Solid Earth Discussions

Solid Earth Discuss., referee comment RC1
https://doi.org/10.5194/se-2021-68-RC1, 2021

Comment on se-2021-68

Frédéric Mouthereau (Referee)

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-RC1, 2021

General comments

This paper presents 1097 new U-Pb ages and 74 new AHe on zircon providing 74 double dates on key deposits from the Zagros foreland and proto-foreland and sediments from the Zagros (Kurdistan) suture zone. These constrains are used to position the Red Beds Series and decipher between different scenarios of the evolution of the transitional domain stretching between the Arabian margin and the active margin of Eurasia. The paper is generally well written and organised expect the introduction that requires shortening and rewriting. This part also contain several unclear statements (see below). My main concern is about the discussion. The discussion indeed implements models of large scale geodynamic reconstructions but unfortunately do not enough present similar constraints (stratigraphy, basin evolution and sparse thermochronological constraints or description of sediments) obtained in other regions of the Zagros including Kermanshah region but also in the Fars. As presented below there are several lines of evidence suggesting the Red Beds Series and the WNK volcanic complex could correlate with deposits identified along the strike of Zagros suture zone. This has obvious implications on the architecture of the suture zone that could argue for a cylindrical margin over more than 2000 km. Also I suggest the Red Beds Series may be part of the Zagros foreland above the obducted units and above the the proto-foreland basin.

Main comments

The U-Pb/Zhe age signature obtained for RBS may be compared to the few AFT data from the base of the Neogene strata (Razak Fm) of the Fars region of the iranian Zagros (Khadivi et al., 2012) revealing source from a mixture of ophiolitic series (100 Ma) and arc derived rocks (magmatic or erosion events in the range 66-39 Ma) that was emplaced in the inner part of the Zagros and likely covered part of the High Zagros. In this work the base of the foreland deposits (Razak FM), which is found only to the north close to the MZT, share some FT ages (but not U-Pb ages signature) with the early (proto-)foreland

deposits of Paleogene age (e.g. Amiran Fm).

In the scenario presented the WNK complex would be a possible source of Razak Fm that we never found preserved in the Fars. It terms of terminology and spatial correlation would it be possible that the RBS=Razak Fm ? In this case the RBS could be part of an inner foreland basin as commonly described in the Iranian Zagros rather than intermontane basin. In other word, the zagros suture zone was the inner foreland during the Neogene.

In addition, an erosional event is described in the Eocene in the high Zagros (Mouthereau et al., 2012; Khadivi et al. 2012) in the Lorestan and the Fars. This could correspond to the unconformity inferred at the base of the Suwais Fm. Although the margin of Arabia was obviously variable along strike such equivalence would make the foreland more cyclindrical.

Specific comments

L40-53: This part is unnecessary long and wordy. It contains disconnected sentences. I suggest to shorten in 2 short sentences.

L55 : No. The Zagros orogen did not form as a result of obduction but due to convergence and most likely collision between Eurasia and Arabia plates.

L58: Different terranes ? which ones ?

L59: Why uncertainties arise from the almagation of different tectonic terranes ? If their geometry and kinematics are simple then the reconstructions can be straightforward.

L61-62: … Walash Fm.. Red Beds Series. Not yet introduced.

L108-109: Yes but not only. Acknowledge also older works.

L118-121: how do these successions relate to the deep marine to shallow marine transition you mentioned above ?

L127: Would be useful to know how these formations correlate with more familiar stratigraphy of the Iranian Zagros. This could be done in Figure 2.

L235: This is not true. The neogene period is obviously syn-collision.

L236: Tanjero Fm belongs to the obduction phase according to your stratigraphic chart not to the proto-Zagros. This is a lot of names. Wherever possible add the stratigraphic ages.

L239: The WNK complex should be defined earlier when you introduce the Walash-Naopurdan series for the first time.

L257: It is not trivial to associate zircon with the expected juvenile composition of magmas on mid-oceanic ridges. the same comment holds when you relate zircon U-Pb age of 100 Ma with the Tethys. Although common in cumulate this is not expected in basalt. Just add a few words perhaps in Chapter 2, to make this point clearer.

L258: Somewhat related to my comment above but this point should address earlier when you present the geology of potential sources.

L262: Unclear why you need to recycle sediments of this basin which is rich in carbonates.

L326-327: This is not what is shown in Fig. 5c.

L339: Ok there is one finally. So why this is different from Le Garzic et al. 2019 ?

L353: But what if RBS have been originally deposited above WNK which series were later emplaced during the Neogene ?