Floods in the Pyrenees: A global view through a regional database

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Answers to Review 1

> The paper "Floods in the Pyrenees: A global view through a regional database" shows the analysis on the first systematic dataset of flood episodes referred to the Pyrenees massif, named PIRAGUA_flood, concerning the period 1981-2015. The topic is very important, and the paper fill a gap for a wide area including regions of different countries.

Dear reviewer,

Above all, we want to express our acknowledgement for the time spent reviewing this paper. We have carefully considered all your comments, as well as those from the other reviewer, and have implemented substantial revisions to the paper. We are confident that these changes have significantly enhanced the quality of our work. Since at this stage of the review process we cannot yet attach the new version of the article, we have chosen to introduce those paragraphs, figures and tables that have been significantly modified or that are new.

We would like to thank you again for your helpful feedback and availability to review this paper.

Maria Carmen Llasat on behalf of all the authors

1. Nevertheless, I think that the paper is not ready for publication, it must be strongly reviewed and better addressed. As is, it seems a folder containing scattered notes without a clear goal to reach. I suggest to select a series of goals, declare them at the beginning, and try to reach them, even if this mean that some of the paragraph must be eliminated. Currently there are a series of points but no one of them is analyzed deeply.

Thank you very much for your comments, which have been very useful for us to improve the article and make major changes. According to them, the text of the paper as well as the figures and tables have been considerably modified. To make it easier for you to track the changes made, and considering that, in this part of the review process, we have not yet sent the corrected article, we have included the changes made in the letter with the responses. The new references that have been added to the article have also been included in this letter.

In response to your comment, the Introduction has been substantially modified as you can see in the answer to your comment number 4. The final objective of the paper is the presentation of the database on flood events in the Pyrenees, PIRAGUA_flood, that we have made available to the public, and the meteorological and climatological characterization of such events. In order that a database like this can be reproduced anywhere else and to show the rigor that sustains it, the first part of the article focuses on the detailed presentation of the methodology and criteria that have been used. The second part offers the first approximation to the knowledge of the floods in the entire Pyrenean region, their spatio-temporal distribution, types of weather and trends. In the revised version of the article, a proposal for adaptation measures against floods in the study area has been introduced into the discussion.

This type of article is in line with others already published by NHESS, such as those by Llasat et al. (2013), Papagiannaki et al. (2013), or Gil-Guirado et al. (2019). The journal Natural Hazards has also published articles along these lines, such as that of Zêzere et al. (2014). (Note: references are at the end).

2. The database is updated to 9 years ago! It seems very strange, especially because the Authors are interested to analyze temporal distribution of the events, and an old series does not allow to evaluate the recent tendencies, especially in the light of climate change. I think that this is the large obstacle to the publication of the paper.

We agree with your comment and that is why we consider that a clarification is necessary. This database was created in the context of the European Interreg PIRAGUA project, which began in 2018 and ended in 2021. The database began to be created at the beginning of the project and it was considered appropriate to finish it in 2015 because this provided a period of 35 years, which was considered sufficiently representative. On the other hand, the period ending in 2015 is consistent with the one analyzed in terms of flow trends, within the PIRAGUA project itself, and temperature and precipitation, within the CLIMPY project. The flood database presented here has recently been included in the publications of Beguería et al. (2023a, 2023b), and has been made available to the public both through the OPCC Geoportal (https://www.opcc-ctp.org/en/geoportal) and the CSIC repository (http://hdl.handle.net/10261/270351). These publications have also allowed us to improve the discussion in this article about precipitation and flow trends.

As I have already mentioned, our objective is to present a database that we have made available to other researchers and anyone interested, and to approach for the first time the knowledge of floods in a mountain massif such as the Pyrenees, to which until now there were only partial studies referring to specific events or locations.

A period of 35 years is sufficient for this characterization, as well as to talk about trends. However, as you say, it is not enough to be able to attribute any of the latter to climate change, which is already discussed in the discussion.

3. From the point of view of the structure, the paper needs to be homogeneised. The paragraphs are short and not always contain what the title says. Some attributes, available for subsection of the study area or sub-periods, should be eliminated because they are useless if not available in a homogeneous way (see table 2: “the compensation paid by the CCS to the municipalities in the 230 Spanish Pyrenees for floods that took place between 1996 and 2015, adjusted to 2015” for example).

