General comments:

This paper deals with a very interesting and challanging issue: how to forecast the impacts of flash flood (FF)? Indeed, usually, flood forecasting related papers only deal separately with one issue: meteorology, hydrology, social sciences. This paper pro poses a common framework and presents a FF forecasting impact method, based on a 2-step chain: 1/ pre-determination of flooded areas allowing to define "potential" impacts and 2/ a real-time rainfall runoff model used to choose the relevent predetermined flooded area. This two-step approach is convincing. It is simple enough to be run in real-time. On the other hand, the needed simplifications (for instance in the hydraulic model) are carefully identified and analyzed on very well documented two case studies. Finally a "validation" is presented, based on insurance claim data. Considering the high quality of this paper, I would recommend its publication with only a minor revision.

My main suggestions (detailed in the following remarks) are:
- Some details in the methodology need to be better explained;
- I am not sure that we could talk about "validation based on insurance claim data" as stated in the title, since as it is well explained in the paper, the ratio "nb of claim"/ "nb of flooded policy" does not reach 100% and need here to be event-based calculated using observation data (see my last remarks).

We thank referee n°1 for the careful reading and globally positive appreciation of our manuscript, and for having raised these two main weaknesses. We explain hereafter how we plan to address these important points (see our answers to detailed comments).

Detailed comments
1. Page 3, Line 19: reference not suitable : this authors are talking about the FFG, which is typically dedicated to ungauged catchment. Find some references dealing only with gauged systems.

OK, we propose here to keep these references but to reformulate the presentation of flash flood guidances, which are to our knowledge among the first approaches really devoted to flash flood warning: "The first approaches developed, namely the flash flood guidances, were based on a preliminary analysis of rainfall volumes generating bankfull flow, for several durations and catchment initial moisture conditions (Georgakakos, 2006; Norbiato et al., 2008). More recent approaches aimed to directly forecast peak discharges at ungauged locations based on distributed hydrological models and radar based quantitative precipitation estimates or nowcasts (… ".

2. Page 3, Line 20: Figure 1 and text are not totally coherent. The text mention 3 steps and the figure has 4 illustrations. After reading, it seems that illustrations a and b are related to step one and illustration c and d are relatated to step 3. Step 2 is not illustrated (1-D longitudinal water profil computation). I would suggest to make clearly appear the 3 steps on the figure.
3. Page 3, Line 23: Too few information is provided for step 3. How exactly do you move from the 1D longitudinal model to a 2D representation of the flooded area? Furthermore, from the Fig1 legend, it is understood that a (manual?) post treatment is applied to remove some disconnected area, not clearly mentioned in the text.

Actually figures 1.a to 1.c correspond to the three computation steps mentioned in section 2.1 (l.20-23), and figure 1.d to the additional post-treatments described in section 2.2 (p.4 l.21-24 and l.32-33). We suggest here to group the description of all these treatments in section 2.1 (see answer to point 4 below), and to reformulate the text for an explicit reference to the appropriate figure for each step described. The caption of figure 1 will also be changed for an explicit reference to the computation steps described in the text.

4. Page 4, Line 13: maybe detail and regroup here all the manual corrections (including the removal of disconnected area if it is manually done, (see previous rq), in order to insist on

problem of using an 100% automated method, and on the consequent amount of work you have done to deal with this issue in order to obtain coherent inundation areas.

Ok the description of additional treatments (corresponding to figure 1.d), will be moved from section 2.2 and grouped here (i.e. at the end of section 2.1). We will also mention here that these additional treatments could be applied automatically (even if it was done manually here).

5. Page 4, Line 15: The mentioned return periods are not coherent with the Fig2: 6 return periods on a), 10 on b). Furthermore, in the text, latter you also mentioned 10 flooded areas (page 5, line 18). I imagine the 10 return periods you analyzed are those of fig2b ie : 2, 5, 10, 20, 30, 50, 100, 300 (not 200), 200, 1000)?

The 10 return periods are indeed the following: 2,5,10,20,30,50,100,300,500,1000. The list in the text has therefore to be corrected. Figure 2.a includes only one part of these computation results: the T=30, 300, 500, and 1000 years maps are not included. We propose to modify this figure: see the joint updated version including a comprehensive representation of the results.

6. Page 4, Line 15: Do you have just a upstream flow input or also lateral flow inputs? If yes, how this lateral input is estimated and injected in the hydraulic model?

Only an upstream flow input was applied here for the computations, since the information on discharge quantiles was available only at these input nodes. Therefore the discharge is assumed to be homogeneous on each river reach. A comment on this important simplification will added in the text. Fortunately, the considered river reaches are not very long (~2 km in average) and the effects of this simplification should be limited. However, if necessary, running the hydraulic computations with lateral inputs would be possible based on a continuous discharge quantiles information along the stream network.

