Dear Editor, you will find below the comments sent by the reviewers and our answers. Modification made on this revised version in accordance with the reviewers' suggestions are highlighted **in bold**.

Reviewer's 1 comment	**Reply - Modification**
Based on the compilation of 573 articles published between 1977 and 2020, reporting the collection of 1351 individual dating sediment cores, this review documents the occurrence of three main sources of ^{137}Cs that are the most widely detected in sediment cores (the thermonuclear bomb testing peak in 1963, the Chernobyl accident in 1986, the Fukushima accident in 2011), as well as 24 additional local releases of ^{137}Cs. The correct attribution of these sources may improve the chronology of surface sediment. Furthermore, this review also highlights the low proportion in the Southern Hemisphere, compared to what has been published for the Northern Hemisphere, and outlines the necessity to use additional tools (e.g., ^{240}Pu/^{239}Pu isotopic ratios) to provide an unambiguous distinction between potential sources and avoid any dating errors.	We are grateful to the reviewer for providing this overall positive comment outlining the extensive amount of work required to compile the data on 1351 sediment cores from 573 articles published between 1977 and 2020.
While this worldwide meta-analysis of ^{137}Cs will be of interest to those studying of dating surface sediment cores in Environmental and Earth sciences, this review represents fairly superficial and does not present significantly new ideas. Two major flaws, to be illustrated further below, exist in the current version: 1. More articles using ^{137}Cs for dating surface sediment cores should be included in this review. 2. The potential influence of Chernobyl accident, Chinese Nuclear Tests and Fukushima accident is highly overestimated. For these and other reasons, listed below, I do not recommend publication in the prestigious journal of Earth System Science Data.	We take this opportunity to respond that, although we fully respect the reviewers' opinion, we disagree with this statement. Of note, we think that the reviewer considers a 'review article' in *Earth System Science Data* as that in any other Earth Science journal. Of note, as detailed online in the journal guidelines (https://www.earth-system-science-data.net/about/manuscript_types.html), ESSD manuscripts describe original research data, databases, or combined datasets derived from them. Review articles evaluate in particular the relative merits of datasets, databases, or data collections. Therefore, we disagree with the opinion that our review remains 'superficial' as it sticks to the journal originality in that it "evaluates the relative merits of datasets". Regarding specific remark (1), we had to limit somehow the selection of articles covered by the review through the application of reproducible criteria (i.e. "Journal articles using ^{137}Cs for dating sediment cores published in English language were extracted from the Thomson Reuters Web of Science database until 29 February 2020. The search words "137Cs" and

