The paper by Halsted et al. presents a very large dataset of cosmogenic nuclides (^{10}Be and ^{26}Al) drawn from the literature, along with 121 new ^{26}Al measurements. The samples correspond to riverbed sand covering a fairly wide portion of the globe. The authors propose an original indicator (although I do not clearly see its relevance at this stage of the paper) to characterize the complexity of the burial history of the sediments studied. Finally, simple yet well-supported statistical analyses allow for testing potential relationships between the burial indicator and a series of morphometric and climatic parameters.

The results indicate that (1) almost half of the samples show a complex exposure/burial history, and (2) there is a significant relationship between the catchment area and the complexity of sediment transport. These results thus support the recent (and quite similar) study by Wittmann et al. (2020), which obtained similar findings.

In my opinion, the value of this study lies in the size of the dataset (624 samples), the simplicity of the approach, and the clarity of the message.

The article is well-written, and the figures are clear and of good quality. In my view, this paper deserves to be published, with a few minor revisions. Below are some general comments, followed by more specific remarks throughout the text.

General comments:

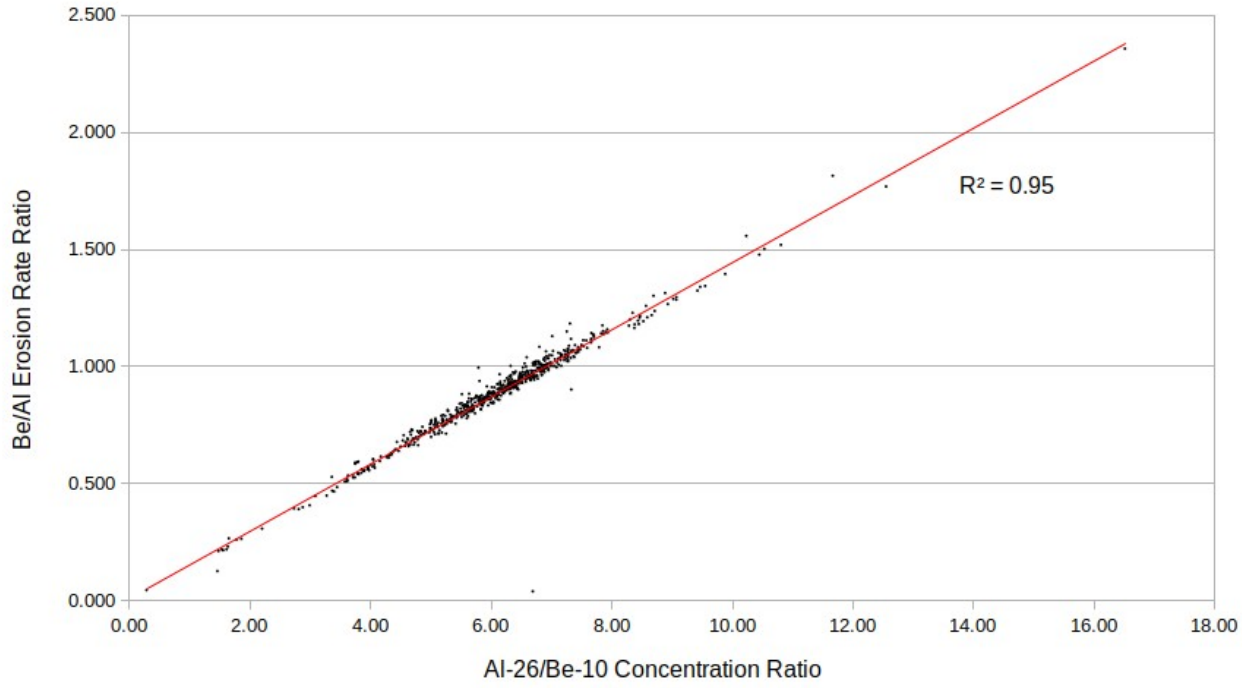
- The title should be modified, as you are not using concentration ratios but denudation ratios. You should also add 'modern' fluvial sediments.

- The objectives and methods could be more clearly described right from the introduction. I believe your general objective is found in Lines 176-178: "We measure the morphometric and climatological properties of basins from which the sampled sediments derive and use a variety of statistical analyses to assess if basin properties are correlated with cosmogenic indications of such burial."

- In my opinion, you are missing an important potential control factor: the nature of the deposits in which the rivers evolve. For example, we recently demonstrated (Jautzy et al., 2024) a significant relationship between the proportion of glacial deposits (or LGM glacial cover) within the basins and the degree of cosmogenic imbalance. You could easily test this relationship using the glacial cover shapefiles from Ehlers et al. (2011) ⇒ https://booksite.elsevier.com/9780444534477/

- In your database, I don’t see the 35 samples presumably associated with Wittmann (2011) in their publication. It seems that they only measured ^{10}Be, and your study did not measure those. This point needs clarification.

- I understand that comparing denudation rate ratios allows you to eliminate spatial variations in production rates. However, as the paper currently stands, I don’t fully grasp the actual benefit of using denudation rate ratios instead of concentration ratios. It’s original, potentially interesting, and useful, but it would require more justification. Ideally, an introduction on the use of concentration ratios would be relevant, as this is the commonly used method to study sediment burial history. A simple linear regression between denudation rate ratios and concentration ratios (see figure below) confirms a very strong correlation between these two ratios. The use of the denudation ratio, therefore, needs to be better justified.



Specific comments:

Line 21: ‘We test for correlations between such discordance and topographic metrics’
You also test for climatic metrics. It should appear in the abstract.

Line 46: ‘Data by which to evaluate these assumptions are scarce.’
Il manque un mot ou une phrase de transition avant cette phrase.

Line 56: ‘Measuring the concentrations and calculating ratios between multiple cosmogenic radionuclides has provided insight into sediment provenance (e.g., Cazes et al., 2020) and storage histories (e.g., Wittmann et al., 2011; Fülöp et al., 2020; Ben-Israel et al., 2022) in large river systems.’
Not only in large rivers. By the way, ‘large rivers’ should be defined somewhere in the paper.

Line 95: ‘first using single nuclides and later paired nuclides’
Could you add references after each case (single and paired)?

Line 100: ‘the ratio of ^{26}Al to ^{10}Be at production is ~6.8’
Add reference.

Line 127-131: ‘arid, tropical and very large’ ⇒ this is a weird way to distinguish different geographical settings. I suggest rephrasing the sentence.

Line 186-187: ‘Although we identify basin properties that correlate with isotopic indications of burial and storage, the identification of specific processes responsible for storage and subsequent remobilization likely differs on a case-by-case basis.’
Yes, of course. I think you must develop this point in your Discussion.

Line 198: Maybe you could add our recent dataset ? (Jautzy et al., 2024)

Line 387-400: This paragraph deals with analytical biases. It is necessary, but I think it would be relevant to insert it in an additional sub-section that talks about the limitations of the study, also adding potential control factors for discordance, which have not been tested in this study. Such as, for instance, the nature of the deposits in which the rivers flow.

Line 427-441 (Conclusions): In view of your striking results (~50% of samples showing burial), I suggest that you reiterate in your conclusion not only the usefulness of the paired-nuclide approach, but also its necessity to verify the steady-state hypothesis, too often simply assumed in this kind of study.