

Earth Syst. Sci. Data Discuss., referee comment RC1  
<https://doi.org/10.5194/essd-2021-35-RC1>, 2021  
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## Comment on **essd-2021-35**

Anonymous Referee #1

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Referee comment on "A global dataset of atmospheric  $^7\text{Be}$  and  $^{210}\text{Pb}$  measurements: annual air concentration and depositional flux" by Fule Zhang et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-35-RC1>, 2021

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This manuscript provides an incredible contribution to the literature through the compilation of annual concentrations and annual deposition fluxes of Be-7 and Pb-210 around the world. Overall, the manuscript is well-written (although there are multiple typos throughout the text) and the data treatment/interpretation is of interest to a large audience (including vast research communities dealing with processes occurring in the atmosphere, the ocean, soils and rivers and for which the use of Be-7 and Pb-210 as a tracer is particularly useful).

### General remarks

In my opinion, there is a research topic missing from the list, i.e. use of Be-7 and Pb-210 as tracers of the sources and dynamics of riverine sediment (and not only soils and ocean particles, there are transfers in-between both compartments). This should be acknowledged in the text, with some supporting references.

Overall, I thought that there might be a confusion regarding Pb-210 measurements between the supported Pb-210 and the unsupported Pb-210 (that referred to as 'excess Pb-210'); could this be clarified in the text?

### Database

Regarding the dataset in itself, I am not sure that modifications can still be made, but I wondered whether the monitoring period (from year x to year y, typically) could be added? Currently, to the best of my understanding, only the publication year is referred.

In relation with this remark, how to explain the following statement: 'The dataset includes 494 annual surface air concentration data of  $^7\text{Be}$  covering 367 different sites, 366 annual surface air concentration data of  $^{210}\text{Pb}$  from 270 different sites, 304 annual depositional flux data of  $^7\text{Be}$  from 279 different sites, and 645 annual depositional flux data of  $^{210}\text{Pb}$  from 602 different sites.' >> these values at each site correspond to different years/periods then? I feel that this remains somewhat unclear...

Some of the results obtained in this meta-analysis are of very large interest for the community. They could avoid colleagues to start monitoring  $^7\text{Be}$  or  $^{210}\text{Pb}$  fluxes and rely on previous data monitoring. For instance, on Figure 7, providing the empirical equations describing the relationships between annual precipitation and  $^7\text{Be}$  depositional fluxes for different latitudinal bands would be extremely useful (at least for those latitudinal bands where the relationship is satisfactory) >> could they be added in a table and made accessible to the community? The same suggestion could be made for  $^{210}\text{Pb}$  in Figure 8.

A similar remark can be made regarding Fig. 9: how could this very useful data compilation on  $^7\text{Be}/^{210}\text{Pb}$  activity ratios be of further use for the community in the future? Could the range in ratios found in different latitudinal bands be provided somewhere (e.g. in a table)?

A final general question (that could be addressed in section 3.7 for instance) is to think about the potential inclusion of nuclear safety continuous monitoring data (e.g. those monitored by state agencies in charge of nuclear safety) in future global databases, what would be the opinion of the authors on that?

Detailed remarks throughout the text

Abstract

L.17 "for tracing soil redistribution processes on land and particle dynamics and mixing processes in the ocean" >>  $^7\text{Be}$  and  $^{210}\text{Pb}$  are also widely used for quantifying the sources and the dynamics of riverine sediment (not only soils or ocean particles as mentioned in the current version of the text)

L.21 I would remove the second 'of'

L.25 'future researchers' public consumption in their research' >> unclear what is meant here

## Introduction

L.29 Earth's surface > Earth' surface

L.32 they do not >> it does not?

L.33 and changing >> which changes?

L.40 while not providing a range of Rn-222 fluxes for the oceanic areas as for the continental fluxes?

L.41 a part of the sentence is missing here (at the end of L.41?)

L.49 'in accumulation mode'? >> unclear what is meant here

L.54 and similar tropospheric...?

L.66 (and elsewhere); of note, this type of research is also widely conducted in freshwater/ river environments and could be acknowledged in the text, e.g.

L.77 IMS operated by CTBTO?

## Methods

L.89 'high volume air' >> a high volume of air?

L.101 spectrometry instead of spectroscopy?

L.111 'tedious procedures' >> unclear what is meant here

L.112 'deserted areas' >> unclear what is meant here

L.114 'to an undisturbed area' > to undisturbed areas?

