

Review of the manuscript “Impact of rainfall variability on sedimentary and hydropower dynamics in a dam reservoir of southern France” by P. Hazet, A. Foucher, O. Evrard, & B. Quesada submitted for publication in EGUspHERE.

#### Major comments

- This paper introduced an interesting and original study on the sedimentation of a dam reservoir based on three cores analysis completed with an analysis of precipitation and dam regulation data.
- In general, the main weakness of this paper is the lack of links made between the three types of data analysed: core analysis, precipitation analysis and hydropower generation analysis. Ultimately, the lack of clear results linking these data leads to speculation rather than discussion. My feeling is that an analysis of the sediment dynamics in the dam reservoir is missing. Additional data on water discharge (apparently available from BRL) and suspended sediment concentration would be very useful. It is a pity not to have an estimation of the sediment yield, including a discussion of its temporal variability. From my point of view, one objective would be to determine the origin of the 27 events observed for the ORB09 core and explain why other significant hydrological events were not captured by the core. Possibly, a numerical modelling of the dam reservoir could also provide some interesting information.
- There are too many figures in appendix and in the supplementary materials that are discussed in the text making the reading quite difficult. First, I suggest to use supplementary materials only (no appendix); Second, do refer to the supplementary materials (or appendix) only for additional information, not for to provide additional arguments for your study.
- There are still many typos, which shows that the article has not been proofread very well. I have made some corrections in the “minor comments” section, but I may have missed many.

#### Minor comments

- Why adding initials after each name?
- L23: It would be more correct to also present drawbacks from hydro-power dams.
- L30: “runoff\_ (“
- L32: “Intergovernmental Panel on Climate Change (IPCC)”; Since it is cited several times, I’d suggest to write “(IPCC, 2023)”
- L54: “wear\_ (Hauer”
- L57: One interesting discussion would be on the effects of global change on these figures.
- L62: “Raymond et al.” → “Raymond **Pralong** et al. (2015)”
- L64:  $\text{m}^3 \text{day}^{-1}$ ; I don’t see the interest to add a unit if no figure is introduced
- L66: reference?
- L79: “Foucher al. (2023)”
- L80: “(Foucher al., 2023)”
- L81: What do you mean by “sediment variability”? Erosion rates, sediment fluxes?
- L95: use unbreakable space between figure and unit: 145 km
- L107: Any reference for this argument?
- Fig. 1: Difficult to see where in France the site is located. Instead of a world map, please use a more precise map (of Europe) showing where subplot 1a is located. For Fig. 1b, it would be useful to better highlight the hydrographic network
- L127: What do you mean by “instantaneous deposits”?
- L160: I suggest to use appropriate variables for the grain size characteristics:  $D_{10}$ ,  $D_{50}$ , and  $D_{90}$
- L168: “(Appleby and Oldfield, 1978)”
- L171: “(Arnaud et al., 2002)”
- L183: “Mass Accumulation Rate (**MAR**) in”