	"sediment core" were used in combination." (L.86-88) Regarding specific remark (2), we fully agree with the reviewers' diagnosis, although we cannot change the conclusions made by the authors in their original publications. We hope to have the opportunity to clarify this when revising the manuscript, as we do think that it fully fits to the journal guideline that ESSD review papers should "evaluate the relative merits of datasets".
As this manuscript is classified as Review Article, the current content does not justify its publication in Earth System Science Data. Although the search words of "137Cs" and "sediment core" were used in Web of Science (WOS) and a total of 573 articles (or 910 publications) were found, a large number of studies for paleoclimate which was established the chronology based on ^{137}Cs, have not been included in this review. For example, Lake Sugan (Wu et al., 2010, EST, doi: 10.1021/es9029649), Lake Bosten(Liao et al., 2014, EST, doi: 10.1021/es405364m), Lake Sayram (Lan et al., 2019, Science China, doi:10.1007/s11430-018-9240-x), … in northwestern China (as cited by Lan et al., 2020, QSR, doi: 10.1016/j.quascirev.2020.106413). Well, I believe this review is also not a comprehensive study in other regions. So, this review manuscript is not sufficient for the worldwide meta-analysis of ^{137}Cs and I suggest the search word of this study in WOS includes the paleoclimate or paleoenvironment as well as late Holocene.	We thank the reviewer for drawing our attention to these articles. Of note, the articles of Wu et al. (2010), EST and Liao et al. (2014) are *already* covered by our review (see the references listed on L. 1460 and L. 2070). The article by Lan et al. (2020) was accepted in June 2020 (i.e. after the end date of the period covered by the current review until 29 February 2020). However, we propose to include it if we have the opportunity to revise the manuscript given the relevance of the topic for the current review. Regarding the publication of Lan et al. (2019), it was not included because it was not identified through the WoS search (as authors do not outline '137Cs' as an important feature or keyword). As for other paleoclimate studies, by definition, they target very long timescales (several thousands of years) and most often do not detail the procedures using ^{137}Cs/^{210}Pb (only detected in the uppermost part of very long archives) to date them. Accordingly, we do think that including these paleoclimatic studies would provide very limited added value to the current compilation.
The potential influence of Chernobyl accident, Chinese Nuclear Tests (CNT) and Fukushima accident is highly overestimated in this manuscript. Based on the potential influence of radioactivity transport from the Chernobyl accident and Chinese Nuclear Tests, and the comparison with deposition records of 26 European lake sediments and 5 Alpine ice cores, Lan et al (2020, QSR, doi: 10.1016/j.quascirev.2020.106413) propose that the ^{137}Cs fallout maximum of lake sediments in NW China and central Asia is primarily attributable to the global atmospheric thermonuclear weapon tests in 1963-1964 and that there is no unambiguous evidence to	We agree with the referee's comment. The detection of fallout associated with Chernobyl or the Chinese tests is overestimated. Nevertheless, these results come from the conclusions made by the authors in their original studies, and the purpose of the current ESSD review is to evaluate the merits of these independent datasets. Accordingly, based on this data compilation, we discuss the reasons for these discrepancies, as in sections 4.1 and 4.2 (wrong attribution of ^{137}Cs peaks, remobilization processes of this radionuclide (e.g. soil erosion, bioturbation).

confirm the Chernobyl- and CNT-derived ^{137}Cs local-fallout subpeaks. The evidence of references at Line 315-327, which is associated with Chernobyl- and CNT-derived ^{137}Cs, is insufficient. Accordingly, ^{137}Cs of lake sediments in southern and eastern China should also cannot record the Chernobyl- and CNT-derived ^{137}Cs local-fallout subpeaks. As suggested by authors, ^{240}Pu/^{239}Pu ratios should be a good candidate to achieve this type of discrimination. Frankly, Wu et al (2010, EST, doi: 10.1021/es9029649) and Liao et al (2014, EST, doi:10.1021/es405364m) have conducted the ^{240}Pu/^{239}Pu ratios in lake sediments of northern China and have a similar idea with Lan et al (2020, QSR, doi: 10.1016/j.quascirev.2020.106413).	As mentioned in our review and highlighted by the referee, we suggest the use of other tracers to improve the attribution of ^{137}Cs peaks in regions of the world where their identification is sometimes complex. We agree again with the referee as we clearly state this in the text (e.g. L. 332-334). Of note, Wu et al. (2010) and Liao et al. (2014) are already cited in the current manuscript, and we propose to add that – more recent – of Lan et al. (2020) if we are given the opportunity to revise our work. **Reference was added L. 338**
Furthermore, as suggested by authors, the attribution of ^{137}Cs peaks to Chernobyl and Fukushima in Mexico and Ghana should be taken with great caution in view of the observations made in this manuscript (Fig. 4c).	Again, we fully agree with the referee's comment. This review helps to highlight erroneous fallout source attributions. The interest of our study is to highlight these potential errors, discuss them and make recommendations for future studies. This is what we do, for example, on the issues outlined by the referee on LL. 369-376.
Specific comments/suggestions: Line 2: $^{210}Pb_{xs}$ in Title should change to ^{210}Pb.	To avoid any potential confusion between the use of excess ^{210}Pb ($^{210}Pb_{xs}$) and that of total ^{210}Pb, we propose to keep the $^{210}Pb_{xs}$ notation in the title.
Line 20-21: the others information need not shown in Abstract.	This information will be removed from the abstract as suggested by the reviewer. **Information was removed on this revised version.**
Line 49-50: this sentence should be cited more representative references.	We agree with the referee, we propose to cite earlier articles on radionuclide dating with $^{210}Pb_{xs}$ in the revised version (e.g. Appleby and Oldfield, 1978). **More representative reference was added L. 50**
Line 110-111: should explain how to corrected to 1 Jan 2020.	The decay-correction method will be further detailed in the revised version of the manuscript. **The decay-correction method was detailed L. 133-114**
Line 193-196: Fig. 4 does not show the average activity.	Agreed. Reference to Figure 4 will be removed here. **Reference to figure 4 was removed**
Line 203: as suggested as aforementioned, the Chernobyl sign in China is incorrect.	Again, we fully agree with the reviewer. This is why we state in the text that "*Surprisingly, a*

