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Timing of the Arabia-Eurasia continental collision—Evidence from detrital zircon U-Pb geochronology of the Red Bed Series strata of the northwest Zagros hinterland, Kurdistan region of Iraq

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We (Koshnaw et al., 2018a) advocated that the Arabia-Eurasia continental collision was underway by ca. 26 Ma in the northwestern Zagros fold-thrust belt in the Kurdistan region of Iraq. In other words, the minimum age of collision is ca. 26 Ma. This conclusion is based on the depositional age, provenance, and structural and stratigraphic relationship of the Suwais unit by utilizing detrital zircon (DZ) U-Pb geochronology.

The DZ U-Pb analysis determined the maximum depositional age (MDA) of the Suwais unit that contains provenance signatures from the Eurasian plate. The DZ MDA constrains the lower age limit of sedimentary deposits, because deposits can not be older than the youngest DZ U-Pb crystallization age. Hence, the Suwais unit can not be older than the age of the youngest crystallized zircon grains, which is ca. 26 Ma. The DZ MDA method has been used widely for over a decade to constrain the depositional age of deposits (e.g. Nelson 2001; Fedo et al., 2003; Fildani et al., 2003; Dickinson and Gehrels, 2009; Hu et al., 2016).

Our DZ results show that only ~10–15% of the DZ grains that have Jurassic and late Paleozoic U-Pb ages are unequivocally derived from the Eurasian plate (not all the grains as stated by Mohammad and Karim [2019] in their Comment). No similar crystallization ages (Jurassic and late Paleozoic) have been reported from the Arabian plate, particularly in the northeastern margin of the Arabia, as it was a passive margin (Ziegler, 2001; Stampfli and Borel, 2002). In Koshnaw et al. (2018a), the potential source terranes are clearly identified in the "Detrital Zircon Provenance" section, with references. Source terranes for zircon grains could be bedrocks and/or sedimentary rocks (not necessarily to be clastics). In Koshnaw et al. (2018b), we stated that samples from the Paleogene proto-Zagros foreland basin (Tanjero, Kolosh, and Gercus Formations) show a unimodal U-Pb age distribution at ca. 95-100 Ma. In Koshnaw et al. (2018a) results, as shown in our figure 3, do not show a unimodal U-Pb age distribution at ca. 95-100 Ma, but limited contribution. This contrast in the DZ U-Pb provenance between the Suwais unit and the Paleogene proto-Zagros foreland basin deposits urges differences in the basin setting and the geologic conditions. Therefore, consideration of the Suwais unit as an equivalent of the Gercus Formation can not be precise. Furthermore, the recently reported Gercus Basalt is considered to be a superficial lava flow and syndepositional in age with no cross-cutting relationship (Kettanah and Bamarni, 2018). Mohammad and Karim did not provide any citation for their statement, but we assume they meant the Gercus Basalt in Kettanah and Bamarni (2018). Our results show that the youngest zircon grains from the Red Bed Series (RBS) are found in the lower Suwais unit rather than in the upper Merga unit. This is due to the source terrane exhumation that result in erosion of the younger upper rocks first and exposure of the older rocks later. Consequently, the lower rock successions in the basin include younger zircon grains than those in the upper rock successions. This is in total agreement with principles of stratigraphy! Based on the ca. 26 Ma DZ MDA of the Suwais unit of the RBS and the Maastrichtian Tanjero Formation (Kassab 1975, referenced by Jassim and Buday, 2006), the age gap must exist.

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