All paragraphs have been reviewed for length, content, and title. It is true that information on compensation due to floods has only been obtained for Spanish municipalities, and it only exist since 1996, while the study began in 1981, but we believe that this information, that we have obtained from the raw data of the CCS, is useful for the discussion of some results. That is why, following your comment, it has been decided to eliminate the CCS maps and use that information only for discussion.

4. Introduction should be enlarged and improved, mainly by quoting more recent papers published in the latest years of this century. Lines from 41 to 53 describe the study area. Why this part is included in the introduction instead of be in the STUDY AREA section? Figure 1: the size is large with respect to the information contained; a European map must be included to allow the reader to understand where the study area is.

The introduction has been modified following your suggestion. More references have been added and the common thread has been more clearly defined. The description of the study area that appeared between lines 41 to 53 has been moved to the next section and has been integrated into it. Figure 1 has been modified: the top has been cropped, the main rivers and a smaller map showing the location of the Pyrenees have been added.

Below we attach the new Introduction and the new Figure 1 (section 2):

Figure 1: Map of the Pyrenean municipalities located within the area defined as the Pyrenees by the OPCC. The frontiers and names of the Pyrenean regions are also included.

New **Introduction**

It is well known that floods in the Mediterranean area are usually flash floods (Gaume et al., 2009; Braud et al., 2014; Llasat et al., 2016), associated with very heavy rains with a short duration. In general, they cause local damage in coastal populations or mountainous regions, which can sometimes be very serious. Other times they can affect large regions, as happened with the Gard floods (France) in 2002 (Braud et al., 2010). Most of these episodes do not appear in the best-known flood databases such as EM-DAT (https://www.emdat.be/) or Munich Re's NatCatSERVICE (https://www.munichre.com/en/solutions/for-industry-clients/natcatservice.html), because they are often based on indirect information (i.e. from the insurers that Munich Reinsurance reinsures) so many events are not included, either because the insurers are not aware of the events, or because they are not considered to have had sufficient impact (Llasat et al., 2013a; Wirtz et al., 2014). More systematic and precise studies are therefore necessary, but the high workload required to elaborate these studies means that they are only available for few regions. This is the case of INUNGAMA (Llasat et al., 2014) that includes all the flood events that have affected Catalonia (NE Spain) between 1981 and 2020 (partial information available in the Flood Observatory of Catalonia, https://experience.arcgis.com/experience/484172e12fae4cbb934441203ee04e36/), and FLOODHYMEX (Llasat et al., 2013b), which currently includes all the catastrophic flood episodes (following the criteria of "catastrophic" introduced in Barriendos et al., 2003) that have affected Catalonia, Valencian Community and the Balearic Islands, in Spain, the former Languedoc-Roussillon region, Midi-Pyrénées and PACA (Provence-Alpes-Côte d'Azur) in France, Calabria, in Italy, and all Greece. This dataset can be found at https://mistrals.sedoo.fr/catalogue/

On the other hand, concern about the impact of climate change in mountainous regions, including natural hazards, has grown significantly in recent decades. Proof of this is the increase in publications on this topic (i.e. Beniston, 2003; Beniston and Stoffel, 2014; Zimmermann and Keiler, 2015; Steiger et al., 2022) including a cross-chapter devoted to Mountains in the Sixth Assessment Report of IPCC (2022). There are, however, few studies that address mountain massifs in their entirety from a climatic or meteorological perspective. This is the case of the Pyrenees, a cross-border mountainous region between Spain, France, and Andorra, where an example of such studies would be the article by Amblar-Francés et al. (2020). To facilitate the international management of a massif distributed between three countries, the Pyrenees Working Community (CTP) was created, which in turn founded the Pyrenean Climate Change Observatory (OPCC, https://www. opcc-ctp.org/en) in 2010. Given that the Pyrenees are key in the generation of water resources in the surrounding regions, where more than 20 million people live, as well as in the production of hydroelectric energy, the OPCC promoted the PIRAGUA project financed by the European call for projects POCTEFA (https://www.opcc-ctp.org/en/piragua) and whose results are available to the public in the OPCC Geoportal (https://www.opcc-ctp.org/en/geoportal).

