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Comment on se-2021-68

Anonymous Referee #2

Referee comment on "Detrital zircon provenance record of the Zagros mountain building from the Neotethys obduction to the Arabia–Eurasia collision, NW Zagros fold–thrust belt, Kurdistan region of Iraq" by Renas I. Koshnaw et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-68-RC2, 2021

MS No.: se-2021-68

Title: Detrital zircon provenance record of the Zagros mountain building from the Neotethys obduction to the Arabia-Eurasia collision, NW Zagros fold-thrust belt, Kurdistan region of Iraq

Author(s): Renas I. Koshnaw et al.

General comment: The manuscript presents new detrital zircon age data and intends to combine the data with field observations to conclude that unlike the existing plate tectonic model for Iraq the Paleogene Walash-Naopurdan-Kamyaran arc-related complex formed on the Eurasian side of the Neotethys. But the presented new model is poorly substantiated and the targeted rock units for detrital zircon study is not satisfactory. Based on the comments summarized below, my conclusion is that the current manuscript has been prepared in a rush and needs a major repair before being considered for publication.

Specific comments:
Data: Introducing of the situation of the "new data" is not clear and data tables are missing. Lines 70-74 say that the new provenance information will be combined with published data. Then there is a mention of "five" samples which have been selected for detrital zircon double dating. Till here, the reader learns that new data for five samples are being used in this paper. Later, Lines 185-189 state that 1097 new detrital zircon U-Pb ages and 74 new detrital zircon helium ages are presented from "eigh"t Red Bed Series samples and "three" samples from the proto-Zagros formations. But no data table is attached to check all that. In the beginning, I thought perhaps I have missed downloading the Tables but then I realized that no reference has been made to a data table in the text.

By piecemeal search throughout the MS, I found a general picture of the data source in Figure 12, oddly referred to only in Figure 13. This Figure 12 nicely presents a summary of the previous work and the current study linked with an interpreted stratigraphy but strangely this figure is not cited properly throughout the text.

Expression: For someone not much into the stratigraphy of Iraq the text is hard to follow. Keeping names of such many rock units in the right age order in mind is no easy. It would help if age could be mentioned before the Formation name; for instance, "the Oligocene Swais Group" rather than just "Swais Group".

Regarding the English of the text, I noticed frequent missing verbs, wrong verbs, and typos. That indicates the text has been submitted before comprehensive editing by the team of authors.

Tectonic model: Koshnaw et al. propose a new model of tectonic accretion of the Tethyan Paleogene blocks onto the Eurasian side of the Neotethys. Their suggested model competes with an existing model which considers the pre-Miocene accretion happened on the Arabian side of the ocean. Contrasting with the conventional model (e.g., Aswad et al., 2014; Ali et al., 2019; Jones et al., 2020) formation of the WNK complex is now proposed to have taken place entirely on the Eurasian active margin. However, the supporting discussion for the new model is inadequate. For instance, development of the Paleogene WNK arc-related complex in juxtaposition with the Sanandaj-Sirjan zone requires that sediments within the former to be containing Triassic-Jurassic-Cretaceous age detrital zircons from the latter. Discussion of such aspects of the proposed reconstruction is missing.

Methodology: Since the main objective of the current manuscript is to show that the Paleogene arc activity along the WNK took place in the same tectonic setting as the Sanandaj-Sirjan arc, study of the detrital zircon content of the WNK complex rocks is required. Characteristic zircon U-Pb ages of the Sanandaj-Sirjan zone with conspicuous peaks for Ediacaran, Carboniferous-Permian, Triassic and Jurassic periods if seen in the WNK sediments would support the proposed tectonic model.

Variscan orogeny deduced from Carboniferous-Permian zircon ages: The current MS attributes Carboniferous-Permian zircon ages to Variscan orogeny. That inference is not warranted because the Arabian plate was not affected by Variscan orogeny. Why not also considering other possible nearby source regions for such age-range zircons? Also, we should remember that large areas of the Arabian subcontinent is buried under Mesozoic and Cenozoic sediments. Investigated alternatives include rift magmatism of Early Carboniferous age in Israel (Golan et al., 2017. International Geology Review), buried late Paleozoic crust beneath northern Arabia (Stern et al., 2014. EPSL), continental arc magmatic rocks in Turkey correlated with southward subduction of Paleotethys (Candan et al., 2016. Tectonophysics) and continental rift granitoids in Iran linked with Neotethys opening (Jamei et al., 2020. International Geology Review). Obviously Variscan orogeny is not the subject matter of this MS and can be avoided safely considering the doubts that surround its application to the Arabian Plate.

Stratigraphic chart missing: Presentation of an uninterpreted stratigraphy is essential for this paper. Figure 12 presents the stratigraphy but it 1) comes at the end and 2) is interpreted to go along with the proposed model. A simple stratigraphic chart to go with section 2 would be very helpful for the readers of this paper especially if the reader is unfamiliar with the region.

Some detailed comments:

L102: Here, the phrase "the basin shallowed upward" doesn't make sense. Shallowing and deepening are used for a sequence. You mean that the basin shallowed over time. Therefore, the sentence should be rearranged like "an upward shallowing is suggested by sedimentary facies change in the basin deposits."

Figure 12: Events shown by circled numbers 1-4 are not explained in the figure caption. Also, there is no reference to this figure in the text to help the reader about those numbers.

Figure 13: Below are some questions

Panel a (Late Cretaceous time): Two subduction zones are shown one underneath the Sanandaj-Sirjan zone, and one is intraoceanic. Neither is associated with magmatic activity. Any explanation?
Panel b (Paleocene): The intraoceanic subduction is still amagmatic. No explanation?

Panel c (Eocene): (1) Arc magmatism over the intraoceanic subduction (closer to the Arabian margin). What volcanic rock formation is produced here? (2) Slab flattening shuts off arc magmatism along the Sanandaj-Sirjan zone, but activity continues closer to the trench along the WNK. How do you explain this improbable situation?