Dear Mr. Neil Macdonald,
Thank you for the time and effort that you have dedicated to provide valuable feedback on our manuscript. We appreciate your insightful comments.
We incorporated changes to reflect most of the suggestions you provided. Here is a point-by-point response to your comments and concerns.

Key points.

- **Key point 1:** *You conflate the idea of flood impacts with flood frequency/occurrence (l329-333; l373-378; l532), I think you need to take care and ensure you recognize that you are not looking at flood frequency, just the impact of flood events from historical sources. It would I believe be beneficial to present the hydrological records from the valley's studied, if these are available, and then compare the relationship between discharge and time, as this would help clarify that flood frequency has not changed just the recording of flood impacts. This would then support the argument that social and cultural changes may explain the increased impacts as buildings are increasingly constructed in risky areas.*

We agree with this and we have indeed specified that it is the occurrence of events that are responsible for impacts recorded in the database (and not "flood occurrence").
Today, hydrological data are only available for the main river, the Arve. As a consequence, these data are not very representative of the impacts recorded in the database, since they are mostly caused by small torrential streams (53%), and among them, almost a third is related to glacial tributaries. The available hydrologic data do not allow to consider impacts caused by runoff or small and fast responding tributaries (torrential or flash floods).
Indeed, it is the reason why the database is relevant since it allows to give a comprehensive representation of past hydrological events in spite of the lack of instrumental data.

- **Key point 2:** *Did you consider ranking the descriptions of impact, or consider the use of indices in assessing the historical records to determine flood severity – if not this might be a future development and worth considering.*

Thank you for this suggestion. Indeed, we have started to explore this aspect. The creation of an index could make it possible to analyze and compare the 900 impacts recorded in the database. This would make it possible to compare them with each other (severity scale) but also diachronically. To do this, we need an index that allows to classify the events according to their impacts, in spite the lack of quantitative data. Indeed, we have very few measurements of flows or water heights. We do not have more quantitative data regarding the impacts e.g. precise number of flooded houses.
However, in the case of this paper it seems slightly out of scope because, as this paper aims to describe the HIFAVa data set and its collection. This aspect will be analyzed in later studies.

- **Key point 3:** *It would be advantageous to explain how you define impact early in the paper.*

Thank you for pointing this out. By "impact" we mean any disturbance caused by a flood that has been reported in the archives. It can be the flooding of a field, the cutting of a communication route (footbridge, road etc.), the destruction of a building or victims. We have added a definition in the introduction: L.70. "*The impacts recorded in the database can include any types of human goods that has been damaged by the inundation, like a field, a communication route or a building for example."*

- **Key point 4:** *Are changing literacy rates over the timescales considered a consideration in the region? This could be easily stated and removed as a potential variable.*

This is a very interesting point. Literacy rates can have an impact on sources such as newspapers for example. However, since the sources used to complete the database are particularly varied, it is likely that this factor plays little role.
Moreover, the literacy rate is very high in French Northern Alps since the 18th century (Jean Nicolas, *La Savoie au XVIIIe s.*, 1978).

- **Key point 5:** *Is engineering information available that would provide insights into the changing nature and elevation of any flood defences in the valleys discussed, as changing exceedance thresholds of such structures may vary vulnerability of communities. A short section present (l460), but further historical consideration would be valuable.*

What is striking in the Arve watershed is that in 1850 almost all the current diking systems were already in place. From 1880 onwards, most of the dyke construction work was completed. Most of the developments carried out in the 21st century concern the construction of weirs to fight against the generalized stream incision because of the important extraction of materials in the rivers. Repairs were carried out on dikes during the 20th century, but it was only at the beginning of the 2000s that some new works (development of thresholds, raising of dikes) were carried out. Dyke rehabilitation works were carried out on the Arve River in the Bonneville area following the 1968 flood. However, since then no similar event as the one of 1968 has yet happened. Therefore, it is not possible to draw conclusions on the impact of the raising of the dykes.

- **Key point 6:** *It would be interesting to see some sense of data completeness, or assessment of data availability through time, we have previously tried this (see https://doi.org/10.5194/hess-21-1631-2017).*

We read with interest this study, thank you for recommending it.
However, this methodology seems difficult to apply to the analysis of the HIFAVa database. Indeed, the available hydrological data cover only the last few decades and concern only the main river. Moreover, the database mainly lists small-scale events and there are only a few high magnitude flood events.