One of the objectives of PIRAGUA project was the analysis of floods in the entire Pyrenean region, where floods, usually flash floods, can have a great direct impact on both the fixed and floating population, as well as on water services and energy resources. Some examples are the catastrophic flash flood at Camping las Nieves, in Biescas (Aragón, Spain), on August 7, 1996, in which 87 people drowned (García-Ruiz et al., 1996); the June 2013 floods with catastrophic damages in Spain and France (https://hepex.org.au/flash-floods-in-the-french-western-and-central-pyrenees-17-19-june-2013/); or the floods produced on 6-8 November 1982 (Trapero et al., 2013) that affected the three Pyrenean countries. The recent death of two people who were canyoning in the Pyrenees of Aragón (Spain) on September 2, 2023, when a flash flood event occurred is another example of this type of event that most people are unaware of. However, until now there is no database or flood catalogue that specifically covers the Pyrenean regions, and even less so, the Pyrenees massif as a whole. For this reason, and in the same way that the final objective of FLOODHYMEX was to cover the entire Mediterranean region, it was decided to create a similar database for the Pyrenees, but that would include all flood episodes.

The aim of this article is to present the first systematic database of flood episodes covering the entire Pyrenees massif, for the period 1981-2015. This database is available at http://hdl.handle.net/10261/270351(Llasat et al., 2022). Following the introduction of the study area, the structure of the base, the criteria followed for its construction, and the sources of information used are shown. The spatial and temporal distribution of flood episodes, both in the massif and the administrative regions, as well as the weather types, are then analysed. The paper ends with conclusions and discussion, where some adaptation measures are also commented.

5. A table clearly reporting the main physical characteristics of each study region (and the abbreviation used, possibly being the same throughout the paper...) and the information sources must absolutely be included. As is, this section is very verbose and not understandable, and it is not clear what are the regions, where they are and what country they belong. The sentence "L 105 In some specific

cases, precipitation maps were created from rainfall reanalyses provided by SAFRAN (Quintana et al., 2016), which allowed us to detect some municipalities that suffered flood damage where there was no other record" is unclear. It is the methodology used for some specific region? What region? This must be included in the abovementioned table.

Following your proposal, a table has been introduced in section 2.1 that includes for each region or autonomous community: the country, the number of municipalities that are part of the Pyrenees, the total population of those municipalities, the area they cover, the average GPD of the community, and the sources of information consulted. The phrase relating to SAFRAN (Quintana-Seguí et al., 2016) has been modified to clarify that it has only been used in the case of Navarra and Aragón. Below, we include the new table and the revised paragraph:

2.2 Sources of information and identification of flood events

Table 1 shows the main physical and socioeconomic characteristics of the study area as well as the sources of information used to identify all the flood events that have affected de Pyrenean Region. FLOODHYMEX (Llasat et al, 2013) was used to recover the catastrophic events that have affected the Pyrenees in Catalonia and the part of Occitanie corresponding to the Languedoc-Roussillon. For the Spanish part of the Pyrenees, the National Catalogue of Historical Floods (Catálogo Nacional de Inundaciones Históricas - CNIH) and the information from the Spanish Insurance Compensation Consortium (CCS, 2021) were also used. The CNIH catalogue was published by the General Directorate of Civil Protection in Spain and contains the most important flood events (DGPC, 2022). It is made up of reports made for the different river demarcations into which Spain is divided, observing some heterogeneities, such as the fact that the same event can be in two reports associated with different dates, which requires careful contrast with other sources. The CCS provided for the period 1996-2015 the compensation paid to municipalities in the Pyrenees, organized by postal code and date of the "claim". which may be different from the date of the flood. In order to resolve this, the postcode data was transformed to a municipality data (a municipality may have more than one postcode) and the damage caused by a flood event was considered to be the sum of the compensations due to floods between the initial day of the event and the final day, with an additional 7 days, as in Cortès et al. (2019). Data from CCS has been also useful to identify some minor flood events that haven't been found in the other sources of information. Finally, in the case of Catalonia, Aragón and Navarra, the information was completed based on news from the La Vanguardia, El Heraldo de Aragón and Diario de Navarra, newspapers, respectively. La Vanguardia had already been systematically consulted, day by day, for the construction of the INUNGAMA database (Llasat et al, 2014), part of which was included in FLOODHYMEX (Llasat et al., 2013) and PIRAGUA_flood. Given that day-to-day consultation of newspapers is extremely slow, in the case of Aragon and Navarra only the cases identified from the rest of the sources cited above were consulted plus the government press releases and the days of rain that exceeded 40 mm (threshold fixed following the criteria of Cortès et al., 2019). This information was obtained from the precipitation field provided by the SAFRAN analysis (Quintana-Seguí et al., 2016). In the case of the Basque Country and Andorra, the project partners, through whom we obtained the information, confirmed that it was complete, so it was not necessary to consult the newspapers, since the creators of the respective episode lists had done so.

