

## Comment on **essd-2022-446**

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Referee comment on "A strontium isoscape of northern Australia" by Patrice de Caritat et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-446-RC2>, 2023

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### General comments

The manuscript "A strontium isoscape of northern Australia" by Caritat et al. presents a new large-scale  $^{87}\text{Sr}/^{86}\text{Sr}$  isotope dataset for Northern Australia based on archival fluvial sediment samples. The scope of the study is very impressive, and the data are going to be very useful for the science community. The analytical methodology and statistical evaluation of the data are appropriate and provide confidence in the provided results. Specifically, the use of archived sediment samples that should represent a mixture of the varied geology is very interesting and overcomes the lack of samples from Northern Australia. Overall, I believe this is a very important contribution and it is great to see that the authors have chosen to make this data available.

### Specific comments

- I think it would benefit the reader to make it very clear that the data presented here are total Sr and not bioavailable Sr. This does get mentioned in the manuscript, but I think it should be front and center to avoid any potential confusion and incorrect use of the data. I am also interested in why the bulk Sr extraction was chosen rather than bioavailable? I think elaborating on this in the discussion would be useful and interesting. Is there any use in getting bioavailable Sr out of these samples?
- In the quality assessment section (Line 222-228): To confirm the data are interpreted based on the 3<sup>rd</sup> decimal place because the within sample variability was high? Why is that so? Is that a result of the total Sr extraction method, the type of these sediments, or another process? This should be elaborated on in the discussion. For example, would you recommend analyzing more sediment samples to get a better handle on this? Or a different extraction method? Or a different sample type?

### Technical corrections

Abstract

I focused on the abstract as this is the most widely read part of the paper. The following comments are all suggestions that I hope improve clarity.

Line 8: Maybe add "useful as a tracer" or something similar. Just useful seems not very informative.

Line 10: I think it should be "archived".

Line 11: Suggest removing the reference style (last accessed) from the abstract (here and at the end).

Line 12-14: This is a lot of method detail for an abstract. Since the paper is open access and the method section will be available to all to read I suggest to condense this to a single sentence. "Total Sr was extracted and measured..."

Line 16: Why preliminary?

Line 21: Can you add a range to the carbonate units. Also, the word "signature" at least to my ears implies some type of unique value so maybe the word "range" or "ratio" is better here.

Line 27: How should these data be used in archaeological, forensic, and ecological studies? The sentence from Line 76 might actually be a good fit here. "The present study affords an opportunity to further redress this deficiency and will reduce the northern-hemisphere bias in future global  $^{87}\text{Sr}/^{86}\text{Sr}$  models."

#### Introduction

Line 40-70: I don't believe all these references are needed or useful for the reader. Maybe focusing on 2-3 key references per statement would improve this intro.

Figure 1: Great figure but small in the pdf and symbology is hard to distinguish (maybe different symbols could improve this). Actually all figures could be larger (full width).

#### Data analysis

Line 230: Why choose Excel rather than R or python for the data analysis? One of the main benefits of using a scripting language would be that others could reproduce the results (and figures) directly.

Figure 4: Remove one of the legends to save space and as before make the figure larger

Table 1: Really useful compilation! Thank you.

#### Conclusions

Line 373-381: This could be removed to provide more focus in the conclusion. The number of samples and the range could be incorporated into the following sentences.

Also again be very specific about how these data could be applied in provenance studies in archaeology/forensics.