- **Key point 7:** *You need to provide more detailed figure captions.*

Thank you for pointing this out, we completed captions from Figures 3, 6 and 7:

“Figure 2. Number and diversity of studied sources to document flood impacts since 1850 in the Arve Valley. The ticks indicate the mentions and the shaded area display cumulative mentions of studied sources."
“Figure 3. Representation of the yearly occurrence of impacts – as well as years with more than 25 recorded impacts – and decennial moving averages of impacts and associated flood events.”
“Figure 5. Comparison of the distribution of sources describing the recorded flood impacts in the Arve catchment during two periods: 1850-1959 and 1960-2015.”

"Figure 6. Aerial photographs allowing to visualize the evolution of the land use and the urban sprawl growth in Chamonix and Bonneville – completed by the representation of the impacts and the growth of the population from 1848 to 2011 (© IGN)."
"Figure 7. Distribution of flood impacts categories according to the river types. The class "non attributed" correspond to all impact with no assigned river (e.g. overland flows)."

- **Key point 8:** *You allude/suggest further analysis – such work would certainly strengthen the analysis within this manuscript.*

Thank you for pointing this out, in fact we hope to be able to communicate soon about these further analyses currently conducted. For reasons of paper length, these analyses could not be presented here. Hence, this paper aims only to describe the HIFAVa data set and its collection.

- **Key point 9:** *There are now several regional databases from across France and a national database, why are all these not condensed into a single location that would facilitate searches of historical flood information, I appreciate that they may have different aspects of focus – impact compared to water level, but does having different databases not make in more challenging for future studies? Has all the data in this database also been added to the national database? I think a statement addressing this would be beneficial in the discussion/conclusion. You note several of the databases in the Introduction.*

Indeed, the centralization of information from distinct data bases would greatly facilitate research and we all regret that such a long term and sustainable task is not supported by an ad hoc national french institution. To our knowledge, today only remarkable flooding events are consistently registered through the BDHI database (https://bdhi.developpement-durable.gouv.fr/welcome) but it doesn't address less dramatic or small-scale events that are more numerous and less documented. Over the Arve catchment, only Saint-Gervais 1892 and Grand-Bornand 1987 floods are in fact recorded in this database which doesn't allow any quantitative analysis. Nevertheless, currently there is not yet a single centralized database to upload the HIFAVa database and contribute to an exhaustive national wide database.

Supplementary comments.

Introduction.

- **Comment 1***: l.84. You might also consider the CBHE which covers the whole UK and is one of the largest. Andrew R. Black & Frank M. Law (2004) Development and utilization of a national web-based chronology of hydrological events/Développement et utilisation sur internet d'une chronologie nationale d'événements hydrologiques, Hydrological Sciences Journal, 49:2, -246, DOI: 10.1623/hysj.49.2.237.34835*

Thank you for recommending this article. We have added this reference in the part of the article presenting the already existing databases.

- **Comment 2:** *l.126. Is this the justification for the start date? therefore comparability after this point?*

The time step of the HIFAVa database has been reduced to 165 years, the most interesting from the point of view of the wealth of the information recorded (1850-2015).

- **Comment 3:** *l.252. You have not explained what or how you define impacts - what do you consider an impact?*

Thank you for pointing this out. As we wrote in the answer to the Key point 3, we have added a definition in the introduction: L.70. "*The impacts recorded in the database can include any types of human goods that has been damaged by the inundation, like a field, a communication route or a building for example.*"

Results and discussion.

- **Comment 4:** *l.300. The figure caption needs to explain what the coloured sections are behind the bar graphs - number of sources used. It is difficult to compare these as the axis on each is different - consider using two consistent axis or a log axis?*

Thank you for pointing this out, we have modified the caption in order to explain the colored sections.