	peak of radiocaesium was also attributed to this accident in cores from China (n=17)", although we cannot change the conclusions made in the original study.
Line 316-327: rewrite this paragraph. Yunnan Province is located in southwestern China not southeastern China.	Thanks for catching this, our apologies for creating this confusion. This part of the text will be thoroughly checked and rewritten. **Text was modified L. 322 and 323**

Reviewer's 2 comment	**Reply - modification**
The aim of the manuscipt is to do a review to sediment core dating by using radionuclides. The authors have also uploaded a comprehensive data set to open source platform. I think the work is of interest and is of use to scientific community. The English used in this manuscript is at good level and the narrative proceeds in logical manor. I think is ready for publication after minor revision.	We are grateful to the referee for his general positive comment and for highlighting the interest of this publication for the scientific community.
Generally, try to use past tense in the manuscript instead of present tense	Agree, past tense will be used in the revised manuscript. **Past tense was used in this updated version.**
The Chinese nuclear weaposn test are referred here as "local releases". I find this term controversial since the Chinese tests were detected in aerosols in the other side of the world and Cs-137 originating from the Chinese test have been detected in Scandinavia which is practically on the other side of the globe.	We agree with the referee. The term "local release" is probably inappropriate for atmospheric tests. We propose to distinguish these tests with a regional scope from more local sources such as releases from nuclear power plants. In the revised manuscript we will added a definition of these different terms (Global, Regional/Local). **In the revised manuscript we have added a definition of these different terms (Global, Regional/Local) L. 55-60 and modifications have been made throughout the manuscript**
Section 3.3. I am bit concerned if this section actually deals with excess or unsupported fraction of the Pb-210 ? It is not clearly mentioned how the supported and unsupported fractions were distinquished ? In section 3.4. the isotopes needed to determine the supported fraction. namely Ra-226 and it's daughters, are observed in very rare cases.	Throughout the manuscript we use only the ^{210}Pb in excess. Data for supported ^{210}Pb were rarely given in the publications that we have synthesized. The way to determine the supported fraction was not always detailed which explains the fact that the use of ^{226}Ra was only rarely mentioned in the publications. Another way to estimate the supported ^{210}Pb is to analyses sediment in the deeper part of the core where $^{210}Pb_{xs}$ have been disappear.
Section 4.1. what is menat by post-accidental fallout ? Isn't all the fallout post-accidental ie, deposited after the accident	All ^{137}Cs fallout are not associated with an accident. Like mentioned above, some of them may be associated with atmospheric bomb tests.

	We use the term "post-accidental" in section 4.1 for the fallout associated with the Fukushima and Chernobyl accidents. To avoid ambiguity, the term "post-accidental" will be deleted to homogenize the manuscript with other accidents **The term post-accidental was removed from this revised version.**
line 364: which isotopic evidences you are referring to ?	In this part we were thinking about plutonium isotopes. This information will be added in the updated version. **Added L. 367**
line 369: A similar findings was made...	This correction will be made. **Modified L. 372**
line 400: reusable format ? what does this mean ?	Reusable format means that the data are easily available, as for example in a table or in a detailed figure. This point is detailed between L. 400 and 403 This is part of the FAIR initiative developed in Wilkinson et al., 2016 (cited in the manuscript) which will allow the reuse of these data for other applications, inter-comparisons.
line 413: "complementary tracers" what tracers are you referring to ? Please provide and example.	We were thinking about the use of plutonium, americium or again strontium to distinguish fallout sources. Example will be added in the updated version **Example were added L. 417-418.**