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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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Koshnaw et al. (2019) advocated that ~150 km synchronous collision events between Arabia and Eurasia had occurred at 26 Ma. Their most robust evidence comes from three detrital zircon (DZ) grains in three samples from the base of the Suwais unit of the synorogenic Red Bed Series (RBS). However, available geochronological data contradict the above timing, and support the oblique (scissor-like) and diachronous collision between the two colliding plates (Chiu et al., 2013; Mohammad et al., 2014; Azizi et al., 2018). Following the first coupling of continental parts in the Kurdistan region of northeast Iraq at Mawat-Penjween, in the Middle Eocene (Mohammad et al., 2014; Mohammad and Cornell, 2017; Azizi et al., 2018), the coupling migrated bilaterally toward Oman in the southeast and Turkey in the northeast. This was supported by the younger ages of continental collision between two plates (Mohammad et al., 2014 and reference therein). Khoshnaw et al. (2019) claim that RBS deposits were mainly sourced from forearc-related and/or arc-related terranes along the southwest margin and hinterland of Eurasia without giving any evidence such as photos of detrital volcanic clasts. Moreover they suggest that DZ grains are unequivocally derived from Eurasia, including DZ from Jurassic and late Paleozoic.

During Jurassic–Cretaceous; there was a deep trench between the two plates (Jassim and Goff, 2006) where radiolarites and Balambo fms were deposited. Later these sediments and ophiolites are tectonically obducted on the Arabian platform during Late Cretaceous forming terrestrial land and their rocks recycled (see Dickinson et al., 1983) after erosion and supplied detritus from northeast to basins of RBS and Tanjero Fm at southwest (Al-Barzinjy, 2005; Karim and Taha, 2009).

Furthermore, the data of Khoshnaw et al. suggest mainly sourced of the RBS from forearc- and/or arc-related terranes along the southwest margin and hinterland of Eurasia. This lacks record of detritus of volcanic rocks either as sand or gravel sizes. Another critique is excluding contribution of 95 Ma ophiolite components of the Oceanic basin and trench as sources of the RBS. Absence of ophiolite should also reflect in the foreland deposits; however, Koshnaw et al. (2018) stated derivation of the zircon in the Zagros foreland basin deposits from ophiolite.

Koshnaw et al.'s age interpretation of the DZ U-Pb is based primarily on the observation that the basal units hold no post-collision zircon-derived igneous rock along the northwest Zagros hinterland. However, anorogenic basic igneous rocks have been recently recorded as 30 m dikes within the Gercus Formation, which is equivalent to the upper part of the RBS in the foreland basin of Arabia, and both formations represent lateral facies changes in the same foreland basin (Al-Barzinjy, 2005). Moreover, much post-collision igneous activity recorded in the Zagros hinterland, Iran, ranges in age from 23.3 ± 0.5 Ma to 30.8 ± 2.1 Ma (Aghazadeh et al., 2011). Koshnaw et al. (2019) recorded the youngest zircon from the RBS in the Suwais unit, which is stratigraphically older than the Mirga unit of the RBS. Meanwhile the zircon in the Merga unit is older; this exactly opposites the basic principle stratigraphy of the area, excluding the tectonic relation between the RBS and the underlying Tanjero Formation.

Considering that the three 26 Ma zircon in RBS were derived from a younger igneous body in Gercus Formation or as post-collisional related zircon in Zagros hinterland. Koshnaw et al.'s data support a middle Eocene (37–44 Ma) onset of continent-continent collision, coincides with the previously published scenario by Mohammad and Cornell (2017).

It is clear from Koshnaw et al.'s figure 3 that there is a gap in deposition, spanning ~40 m.y. between the Tanjero Fm (Maastrichtian) and the RBS. This is impossible, because this long time of erosion might allow formation of an angular unconformity between the aforementioned two units due to synorogenic nature of RBS as mentioned Koshnaw et al. (2019) but this angularity has never been observed along the entire Zagros orogenic belt and it is most possibly tectonic relation not stratigraphic. According to Koshnaw et al. (2019) the RBS belongs to the hinterland of western Zagros. This is not the actual geologic condition of the studied area, where the RBS is deposited in the Zagros foreland basin as coastal facies (Karim et al., 2011).

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