For Nouvelle Aquitaine (AQ) and Occitanie (OC), the databases of the Central Reinsurance Company (Caisse Centrale de Réassurance – CCR) and the National Observatory of Natural Risks (Observatoire National des Risks Naturels - ONRN) were used to create PIRAGUA_flood. In this case the information was completed in basis to the extreme rainfall records of Météo France. This ensured that all episodes that produced notable damage were included, although we must recognize that it is possible that episodes with little damage have gone unnoticed.

Table 1. Main characteristics of the study area. N.munic.: number of municipalities; Total pop.: total population; GDP: mean Gross Domestic Product for the region for the year indicated in the table ; *: value relative to the part of the region that belongs to the Pyrenees. CNIH: Catálogo Nacional de Inundaciones Históricas (National Catalog of Historical Floods); INE: Instituto Nacional de Estadística (National Institute of Statistics); PERICFN: Plan de Emergencia ante el Riesgo de Inundaciones en la Comunidad Foral de Navarra (Emergency Plan for the Risk of Floods in the Foral Community of Navarra) (https://gobiernoabierto.navarra.es/es/gobernanza/planes-y-programas-accion-

gobierno/plan-emergencia-ante-riesgo-inundaciones-comunidad); EPRI: Evaluación Preliminar del Riesgo de Inundación (Preliminary Flood Risk Assessment of the 2nd Cycle of the Eastern Cantabrian Hydrographic Area); CCR: Caisse Centrale de Réassurance (Central Reinsurance Company) (https://catastrophes-naturelles.ccr.fr/); ONRN: Observatoire National des Risques Naturels (National Observatory of Natural Risks) (https://www.georisques.gouv.fr/articles-risques/onrn/acceder-aux-indicateurs-sinistralite#summary-target-1); INSEE: Institut national de la statistique et des études économiques (National Institute of Statistics and Economic Studies) (https://www.insee.fr); CENMA-IEA : Centre d'Estudis de la Neu i de la Muntanya d'Andorra-Institut d'Estudis Andorrans (Andorra Centre of Snow and Mountain Studies-Andorra Studies Institute). GDP data have been obtained from https://Datosmacro.Expansion.Com/Pib/Espana-Comunidades-Autonomas (Spanish regions), https://fr.statista.com/statistiques/479490/pib-par-habitant-selon-regions-france/ (French regions), https://datosmacro.expansion.com/pib/andorra (Andorra).

Region	**Country**	**N.Munic.***	**Area**(km^2)*	**Total pop.***	**GPD**(M€)	**Information sources**
Catalonia (CAT)	Spain	213	12,027.38	255,804	255,154 (2022)	INUNGAMA (Llasat et al, 2014); FLOODHYMEX (Llasat et al, 2013); CNIH (DGPC, 2022); CCS, 2021; La Vanguardia newspaper; INE.
Aragon (AR)	Spain	122	10,594.59	60,624	41,763 (2022)	CNIH (DGPC, 2022); CCS, 2021; El Heraldo de Aragón newspaper; INE.
Navarra (NA)	Spain	186	6,418.75	462,932	22,595 (2022)	CNIH (DGPC, 2022); CCS, 2021; PERICFN; Diario de Navarra newspaper; press releases from the Government of Navarre; SAFRAN (Quintana-Seguí et al., 2016); INE.
Basque Country (PV)	Spain	87	2,585.55	222,533	79,350 (2022)	CNIH (DGPC, 2022); CCS, 2021; EPRI (CHC and URA, 2018); INE.
Nouvelle Aquitaine (AQ)	France	162	3,697.2	104,568	189,300 (2021)	FLOODHYMEX (Llasat et al, 2013); CCR; Météo France; ONRN; INSEE.
Occitanie (OC)	France	1025	14,711.01	409,040	181,300 (2021)	FLOODHYMEX (Llasat et al, 2013); CCR; Météo France; ONRN; INSEE.
Andorra (AND)	Andorra	7	468	815,888	3,210 (2022)	CENMA-IEA; Database of the Ministeri d'Ordenament Territorial (Ministry of Territorial Planning) of the Government of Andorra.

6. In Database structure and methodology, it is necessary to put a figure to show the structure of the database because in this way is not understandable. I don't understand what is the meaning of the two tables described and what is the relation between them. How these tables are linked?