7. Page 4, Line 17: Which limit condition do you apply at the very last downstream reach ? How do you determine the length of each reach?

The limits of each river reach are determined by the output points of the rainfall-runoff model (which correspond here to the outlets of the french watershed database provided by the SCHAPI): this information will be added in the text (with a reference to sections 3.1 and 3.2 providing information on the lengths of the considered reaches). The dowsnstream boundary condition corresponds to the normal depth for a uniform flow regime: this will also be mentioned in the text.

8. Page 4 Lines 21-24: this point maybe need to be explained more explicitly (gives some partial answer to my rq 3).

See above the answers to remarks 3 and 4: this explanation on additional post-treatments will be detailed and moved to the end of section 2.1, with further comments on the possibility of automatization of these treatments.

9. Page 4 section 2.2: It seems to me that this section focuses more on the limits of the method than on the "catalogue of flood maps" as indicated by the title. I would change the name of this section to clearly indicates that you focus on the limits of the automated procedure presented in 2.1. I would also regroup in this section all the content related to manual procedures earlier mentioned in section 2.1. In this case, lines 15-19 should be put in 2.1. or maybe in 2.3 which is a little too short in comparison with the other sections. (nota: this change in your plan is only a suggestion)

Our proposal is to reorganize the plan in the following way (by grouping sections 2.2 and 2.3):
2.1 Simplified automatic implementation of 1-D steady-state hydraulic models
2.2 Computation of a catalog of flood extent maps and associated impacts model
2.3 Remaining limits of the procedure
2.4 The rainfall-runoff-impacts simulation chain

10. Page 5 Line 18: "10 flooded" area ? see rq 5.

10 flood maps are actually used for the computation of the impacts models. See answer to remark 5.

11. Page 6 Line 3-4: what spatial and temporal resolution were finally adopted for the rainfall-runoff model in your case studies ? (maybe to be mentioned later, but I didn t find the info in the rest of the paper)
Some elements on the spatial resolution (5km² elementary catchment area for the definition of river network integrated in the model) are provided in section 3 but are probably not sufficient. The temporal resolution of the computations is 15 min. A sentence will be added here to detail these aspects.

12. Page 6 Line 6: If I understood, the "reaches" and cross sections defined here are not the same that in the previous section. How are they determined? Are those mentioned in table 1?
The river reaches considered in the hydraulic computations and in the rainfall runoff model are identical: this will be mentioned by adding a sentence on the model resolution (see previous point). However, the geometrical characteristics of the cross sections are simplified and assumed to be rectangular in the rainfall-runoff model, since only the flood wave transit time has to be well anticipated (see next remark for the determination of the cross sections widths).

13. Page 6 Line 13: "the width of river reaches is the main parameter controlling the transfer function and is estimated based on the Strahler order of river reaches" but previously you wrote Line 6 : "The width of the cross-section varies with return period of the discharge". Could you please clarify exactly how widths are calculated (same rq as 12)
The widths are estimated based on a generic formula proposed by Versini (2010): $W=Lo.i^2$, where i is the Strahler order and Lo is an elementary width having 3 different possible values depending the discharge return period. These details are provided in the cited reference (Naulin, 2013), and are not crucial here in our opinion. Therefore we propose to remove the sentence on line 6 and to reformulate line 13 :"the width of the river reaches is the main parameter controlling the transfer function and is estimated based on the Strahler order and discharge return period (for further details see Naulin et al., 2013)"

14. Page 8 Line 17: temporal and spatial resolution?
1 km² of spatial resolution, 5 min of temporal resolution in both cases. However, this does not correspond to the resolutions of rainfall runoff computations (see above).

15. Page 8 Line 20: may be change the title by:Reference flood maps obtained from previous studies"
(just a suggestion)
OK, we agree.

16. Page 10, Line 7: There is a jump in the figures numbers. Maybe renumber the figure 7 in figure 4.
OK, this will be done.

17. Page 10, Line 32: "It was worse testing if it could provide a number of private houses affected by the floods for each river reach to be compared to the outputs of the proposed forecasting chain." Worth instead of worse? Please reformulate. What do you exactly mean?
We propose a simplification of this sentence: "We tested herein if it could provide a number of private houses affected by the floods to be compared to …"

18. Page 11 Line 12: do you know how hydrometric services extrapolate these rating curves? Using hydraulic consideration?
The extrapolation may be based either on a local hydraulic modelling (Alès and Mialet) or on an expert-analysis of hydraulic control of the streamgauge section (Banne). These important precisions will be added in the text.

