

# Reply to Zhang et al.'s comment on “Geochronology and geochemistry of deep-drill-core samples from the basement of the central Tarim basin”

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We welcome Zhang et al.'s comment on our recent paper dealing with the significance of the first geochemical and geochronological analyses of deep drill-core samples collected from the basement of the central Tarim basin (Guo et al., 2005). In their comments, Zhang et al. raised three questions with regard to our paper (1) the compatibility of our model with regional geology, (2) our interpretation that the central Tarim granitoid was derived from a magmatic arc, and (3) if the timing of our inferred arc magmatism and suturing event across the central Tarim basin is consistent with recently radiometric ages of mafic dikes and Neoproterozoic rift sequences around the Tarim basin. We address them below.

## 1. Regional geology

In our paper we point out clearly the potential complication of Cenozoic deformation in the southern Tian Shan in modifying the original tectonic position of the Aksu blueschist belt in the northern margin of the Tarim basin (Yin et al., 1998; Allen et al., 1999; Burchfiel et al., 1999). In addition, large-scale late Paleozoic strike-slip faulting in the Tian Shan could also displace Precambrian magmatic arcs (e.g., Yin and Nie, 1996). Thus, the lack of a magmatic arc in the southern Tian Shan cited by Zhang et al. as evidence against our tectonic could have resulted from these processes. However, a more plausible explanation is that the arc is covered by the late Proterozoic–early Paleozoic cover sequence extensively exposed along the southern

margin of the Tian Shan and northern Tarim basin (Xinjiang BGMR, 1993). Regardless of the detailed and certainly non-unique interpretation of the where-about of our inferred arc in the southern Tian Shan, the most important fact our mode relies on is the existence of a blueschist in the southern Tian Shan, which cannot be produced by Precambrian rift as would be required by the Zhang et al.'s alternative interpretation, but instead must have been associated with oceanic subduction as seen in the Franciscan Complex in California or continental collision as seen in the Dabie Shan of east-central China.

## 2. Geochemistry and geochronology

We did not suggest that our samples are “calc-alkaline rocks” as quoted by Zhang et al. in their comments. Instead, we discuss in our paper the difference in geochemistry between our sample and typical calc-alkaline igneous rocks. We are not aware of any existing work that precludes the occurrence of syenodiorite during arc magmatism, which was suggested by Zhang et al.'s comment. A clear and nearby case can be made in the Carboniferous Tian Shan, where trachyandesites can be demonstrated to have occurred in an island arc setting (Zhu et al., 2005).

We also find that the criticism of Zhang et al. about not citing some of the recent geochronologic results in our paper around the Tarim basin unfair. Our manuscript was in the process of printing since 2003 and we clearly did not have the chance to read papers by Zhang et al. (2005) and Xu et al. (2005). Nevertheless, we comment below on our work in the context of these new radiometric ages around the Tarim basin. In Zhang et al. (2005), they report ages of mafic dikes near Aksu to be  $807 \pm 12$  and

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785 ± 31 Ma. Xu et al. (2005) presented a SHRIMP age (755 ± 15 Ma) of the lowest bimodal volcanic unit of a Neoproterozoic sequence in the northeastern margin of the Tarim basin at the eastern end of the Tian Shan. Even though the bimodal volcanics may have been related to a rifting event or even the breakup of Rodinia as preferred by Zhang et al., the extensional event must have started at or after 755 ± 15 Ma, because the dated unit lies at the bottom of the syn-rift sequence. The granitoids we studied in central Tarim must have intruded prior to the rifting event in the northeastern Tarim at or prior to 790 Ma, as indicated by our <sup>40</sup>Ar/<sup>39</sup>Ar hornblende ages that represent the minimum crystallization ages. That is, there is no conflict in the temporal evolution between our proposed tectonic model requiring the existence of a late Proterozoic magmatic arc in central Tarim and a later Neoproterozoic rifting event. Even the rifting event in northern Tarim basin and emplacement of mafic dikes in north-central Tarim basin were coeval with our inferred arc magmatism and subduction in central Tarim, these tectonic events with different modes of deformation could still all have occurred in a unified but complex arc system, involving back-arc (NE Tarim) and fore-arc (north-central Tarim) extension.

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