Following your proposal, a figure has been included in section 3 that shows the structure of the database and the relationship between the two tables. Both tables are linked by the event code. The new figure and text are the following:

The database was built in ACCESS but to facilitate its use by any person interested in it, the public version is in EXCEL. It is made up of two tables: a) Events; b) Affected municipalities that are linked throughout the event code (Fig. 2). Tables 2 and 3 show the information and criteria used to create each one of these tables, that follows the example of FLOODHYMEX and INUNGAMA databases.

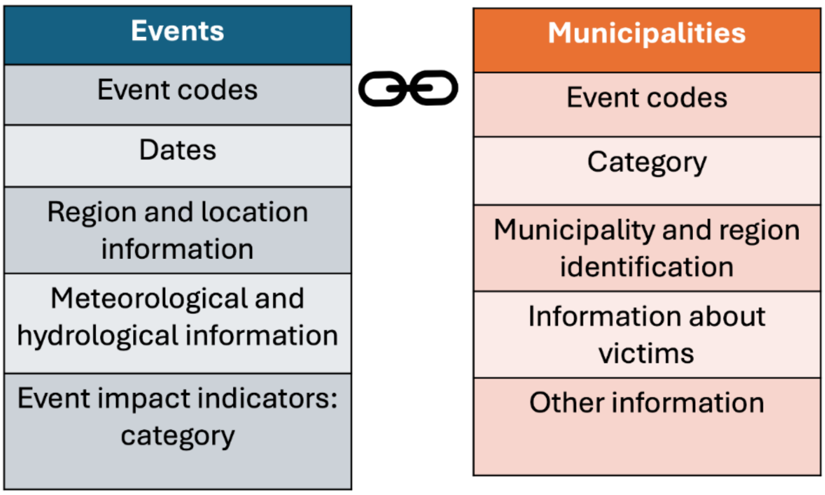

Figure 2. Structure of the PIRAGUA_flood database

In response to your last comment, two tables have been included in this section that summarize Annex 1, which in the modified version will no longer appear. Tables 2 and 3 are included in our answer to your question 10.

7. Line 111: there is a typo. Table 1: put a legend to explain the meaning of the colors

Line 111 has been corrected. Old Table 1 has been deleted and replaced by Figure 3. The new paragraph and figure are showed as follows:

The category of flood events is based on the level of impacts and is divided into categories: 0 (ordinary), 1 (extraordinary), 2 (catastrophic), and 3 (major catastrophic), according to Figure 3, inspired by the criteria presented in previous publications (Barriendos et al., 2003; Llasat et al., 2013, 2016; Barrera-Escoda and Llasat, 2015). However, in these publications, the distinction between categories was purely subjective. In order to facilitate its reproduction by other authors, a table has been designed to help decide in which category an event can be classified. Firstly, the "Damage indicators" have been selected based on literature (Petrucci, 2013; Boudou et al., 2016; Vinet et al., 2016). For each one of the indicators, the "Damage level" has been analyzed, where level 1 refers to possible minor damage (small floods in basements, breakdowns in traffic lights, etc.), level 2 refers to medium damages (it includes floods inside buildings and on communication routes which can cause traffic interruptions, partial damage to infrastructure, etc.), and level 3 refers to major impacts in the indicator (partial or total destruction of buildings, roads, bridges, long lasting supply cuts, etc.). To classify flood episodes into categories, the level of damage in each of the seven indicators is taken into account, as shown in Figure 3. Fatalities are not included in Figure 3 as they can occur in any flood event category, although they are more likely to occur in catastrophic floods. The same applies to vehicles, as they can be swept away if they are parked on a creek where there is normally little water flow, without the river breaking its banks. This is why additional information has been included in the database, with the code of "0.5" if the episode swept away cars and "5" if there were fatalities. Since the category of the episode may be different for each affected Pyrenees municipality, the highest occurring level determines the category of the episode.