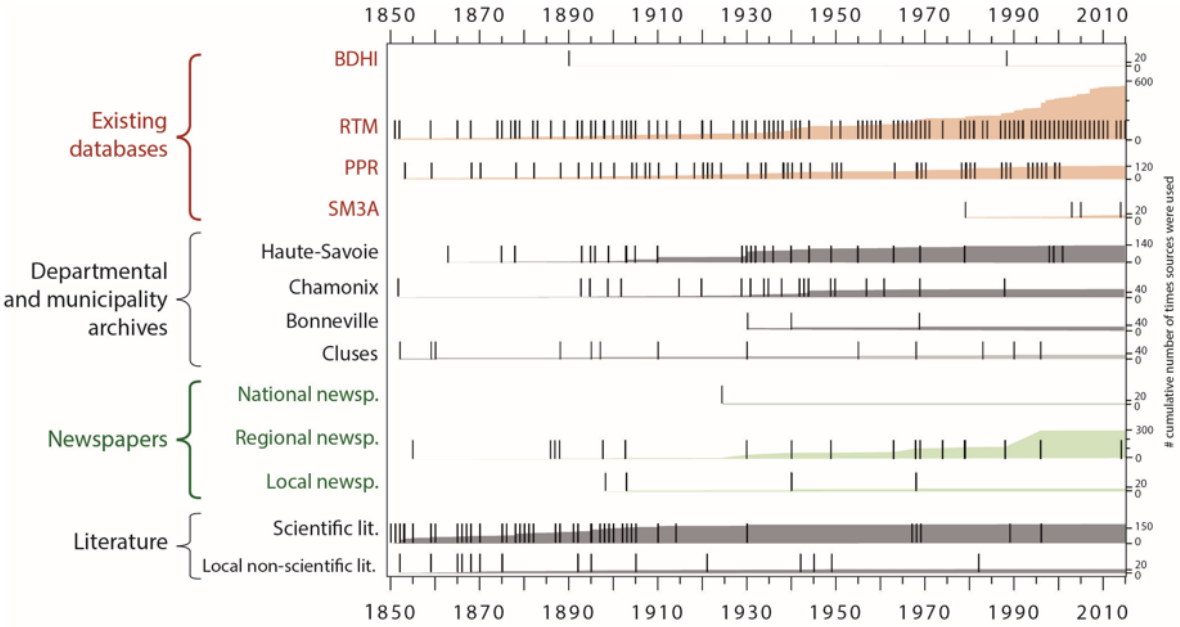
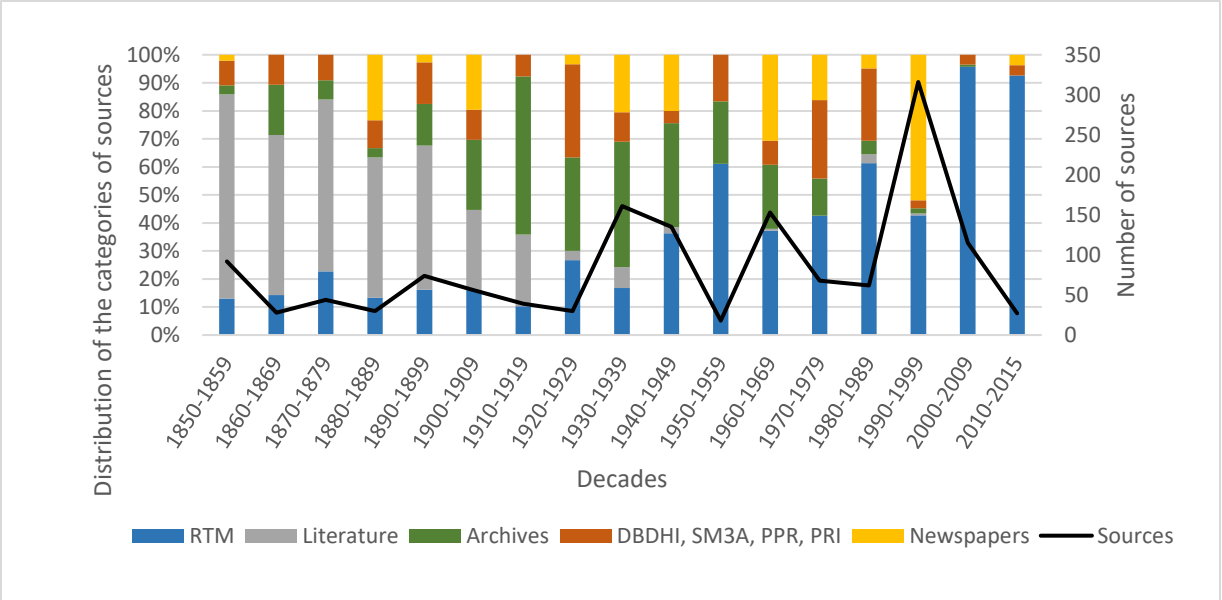


Figure 2. Number and diversity of studied sources to document flood impacts since 1850 in the Arve Valley. The ticks indicate the mentions and the shaded area display cumulative mentions of studied sources.