19. Page 11 Line 32: replace 'form" by "from"
OK.

20. Page 12 Line 21: "This explain why..." Please explain why.
We propose this reformulation "It is important to note that the low-flows water heights are limited in these Mediterranean rivers. This explains why bathymetric data is not crucial to obtain a relevant estimation of the cross sections shapes: aerial topographic surveys are often sufficient to get an accurate representation of the river beds in Mediterranean regions."

21. Page 13 Line 31: How is your rainfall-runoff model initialized (in particular the initial soil moisture conditions)? Don t you think that can also be a (important) source a uncertainty?
Indeed the initialization of the rainfall runoff model is a crucial aspect which can result in significant bias in the estimation of peak discharges. The model initialization is performed here based on the initial method proposed by USDA, using the 5 days antecedent rainfall: this will be mentioned in section 2.4 with a reference to Naulin (2013) for details. More generally, the rainfall-runoff simulation represents a significant part of the final uncertainty of the whole simulation chain. This is illustrated by figures 5.b and 5.d, and commented in section 4.3.

22. Page 13 Line 31: "forecasted peak value" => Maybe replace "forecasted peak value" by "simulated peak value" in all the text since, the RR model is run in a "simulation" not a "forecasting" mode (using QPE, not QPF).
OK, this will be done.

23. Page 14 line 2: In figure 6 legend replace TSI by ISR
OK.

24. Page 14 line 12: maybe change "forecasted peak by "simulated peak".
OK.

25. Page 14 line 26:"Clearly, the number [...] has a random component". I agree, but your random binomial process take into account 'all' the errors of the damage database.
We propose here to modify the sentence: "Clearly, the number of reported claims per river reach has a random component due both to the claims triggering processes and to the limits of the claim database."

26. Page 14 line 29: Maybe indicate explicitly that you choose p=0.37 and p=0.43 from table 2, so knowing the number of "observed" claim divided by the number of policies effectively flooded (ie using the observed flooded area). Do I correctly understand? Or do you divide by the number of policy flooded according to your model (ie using the modelled flooded area)? In this last case, it is not a validation since p seems to me a kind of last adjustment parameter which unbiased the impact model. Please clarify.
Yes, the ratios should be computed inside the actually observed flood area, and without using the computed flood areas. However, the observed flood area may not be available everywhere. By default, our proposal here is to compute the C/P ratios on the 1000-year flood extent (which differs from the simulated flood area for the considered events). This may lead to slightly underestimate the C/P ratios since some non-flooded areas are incorporated in the estimation of the ratio. A sentence will be added in the text to clarify this point.

27. Figure 8: But I maybe missed one point. Why can we see some "horizontal" steps into the claim/policies relation (blue). How did you exactly plot these blue curves?
The binomial process correspond to a discrete random variable: each realization c of the variable is necessarily an integer (c being the number of claims reported for one river reach). The non-

exceedance probabilities F(c) increase by steps in function of c and cannot be exactly equal to 0.05, 0.50, or 0.95. For this reason, the intervals limits were computed here as the lowest discrete c values for which $F(c) > \alpha$, $\alpha \in (0.05, 0.50, 0.95)$. This explains the steps in the curves especially when the number of claims is limited. To avoid this, we propose to estimate the intervals limits by linear interpolation between c and c-1, with $F(c-1) < \alpha < F(c)$, $\alpha \in (0.05, 0.50, 0.95)$. We join the updated figures.

28. Page 15 line 4-5: I don't understand. I thought you used the 'observed' flooded area to calculate the total number of policy (see rq 26). Please clarify.
Provided that the observed flood area is not available everywhere, our choice was again here to estimate the reference number of claims based on the 1000-year flood envelop (i.e. without using the simulated flood area, see answer to remark 26). This time, this choice may result in a significant overestimation of the number of claims observed in the actual flood area.

29. Page 16: I globally agree with the conclusion. But does your paper also suggest that this insurance data are not suitable for a 'real' validation of the impacts (if you mean that "impact" = "nb of claim"), since you need to know the ratio "number of claim"/ "number of impacted policy"... Maybe further researches are also needed in this direction?
How to better estimate this ratio (by removing the other errors you mentioned from the database)? And then how to "forecast" it (is there some national coherences?)?
Clearly the validation process could still be improved. First, by a better identification of claims really related to river flooding in the claim database, which is unfortunately out of reach at this time. A predictive estimation of the claim ratios would also certainly enhance the validation process. Such estimations are usually obtained by insurance companies based on mean relations between claims ratios and inundation water levels, generally established at a large scale. Therefore, a further research step could be to use the water levels from our 1-D hydraulic computations to directly estimate the claim ratios. This consideration will be added in the conclusion.