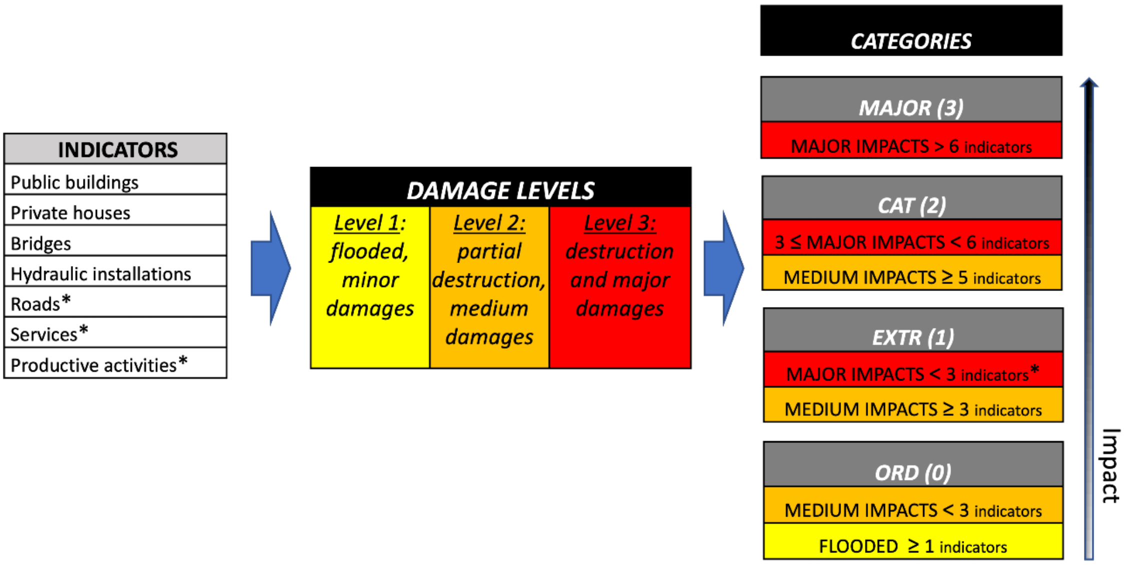

Figure 3: Criteria for categorizing flood events based on impacts. ORD (0): Ordinary flood event; EXTR (1): extraordinary flood event; CAT (2): catastrophic flood event; MAJOR (3): major catastrophic event. The level of damage is estimated from the direct impacts experienced, and a color scale is used (level 1: yellow; level 2: orange; level 3: red).

8. Figure 5-6-7-8: it is unclear where we are in the study region. It is almost useless to put the name of some municipality in very big characters, because readers living outside Europe are not required to know those municipalities. Instead, as in this scientific sector is a common practice, a small framework of study area and sub section must be used (the same size for all the figures).

Figures 2 and 4 have been modified using the same scale for both of them, as follows:

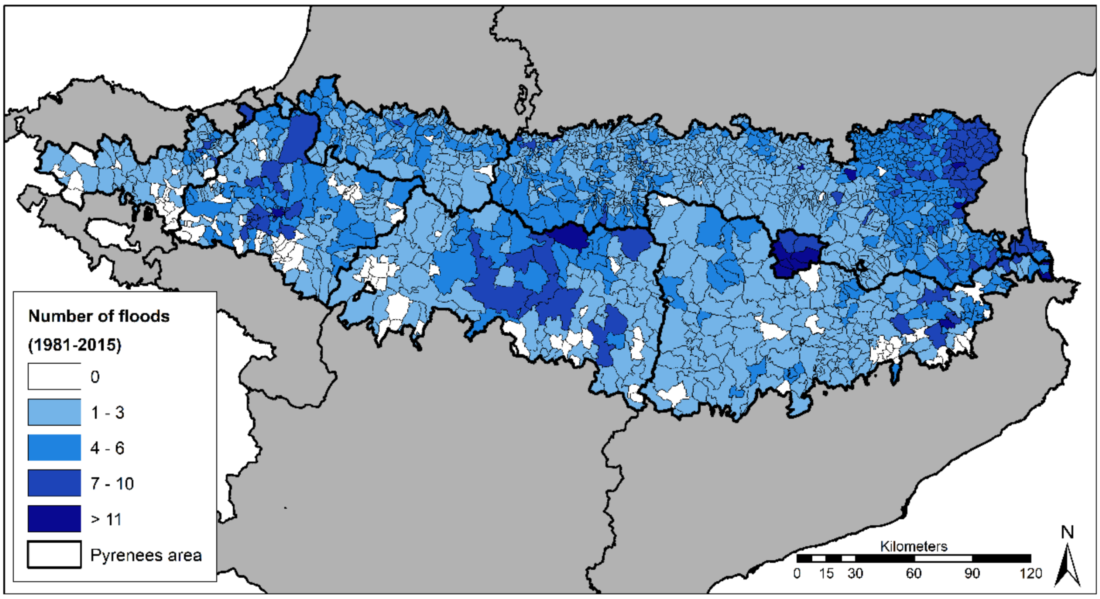

Figure 4 (old Figure 2): Number of total flood events that affected each municipality in the Pyrenees between 1981 and 2015.