We have realized a figure detailing the sources per periods. The figure illustrates clearly the strong emergence of the RTM. It would be provided as supplementary materials and to complement the section 4.1.



Decennial histogram of the categories of sources registered in the HIFAVa database.

- **Comment 5:** l.329. *For such a statement you should look at the hydrological data, has flood frequency increased, or is it simply that greater exposure to flooding has resulted in more flood impacts?*

We agree with this and we indeed specified that it is the occurrence of events that are responsible for impacts recorded in the database (and not "flood occurrence").
Hydrological data available cover only the main river, the Arve. As a consequence, these data are not very representative of the impacts recorded in the database, since they are mostly caused by small torrential streams (53%), and among them, almost a third is related to glacial tributaries.
In this paper we investigate three hypotheses that could explain the increase in the number of impacts recorded in the database. The first one is an increase in flood activity. However, the occurrence of event responsible for impacts did not change significantly before the 1990's (Figure 3). The second hypothesis in an indirect source effect. The Figures 2 and 5 illustrate the strong emergence of the RTM. The third hypothesis is an increase in exposure, due to significant population growth.
The three hypotheses studied are not excluding one another, but can be combined and complement each other.

- **Comment 6:** *l.329. I think you are probably alluding to the increased vulnerability here but it is not explicit, if you remove this section and move to the next it would help the reader.*

Thank you for this suggestion. We have rearranged the section 4.2 in order to make it clearer. We removed the statement from the section, but we kept the first sentence l.329. "*Only the latest period (1990-2015) of increasing impacts may be partially due to a rise in occurrence of events that are responsible for impacts.*"
In order to rearrange the section 4.2., we present the spatial distribution of impacts and then we analyze changes in impacts over time and space:
"The analysis of the spatial distribution of the flood impacts shows that they are spread over the entire catchment (Figure 3). They are, however, mainly gathered in the Arve valley around Chamonix and Bonneville (24 and 12,5% of total impacts recorded in the Arve catchment). These high numbers may

be due to the fact that these towns are both among the most densely populated and the closest towns to the Arve River. The impacts caused by the Arve River floods represent 33% of all recorded impacts, and its two main tributaries, the Giffre and the Borne Rivers, have only caused 8% of the recorded impacts. In fact, most impacts are due to small torrential streams (53%). Among them, almost a third are related to glacial tributaries, while these tributaries are localized only in the uppermost part of the catchment near Chamonix. For instance, small torrential tributaries such as the Arveyron, the Grépon (left bank tributary close to Chamonix) or the Bon Nant have caused alone more impacts than the Borne River itself.

The Arve tributaries produced disasters characterized by numerous and major flood damage. Among them, the 1987 Borne River flooding in its uppermost part washed away the municipal campsite of the village of the Grand-Bornand causing 23 casualties and heavy economic losses (Meunier, 1990). In addition, the 1892 glacial lake outburst from the Tête Rousse glacier in the Bon Nant River (which literally translated means "Good Stream") swept away the thermal bath of Saint-Gervais (Figure A1) and 33 houses causing at least 175 casualties. The glacier was drained in 2010 and is today closely monitored to avoid such a brutal and disastrous natural event (Garambois et al., 2016). All these high impacts events are due to sudden, highly-dynamic summer floods of tributaries, often aggravated by large sediment transport.

The analysis of the temporal distribution of the flood impacts shows a rise of recorded impacts. From 1850 to 1920, the number of impacts fluctuates and only four years are remarkable with more than 15 impacts (1852, 1878, 1895 and 1910). From 1920, years with 15 or more impacts become more frequent (1930, 1940, 1944, 1968, 1979, 1987, 1990, 1996, 1997 and 2007) and the total amount of impacts per year reaches 54 in 1996 (Figure 4). The decennial moving average of the impacts' number highlights an overall increase over the 165 years, punctuated by periods with less frequent impacts (in 1910-1923, 1950-1960 and 1975-1980).