- L191: What is the interest to fill this gap?
- L199: unbreakable space: 100 mm
- L200: “10 mm”
- L205: “Ribes et 205 al. (~~Ribes et al., 2019~~)”
- L223: “generation (obtained from (BRL; (2011) and data provided by BRL—“
- L230: “430 m\_NGF”
- L231: “proposal by **BRL**” (not in italic) → check everywhere
- L243: Any hydro-sedimentary data? It would have been very useful to have discharge and suspended sediment concentration time-series to reinforce the link between precipitation data and dam reservoir sedimentation. I’m a bit surprised there is no discharge data at least close to a dam as dam manager usually have to respect rules for minimum flow discharges. There is a large gap here leading to additional hypotheses.
- L246: Illustrated where? On what criteria did you subdivided the core into different units? It looks a bit subjective.
- L248: Isn’t it corresponding to seasons or to flood events?
- L251: Referring to figures (and tables) in the text, in appendix, and in a supplementary material makes the reading a bit difficult. I’d suggest to move all appendices to the supplementary material.
- L252: “**medium/high (?)** relative density”. From Fig. B1, the averaged relative density appears of the same order of magnitude of the whole stratigraphic profile...
- L254: end → bottom (?)
- L257: How is it confirmed by CT-scan images?
- L264: It would be interesting to discuss the term event? Does it really correspond to a Cevenol event, a large flood event?
- Tab. A1: How are the uncertainties in the dating evaluated ?
- L267: One important issue with age model is erosion periods. How can you assess there were no significant erosion periods?
- L268: “in **Figure 2**”
- L273: So, how do you interpret these two <sup>137</sup>Cs peaks? It would be useful to add age model figures for ORB01 and ORB06 cores in the supplementary material.
- L274: These SAR-values are very high! Does it mean ORB01 and ORB06 cores correspond to 9 and 5 years of deposit only? Yes, indeed.
- Fig. 2: For the first graph, what is the meaning of the grey and orange colours? What about the <sup>137</sup>Cs model? It is not discussed here. What is just used to evaluate uncertainties? Any interpretation of the peak value at  $z \approx 650$  mm ?
- L283: Tab. C1 indicates discharge data from Monts d’Orb dam (it does not correspond to precipitation data from the Roqueronde station). That means there is some kind of hydrometric station with a discharge time-series for the studied period. Why just then focusing on precipitation data that may not be representative (local data)? Discharge data at the dam (together with dam reservoir water level data) are the most interesting data to discuss the potential deposition in the dam reservoir. Precipitation data could provide some information of the potential erosion of the watershed. However, a measurement of the suspended sediment concentration (thanks to a calibrated turbidity meter) would be much more useful.
- Fig. 3 is of real interest. It would have been very interesting to confront the results from this method to those of a hydrometric station where water discharge  $Q(t)$  and concentration  $C(t)$  could be available. If there is no turbidity station, a rough estimate of the concentration could be done based on discrete samples using some fit as a function of water discharge, i.e.  $C = aQ^b + C_0$ . I understand that the only hydrometric station corresponds to the dam (and so is influenced by dam regulation); it is however better than nothing.
- L294: I guess the choice of defining two periods before and after 1986 corresponds to the limit of the ORB09 core. It should be clarified

- Fig. 4c: To be consistent with other graphs, change “first period” to “period before 1986” and “second period” to “period after 1986”
- L311: A similar analysis of the discharge time series would be of interest
- L312: Again, if you discuss figures in appendix in a similar way as those in the text, that means these figures should be in the text
- L357: “(Fig. S7).”
- L359: “material\_to”
- L360: A significant effort was made here to find differences in precipitation characteristics between the two periods and/or between seasons. I’m not sure to follow what the authors want to demonstrate looking at the objective of better understanding the reservoir sediment dynamics
- L365: “**Figure 5**”
- Fig. 5 is of interest but is quite difficult to interpret in term of sediment dynamics in the dam reservoir since hydropower generation is not very correlated to discharge. Also, how is the dam managed during large flood. This could significantly affect the sediment dynamics during large events. In addition to the general trend, it would be interesting to plot the trend for each of the three operation periods.
- L390: This discussion of the changes in seasonal precipitation is of interest. What about the effects on dam reservoir sedimentation and management?
- L402: This discussion corresponds to speculation on the potential effect of the changes in rainfall on soil erosion. It does not provide any clue on what you observed during the last twenty years.
- L418: I expected more discussion on the different events possibly observed through the core analysis. Why do you present this (short) discussion on two recent events only?
- L422: This should appear in the result section
- L431: “(Fig. ??)”
- L436: Is there any correlation between the 27 Cevenol episodes identified and the 22 extreme rainfall events? I have not seen any clear analysis on this point. Once again, such an analysis would be greatly enhanced if it focused on sediment yield (based on an estimate of the time series of fine sediment fluxes).
- L446: It is somewhat challenging to discuss the absence of clear results
- L457: Well, you said there is no clear correlation...
- L465: “(r = 0.46),\_likely”
- References: In most of the reference, the journal name is missing...; when the paper cited is not in English, please indicate it (ex: L540: (in French))
- L540: text in capital...