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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Quantitative historical hydrology in Europe" *by* G. Benito et al.

G. Benito et al.

benito@mncn.csic.es

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The authors are very gratefully for the very constructive comments of the reviewer, and their high value to improve the submitted manuscript. Most of them have been included in the updated version of the text.

Regarding the specific comments:

P.4416, l.1: Please add a comment about the China reports: are they continuous and homogeneous for any long period?

Reply: The following sentence has been added to the text, to explain the continuity and homogeneity of Chinise records:

China documents on historical floods date back in some cases to 2000 years ago, with

detailed descriptions over the recent 600 years and complete and homogenous data over the last 200 years (Luo, 1987).

P. 4416, l.11: Introduce a full stop before starting the paragraph about the early stages of hydrology. Thank you. The change has been included in the text.

P. 4416, l.18-25: It would be better to follow a chronological argument, starting from the longest series (paleofloods), following by historical floods and ending with early instrumental period.

Reply: The argument is not intended to follow a chronological order but the relevance of European historical hydrology on the international context.

P. 4416, l.14: It would be better to cite Fig.1 in another place, because it shows a genera framework of different sources of information and in its present position in the text, it only does reference to gauge stations and data-loggers Reply: Figure 1 reference was deleted from this site.

Reviewer comment: 2. Quantitative historical hydrology The section does not correspond to this title. It is a mix of different thinks that are already included and developed in other parts of the paper, and some general aspects with other more detailed ones. In order to better contribute to the learning of the reader, the better would be: a) to maintain the introductory style and removing it to the introduction doing the necessary changes; or b) to develop more the different aspects commented in the section, merging with other parts of the text. For instance, when you speak about the quantification (numerical or categorical), you should introduce here the classifications that you present in other parts of the paper in basis to return period, peak of discharge or types like catastrophic or extraordinary floods.

Reply: We agree that this section could be included in the introduction. However, we think that including a longer introduction may confuse either further to the reader. The introduction section is mainly devote to explain that this review paper will be focus only

on studies that have quantified flood magnitudes from the historical record, and not to the whole set of historical flood studies. The title in section 2 is need to justified the data sources and methods used in the literate to hydrological quantification of historical floods.

P.4420: It would be better to numerate the equations

The formulae have been numbered.

P.4421, l.26: For the non expert it would be better to say the meaning of "ca."

Reply: All ca. was either change to circa or other full complete words.

P. 4424, l.5: Databases are not usually printed sources.

Reply: Database was removed from the example list

P. 4424, l.11: Remove from the bracket the reference of Barriendos and Coeur (2004), it is cited explicitly in the following sentence. On the other hand, in the paper of Barriendos et al, 2003, the qualitative classification showed is better than in Barriendos and Coeur, 2004, because it synthetizes both classifications, this one used in the papers from Coeur and Lang for French rivers and this other one commonly used by Barriendos and other authors for Spanish rivers. Please, displace here the classification that you show in the first paragraph of page 4436.

Reply: Barriendos and Coeur paper was deleted from the text and reference and used instead Barriendos et al., 2003.

In page 4436 is describe only a part of Barriendos et al., classification, because Ordinary floods are not considered in the applied examples used for Figure 8. I would rather to leave this short description of flood categories on page 4436.

P. 4425, l.4. The River Ter series has been updated until 2002 in Llasat et al (2005) and until 2012 in Barrera-Escoda and Llasat (2015). Please, update the references.

Reply: In page 4425 the discussion is not about the Ter historical series, but in relation to the number of floods having data with exact information on flood depth, in relation with the total number of events recorded. I have read the indicated papers and none of these shows that kind of details or supplementary list of historical flood data.

p. 4435, l.8. As before, the River Llobregat series has been upated in the papers cited previously Particularly, Llasat et al (2005) was published into the SPHERE project and Barrera-Escoda and Llasat (2015) updates the SPHERE series and introduces new analysis and results.

Reply:

The sentence refers to studies that combined historical and palaeoflood data, and neither Llasat et al 2005, or Barreda and Llasat 2015 addressed palaeoflood information.

Please, note the focus of the sentence:

"The SPHERE Project has revealed the complementary of palaeoflood and historical flood information (Benito and Thorndycraft, 2004) with major gain on the quality of past flood records in terms of time and discharge, as it is demonstrated in the studies performed for the rivers Gardon . . .."

P.4435, l.18: Why do you consider rare floods when T>50 years? Any reference to justify it?

Reply: In the sentence on page 4435 "rare" is a relative term or differentiate from frequent (2-year floods). This is why is on quotation marks, and the 50-yr T is justified as it is the one used by Knox 1993 paper ,as referred at the end of the sentence.

Reviewer comment: For this part, and having in mind that this is a review paper, I would recommend you to consider in your paper the recent papers published by Mediero et al (2014) about flood frequency in Spain, Barrera-Escoda and Llasat (2015) and Peña et al (2015) where the influence of climatic aspects in flood frequency and magnitude are widely discussed.

Reply: Several sentences referring to these papers are now included in the text.

Reviewer comment: On the other hand, the impact of climatic features is not the same for catastrophic or largest floods than for extraordinary ones that can be more affected by non climatic factors like changes in the use of soil, increasing vulnerability and so on. I would recommend you to read and include in the references, the paper from Hall et al (2014), where a deep analysis on the different factors that can affect flood frequency changes is presented.

Authors reply: The section aims to detect changes and trends on historical floods quantified by discharge estimates. The analysis of climatic and environmental factors influencing the changes at basin scale are described on the on-site studies referred in the papers cited in this section. Anyway, the reference by Hall et al 2014 was referred now in the text, to indicate the different perspective of flood change obtained from the historical record (flood rich episodes vs flood-poor period) in relation to flood trend detection when the observational period is used.

Reviewer comment: Finally, this section is a little confusing, because there are a lot of quantitative data that are mixed (in some occasions is difficult to know to which river they refer). Please, try to organize better all this information.

Authors reply: The section is mainly referred to the analysis of the eight case studies from figure 8. The order of the data and descriptions follow those case studies.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 4413, 2015.