

A positive test for the Greater Tarim Block at the heart of Rodinia: Mega-dextral suturing of supercontinent assembly

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Based on new palaeomagnetic data from the Neoproterozoic sequence in Southern Tarim and the ca. 820 Ma mafic dikes on the northern margin of the Qaidam, Wen et al. (2018) propose a model of the Greater Tarim Block (GTB, including the Tarim and the Precambrian terranes neighboring Tarim) that occupied a “missing-link” position at the heart of Neoproterozoic Rodinia supercontinent. This GTB model, however, is problematic, as it ignores many aspects of available geological data.

Restoration of the sinistral movement along the Altyn Fault System. The Altyn Fault System consists of two major sinistral strike-slip faults (the Altyn-Tagh fault and the Qiemo-Mingfeng fault), in response to the collision between the Indian and Eurasian plates (Fig. 1A). Between the two strike-slip faults, there are outcrops of the Paleozoic North Altun accretionary belt (ophiolites and lawsonite-bearing eclogite and blueschist) and the South Altun ultrahigh-pressure (UHPM) belt, which are comparable to the North Qilian Accretionary belt and North Qaidam UHPM belt, respectively. The total offset is therefore estimated to be ~400 km, mainly by the southern Altyn-Tagh fault (Zhang et al., 2001). By restoring this offset (Fig. 1B), we see a Paleozoic orogenic belt lying between the Tarim-Alxa and the Qilian-Qaidam super-terrane (QQST).

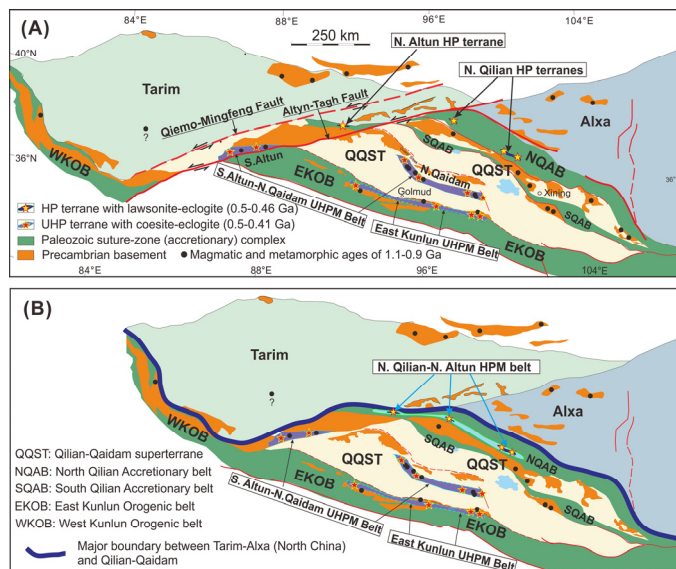


Figure 1. A: Geologic map of the Tarim-Qaidam-Alxa region, China, showing crustal blocks and Early Paleozoic orogenic belts with high-pressure-ultrahigh-pressure (HP-UHP) terranes. B: Same as A but roughly restored the fault offset along the Altyn-Tagh fault.

In the Qilian-Qaidam super-terrane southeast of Tarim, there are Early Paleozoic suture zones featuring three high-pressure and ultrahigh-pressure (HP-UHP) metamorphic belts (Fig. 1). They were the products of the closure of the Proto-Tethys Ocean at ca. 550–410 Ma (Song et al., 2013, 2014, and references therein). They were cut by, but can be traced to the west of, the Altyn-Tagh fault. As a consequence, the QQST was only assembled with Tarim toward the end of the Early Paleozoic, rather than in Grenvillian time (1.1–0.9 Ga) as implied by Wen et al.’s model.

No evidence for Rodinia-forming Tarimian orogenic suture. As shown in Figure 1, the Grenvillian-aged (1.1–0.9 Ga) magmatic and metamorphic rocks are widespread in most Precambrian basements in the Qilian, Qaidam, Alxa, and East Kunlun regions (Wang et al., 2004; Geng et al., 2002; Tung et al., 2013; Wen et al. 2018, references therein). Contrarily, similar-aged rocks are rare in Tarim. The blue-colored orogenic belt in Wen et al.’s figure 1 is actually a 0.44–0.42 Ga UHPM belt with various protoliths dated at ca. 1.1–0.5 Ga (Song et al., 2014), not a “Rodinia-forming Tarimian orogenic suture” in a “Greater Tarim Block”. Wen et al. further speculated an extension of the ca. 0.9 Ga orogenic suture into Tarim. However, the only evidence they used for such a speculation is the reported Ar/Ar ages of 932–891 Ma for a non-deformed granodiorite from this locality (Deep Well TC-1), but the diorite within this granodiorite yields Ar/Ar ages varying from 1199 to 744 Ma (Li et al., 2005; Guo et al., 2005). We regard this as a biased interpretation of a poor data set with no solid geological base.

In sum, the misconception of a “GTB” led to Wen et al.’s speculation of a new “missing-link” configuration for the Rodinia supercontinent. If Tarim is positioned at the heart of Rodinia, there is trouble in explaining the presence of a wide ocean basin to its north (present-day coordinate), subduction of which beneath northern Tarim formed the Neoproterozoic Aksu blueschist and the HP granulites near Boston Lake (He et al., 2012, and references therein).

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