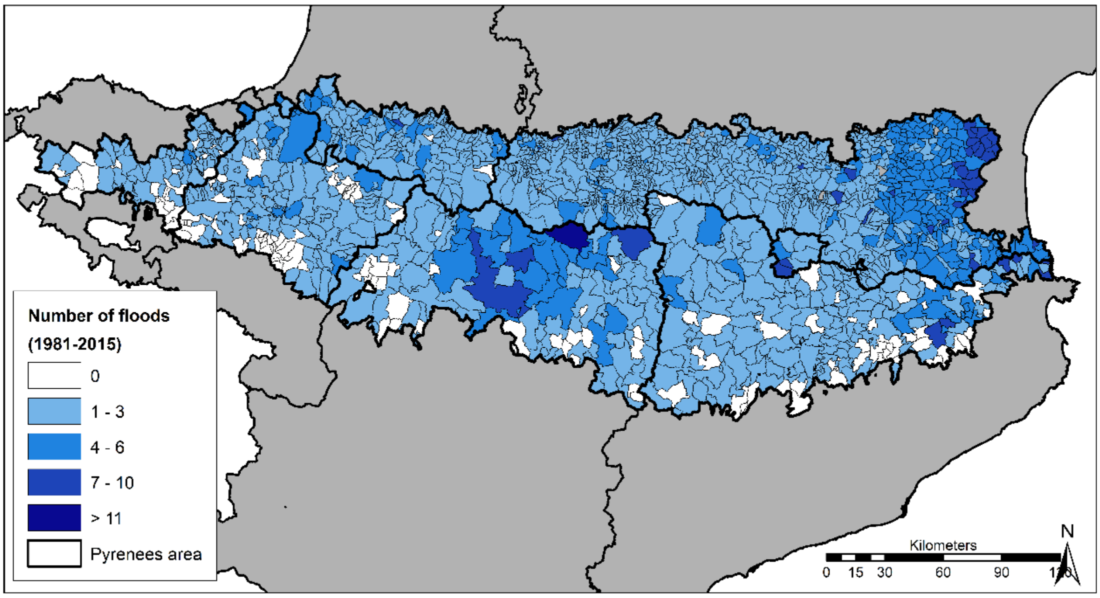

Figure 6 (old Figure 4): Number of notable flood events (catastrophic and extraordinary floods) that affected each municipality in the Pyrenees.

The revised text corresponding to these figures is:

Figure 4 shows that the highest concentration of flood episodes occurs in Andorran municipalities and in the easternmost area of Occitanie and Catalonia. Some municipalities in Aragón and Navarra also stand out, while in the Basque Country and Nouvelle Aquitanie, no municipality have recorded more than 7 episodes of flooding. The region with the highest total number of flood events was Catalonia (66), followed by Andorra (46), while the lowest number was recorded in the Basque Country (16). Andorra is the region that records the highest percentage of ordinary floods (67.4%) although the absolute maximum corresponds to Catalonia (Fig.5). This regional difference may be related to both the orography and the meteorological disturbances causing intense rains, which will be discussed later.

We cannot forget, however, that it is possible that some ordinary floods in France have gone unnoticed. This is why figure 6 has been constructed. It shows the distribution by municipality of flood events with notable damage (that is, they were extraordinary or catastrophic). The distribution hardly changes with respect to figure 4, and only the maxima of some municipalities are smoothed out. Of the 181 flood events, 52% produced notable damages in one or more of the Pyrenean regions. It is observed that notable flooding events are concentrated above all in the municipalities of the Pyrenees closest to the Mediterranean, both on the Spanish and French sides. The central part of the Spanish Pyrenees also stands out, located at the foot of the highest mountains. The highest number of catastrophic flood events was recorded in Nouvelle Aquitaine, followed by Occitanie and Aragón.

Taking into account your consideration that it is unnecessary to indicate the mentioned municipalities on the maps, as well as the homogenization of the information for all regions, which forces the elimination of the maps of the estimated impacts from the CCS data, we believe It is not necessary to put individual maps of the total number of floods, since that information appears in the old figure 2 (current figure 4).

