrol. Earth Syst. Sci., 17: 3853-3869.

Panziera, L., Germann, U., Gabella, M. and Mandapaka, P.V., 2011. NORA–Nowcasting of Orographic Rainfall by means of Analogues. Quarterly Journal of the Royal Meteorological Society, 137(661): 2106-2123.