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Interactive comment on "Early–mid Miocene erosion rates measured in pre-Dead Sea rift Hazeva River using cosmogenic ^{21}Ne in fluvial chert pebbles" *by* Michal Ben-Israel et al.

Anonymous Referee #2

Received and published: 30 October 2019

Review Ben-Israel et al.: Early-mid Miocene erosion rates measured in pre-Dead Sea rift Hazeva River using cosmogenic 21Ne in fluvial chert pebbles

Ben-Israel et al. present 10 new in situ-produced 21Ne concentrations from quartz and chert material in the pre-Dead Sea rift Hazewa River located in southern Israel. Where possible in situ-produced 10Be and 26Al concentrations are provided for the same sample material. The data from sand, pebbles, and nodules is used to determine Early-mid Miocene erosion rates.

General comments:

The manuscript is generally well written and reads well. However, there are several

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weak points in the manuscript which need to be clarified and improved:

1. The interpretations of the data are relatively strong given the amount of available data. As the manuscript stands right now, it is not clear to me if the given interpretations of the results would stand if more data is available. For instance, the nuclide concentrations of the two chert nodules do not agree with continuous erosion of a landscape. In order to investigate the problem more samples should be analyzed. However, knowing that this is easy to say and that cosmogenic nuclide analysis are expensive, a request for more data is not at the right place. Instead a request to tone down the interpretation is made.

2. The method section needs to be set-up in a logical and rigorous way (see detailed comments below). The different methods applied need to be described in more detail. The calculations performed and parameters used explained. In general, the order of the presented information could be rearranged to make understanding easier. Concise wording and details in tables and figures are needed (see comments below).

3. The interpretation of the data needs to be more rigorous. For instance, the nuclide concentrations could be normalized to the same altitude. This would make a comparison more meaningful. A chert nodule at 1000 m above sea level subjected to slow erosion rates is expected to have high nuclide concentrations. Concentrations and erosion rates could also be investigated with "banana plots" for the three different nuclides (e.g., Ivy-Ochs and Kober, 2008). Such plots would help to visualize the data presented in Table 1. In addition, the use of erosion rate in combination with the integration time could be helpful for the reader.

Unfortunately, I am not an expert in the measurements of cosmogenic 21Ne. Therefore, the quality and reliability of the presented measurements are not assessed in this review. This is hopefully addressed by another reviewer. For instance, it is not clear to me what happens to 21Ne during sample preparation when leached at 150°C (see line 118-9)? This question comes up as just some lines above (86-9) the closure tempera-

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ture for 21Ne in quartz is mentioned to be 90 - 100°C. As diffusion is a slow process, the used sample preparation may be valid. Clarification is needed.

Detailed comments:

Abstract

L11-14 The abstract jumps to much into details which are not relevant for the abstract. It would make more sense to give the reader a reason why this study was done and what the goal is.

L15-18 What do you mean by “modern erosion rates”? Do these rates not integrate over hundred thousand of years? Please clarify.

L16-17 Would it make more sense to first report nuclide concentrations and then move to erosion rates?

L20-21 Is bedrock erosion equal to modern erosion?

L21-23 Long sentence not easy to understand. What does the even mean? Are the currently eroding chert nodules not used for the bedrock erosin? Needs clarification.

L24-25 From what material are the “rates calculated today”? And what does it mean “rates calculated today”? As mentioned in the general comments, it might be better to compare (normalized) concentrations rather than erosion rates.

1 Introduction

L37-40 This sentence is not easy to understand for a reader not familiar to the technique of in situ-produced cosmogenic nuclides. Can this sentence be extended? What is the limitation of the method due to the half-lives?

L44 “. . .parts of the. . .”

L46-48 The introduction comes to a quick end. An outline of the study set-up and a hypothesis to be tested would be helpful for the reader. What kind of samples do you

analyze with what method? What are the questions to be answered with this study?

2 Geological Background

L49 This chapter would gain a lot if called “Study Area” and start with a geographic description of today and what deposits are present. Then move over to the geologic background. Changing this order would request to change Fig. 2 to Fig. 1 and vice versa.

3 Methodology and Analytical Procedures

L76-89 This first section could be labeled 3.1 Cosmogenic method. It could contain the existing information, but also explain the method of catchment-wide erosion rates. In addition, it could contain further explanations of possible problems faced. Not all readers know the caveats of the cosmogenic nuclide methods (e.g., radioactive versus stable nuclides). Would it make sense to discuss here the possible influence of the transport distance and time on radioactive and stable cosmogenic nuclides?

L90 Now start here: 3.2 Sampling Strategy?

L134 How is the chemistry blank correction performed? What are the values used for erosion rate calculations?

4 Results

L143-5 This sentence needs clarification. What is exactly 21Neex?

L160-1 What is about differences in 21Neex in chert and quartz samples? Could this have an influence on the 21Necos concentration?

L178-9 Difficult sentence to understand. Please clarify.

5 Discussion

L193 What are the parameters used for these calculations?

L210 The use of “Modern” is misleading.

L211 On what are the calculations of the erosion rates based? Sea level-high latitude production rate, production rate scaling, etc.? This information should be given in the methods.

L215 Are these reported values correct? Please cross-check.

Figures

Fig. S5 - S11: Please label x- and y axes.

Tables

Table 1: Please cross-check units.

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