

Earth Syst. Sci. Data Discuss., referee comment RC1
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Comment on **essd-2021-168**

Anonymous Referee #1

Referee comment on "A worldwide meta-analysis (1977–2020) of sediment core dating using fallout radionuclides including ^{137}Cs and $^{210}\text{Pb}_{\text{xs}}$ " by Anthony Foucher et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-168-RC1>, 2021

Review of paper titled "A worldwide meta-analysis (1977–2020) of sediment core dating using fallout radionuclides including ^{137}Cs and $^{210}\text{Pb}_{\text{xs}}$ " by Foucher et al.

General comment: reject

Comments:

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., $^{240}\text{Pu}/^{239}\text{Pu}$ isotopic ratios) to provide an unambiguous distinction between potential sources and avoid any dating errors.

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. I provide my comments below:

- 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 “ ^{137}Cs ” 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 Suga (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.
- 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 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, $^{240}\text{Pu}/^{239}\text{Pu}$ 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 $^{240}\text{Pu}/^{239}\text{Pu}$ 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).

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).

Specific comments/suggestions:

- Line 2: $^{210}\text{Pb}_{\text{xs}}$ in Title should change to ^{210}Pb .
- Line 20-21: the others information need not shown in Abstract.
- Line 49-50: this sentence should be cited more representative references.
- Line 110-111: should explain how to corrected to 1 Jan 2020.
- Line 193-196: Fig. 4 does not show the average activity.
- Line 203: as suggested as aforementioned, the Chernobyl sign in China is incorrect.
- Line 246-248: check this sentence.
- Line 280: the $^{240}\text{Pu}/^{239}\text{Pu}$ ratio is much better than Plutonium.
- Line 316-327: rewrite this paragraph. Yunnan Province is located in southwestern China not southeastern China.