The number of recorded flood events stays relatively stable between 1.5 and 3 events per year on average until 1990, then it rises up to 4.5 events per year. Therefore, the overall increase in recorded impacts seems partly disconnected to changes in flood occurrence. Only the latest period (1990-2015) of increasing impacts may be partially due to a rise in flood occurrence. In particular, the increase in flood impacts starting in the 1920's and well-marked since the 1960's, especially by repeated years with very high numbers of impacts, may be explained by other processes as discussed in the next section."

- **Comment 7:** *l.336. More detail required.*

Agree, we have provided more detail to the figure caption: "Figure 3. Representation of the yearly occurrence of impacts – as well as years with more than 25 recorded impacts – and decennial moving averages of impacts and associated flood events."

- **Comment 8:** *l.377. You need to be careful that you do not combine flood impacts with flood events. You have evidence of flood impacts, these may be different from flood events, i.e. some events might not be recorded, or a threshold e.g. bank was not overtopped. I do think it would help if you included the annual maximum flood series for these rivers when available.*

We agree with this and we have indeed specified that it is the occurrence of events that are responsible for impacts recorded in the database. "*However, flood occurrence of events responsible of impacts recorded in the database did not change significantly before the 1990's (Figure 3).*"
Today, hydrological data are only available for the main river, the Arve and only for the last decades.

- **Comment 9:** *l.380. Why split it in 1960, just state your justification.*

These periods correspond to the two-time steps for the analysis of the chronological evolution of the impact categories recorded in the database since 1850.
We have clarified the choice for these two periods: "*During the first period, the society of the Arve watershed is a rather homogeneous agricultural society, the river is strongly exploited with extractions and the industry develops slowly. After 1960, the Arve watershed experienced a strong tourist development and a rapid demographic expansion*."

- **Comment 10:** *l.412. Good - have you made any attempt to explore this further?*

Since 1930, there has been an increase in the number of impacts that can be localized at the scale of a building (e.g. a campground in 2009) or a neighborhood. At the same time, we see a decrease in impacts that could only be localized at the commune level. We have not yet been able to explore this further.

- **Comment 11:** *l.430. Not statistically significant - comparable would be better.*

Thank you for pointing out this blunder: "*We see that the trends of increasing impacts are comparable*."

- **Comment 12:** *l.447. A more detailed caption is required.*

Agree, we have provided more detail to the figure caption: "Figure 6. Aerial photographs allowing to visualize the evolution of the land use and the urban sprawl growth in Chamonix and Bonneville – completed by the representation of the impacts and the growth of the population from 1848 to 2011 (© IGN)."

- **Comment 13:** *l.460. This is an important point, are you aware of other changes to flood protection works?*

In 1850, almost all the current diking systems were already in place in the Arve watershed. From 1880 onwards, most of the dyke construction work was completed. Repairs were carried out on dikes during the 20th century, but it was only at the beginning of the 2000s that some new works (development of weirs, raising of dikes) were carried out. Dyke rehabilitation works have been carried out on the Arve River in the Bonneville area following the 1968 flood. However, since the works, an event similar to the one of 1968 has not happened again. It is not possible for the moment to conclude on the impact of these works.

- **Comment 14:** *l.510. Review sentence.*

We have reviewed the sentence: "*This choice of data representation does not allow to visualize the evolution of the absolute values.*" For example, the increase of the number of victims is hardly noticeable because there is a strong augmentation in the total number of impacts mentions since

1930. This increase in casualties is ultimately flooded by the overall increase in the total number of impact mentions.

Conclusions.

- **Comment 15:** *l.532. As previously stated you are just looking at impacts, therefore to make such a statement you should consider hydrological data, or reframe.*

"*This rise does not seem to be related to increased flood hazard since it does not follow changes in flood occurrence of events responsible of impacts, except partially for the latest period (1990-2015).*"

- **Comment 16:** *l.538. Large sediment or high volumes of sediment?*

We meant "high volumes". We corrected the sentence.

Additional clarifications.
In addition to the above comments, all spelling and grammatical errors pointed out have been corrected.