L.123 yields > yield?

L.133 'immediately after' >> immediately added after?

L.137 'was not done resulting in underestimate of depositional' >> resulting in the underestimation of... ?

L.149 After deposited >> after being deposited?

LL.150-51: 'Open Ocean' >> why using capital letters here (instead of open ocean)?

L.169 have shown that the atmospheric fluxes

L.171 "and hence those are data are not included" >> unclear, please rephrase

L.177 'sediment focusing and erosion' >> unclear what is referred to with 'sediment focusing'

LL.182-184 'one is generated from the decay of  $^{222}\text{Rn}$  in the soil minerals, known as supported  $^{210}\text{Pb}$  which is produced from the decay of  $^{238}\text{U}$  and the other comes from atmospheric deposition as unsupported  $^{210}\text{Pb}$ . The fallout of  $^{210}\text{Pb}$  is retained generally in the organic rich surface soils presumably because of the sequestering properties of the organic matter as well as in lithogenic mineral grain.' >> this seems to reflect the old vision that there are a mineral and an organic component in soils, instead of the occurrence of 'organo-mineral complexes'

L.187 'concentration than that expected' >> higher than that/compared to that...?

L.197 'at different sampling time' >> sampling times

L.200 'possibility of the dating ice core' >> 'possibility of dating ice cores'?

L.203 and the Arctic?

L.204 'small montane permanent snow filed' >> unclear what is meant here (maybe snowfield...)?

L.205 'in the same way as the soil' >> in the same way as for the soil, except that...?

L.208 'are very low' > is very low?

L.214 'Regarding compiling' >> please rephrase

L.226 was included > were included?

L.228 'originating authors' > unclear, I would rephrase this

LL.229-230 convert in >> convert into?

L.234 'program' >> which program is referred to here?

LL.235-236 'In rare cases, only the locality name of the study site was available, the geographical

location was digitized by Google Earth.' >> unclear here, do you mean that the approximate coordinates were extracted from Google Earth?

Results and discussion

L.247 in different literature >> unclear what is meant here

Figure 1: the a/b/c/d letters referring to the different figure panels are not easy to see, could there be a way to make them visible?

L.255 'A number' > the number?

L.257 'earlier than that' > those?

L.259 work was started >> I would remove 'was'?

L.271 'in the undisturbed site' >> in an undisturbed site?

L.284 mainly dedicated to investigate...

L.285 Be-7 >> are you referring to the Be-7 fluxes here?

L.295 I would refer to the concentrations and depositional fluxes separately in the sentence to facilitate its reading

L.331 for Pb-210 than for Be-7

L.332 'However' >> why starting the sentence with 'however'?

Figure 6 - caption - L. 338: 'against with' >> versus?

LL.342-43 'less than 5% of that in the same latitude' >> unclear what is meant here?

L.345 'Hokitika' >> I don't know this location, where is it located?

Figure 8 – caption – L. 358: latitudinal bands (in plural)? (same remark in Fig. 7)

L.368 in 19 sites for which (...) ratios were available,....?

L.368 the paired t-test > a paired t-test?

L.375 'their measurements are easy' >> this is all relative, depending on the point of view...

L.389 'is an artifact of the manner in the calculation' >> in the calculation mode?

L.405 were used > was used?

L.418 particle dynamics > riverine particle dynamics ?

Section 3.6 : As mentioned above, I think that riverine particle dynamics using Be-7 and Pb-210 measurements should be addressed in this section.

L.423 of an undisturbed > at an undisturbed?

L.425 'exceeding' > enrichment?

L.425 'accumulation and/or redistribution' >> unclear which difference you make between both processes here?

L.432 'indicates notable sediment focusing or additional particle input other than atmospheric fallout' >> unclear what is meant here, please rephrase

LL.443-444: '7Be depositional flux is independent of longitude and is constant over broad latitudinal bands. Thus, the 7Be depositional flux data in our dataset can be used to estimate 7Be ocean inventory in the same latitude, which can avoid the collection of the large volume of seawater samples and extend the application of 7Be in the Open Ocean'  
>> I fully agree with the authors here and I think that this could be further outlined in the text (including for continental locations)

L.454 are almost non-existent

L.468 meteorological conditions?

L.481 'from the same literature' >> article?

Conclusions

L.486 'spanning the time from 1955 to early 2020' >> spanning the period...?

L.493 maybe add 'in river systems' after dynamics here?