9. Table 3. I don't understand why in this table the authors used the nations. I suggest to maintain both the names of the countries and the regions, in two lines of the table. The same for table 4.

Old tables 3 and 4 showed the transnational flood events, and for this reason we have used the name of the countries. In these tables we don't show the cross-border events between regions. Considering your comment, we have completely modified both tables. Old Table 3 has been replaced by the following figure 9 that illustrates the monthly distribution of cross-border flood events.

Figure 9. Monthly total number of flood events recorded in the Pyrenean Region (1981-2015), for each country (SP: Spain; FR: France; AND: Andorra) and for cross-border events.

Your proposal about searching not only for transnational events but also for transregional events seemed very accurate to us and we have constructed the following table:

Table 6. Number of events that have affected each Pyrenean region and number of events that have affected each pair of regions indicated by the intersection by them.

	CAT	AR	NA	PV	AND	OC	AQ
CAT	66						
AR	10	37					
NA	0	1	24				
PV	1	1	3	16			
AND	7	8	0	0	46		
OC	17	8	2	2	2	36	
AQ	3	4	5	4	1	10	17

10. Appendix A: must be completely rearranged in a schematic way, in form of a table, because as is it is useless

Following your proposal, Appendix 1 has been eliminated and the information that it contained has been synthesized in two tables that have been introduced in section 3. Both tables are the following:

Table 2. Information and criteria used to fill out the EVENTS table.

Event codes	**Integrated Event Code**: numerical code used to identify the event that have affected one or more regions. Indicates the first and last day on which the event has been registered in the entire Pyrenean region.
	Event: Numeric field composed of the start and end dates of the event in the specific region
Dates	**Start date**: Indicates the beginning of the episode in the specific region.
	End date: Indicates the end of the episode in the specific region. Criteria: -The event starts when the rain starts in the region. -The event ends when the flood ends. -A subsequent episode is considered a new episode when there is more than one day (at least) without any of the previous conditions occurring.
Location information	**Region**: Indicates the administrative region affected by the event: Aragon (AR), Catalonia (CAT), Navarre (NA), Basque Country (PV); Occitanie (OC), Nouvelle-Aquitaine (AQ), Andorra (AND)
	Location 1: List of affected counties in the specific region
	Location 2: List of affected municipalities in the specific region
	Number of municipalities affected: number of municipalities that suffered damages in the specific region
	Affected area (Km^2): Sum of the total area of the affected municipalities, in Km^2
Meteorological and hydrological information	**Ptotal (Loc), Pmax (24 h) (Loc) o P (h) (Loc) (mm)**: It indicates the maximum cumulated precipitation in all the event or/and the maximum precipitation in 24h in mm or/and the maximum rainfall intensity in mm/h and its duration. In the three cases the station where the value was recorded is indicated.
	Other meteorological data: Optional field to add more hydrometeorological information.
	Other weather phenomena: Other adverse natural phenomena occurred in addition to floods: landslide, debris flow, hail, snow, windstorm, tornado, snow melting, lightning.
	Affected drainage basins: List of affected river basins
	Maximum flow (m^3/s): Maximum instantaneous flow recorded indicating the river, gauging station and date, in addition to the average annual flow. If information is available for more than one river, it is included.
Event impact indicators	**Category**: The category of the flood event in the region according to the criteria described in section 3.1. There is a column for each category and supplementary categories

Table 3. Information and criteria used to fill out the MUNICIPALITIES table.

Event codes	**Integrated Event Code**: numerical code used to identify the event that have affected one or more regions. Indicates the first and last day on which the event has been registered in the entire Pyrenean region.
	Event: Numeric field composed of the start and end dates of the event in the specific region. The same code that identifies the event in the "Events" table must be used.
Category	**Event category**: The category of the flood event in the region according to the criteria described in section 3.1. There is a column for each category..

Municipality and region identification	**MunicipalityID**: Code (NATCODE, INSEE or equivalent) of the municipality affected by the floods. Each row is for a municipality, which means an event can have more than one row.
	Location name: Name of the municipality.
	Region: region to which the municipality belongs
Information about victims	**Deceased**: Total number of fatalities in the municipality (if any).
	Gender and age of victims: When information is available, the gender and age of each victim is indicated.
	Causes: A brief description of the causes of death.
Other information	**Other information**: Supplementary information that is not covered in the other fields.

New References

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