

Paper Number: 518

**Timing of the blueschist facies metamorphism in the North Qilian orogen**

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The Qilian–Qaidam orogenic belt at the northern edge of the Tibet Plateau, has received increasing attention as it recorded a complete history from continental breakup, to opening and closure of an ocean basin, to the ultimate continental collision in the time period from the Neoproterozoic to the Paleozoic. Determining a geochronological framework for the initiation and termination of the fossil Qilian Ocean subduction in the North Qilian orogenic belt plays an essential role in understanding the whole tectonic process. Dating the high-pressure/low-temperature metamorphic rocks in the North Qilian orogenic belt, such as blueschist and eclogite, is the key in this respect. A blueschist from the southern North Qilian orogenic belt was investigated with a combined metamorphic  $P$ – $T$  and U–Pb, Lu–Hf and Sm–Nd multichronometric approach. Pseudosection modeling indicates that the blueschist equilibrated at peak  $P$ – $T$  conditions of 1.4–1.6 GPa and 530–550 °C. Zircon U–Pb ages show no constraints on the metamorphism due to the lack of metamorphic growth of zircon. Lu–Hf and Sm–Nd ages of  $466.3 \pm 2.0$  Ma and  $462.2 \pm 5.6$  Ma were obtained for the blueschist, which is largely consistent with the U–Pb zircon age of 467–489 Ma for adjacent eclogites. The peak metamorphic temperature of the blueschist is lower than the Lu–Hf and Sm–Nd closure temperatures in garnet. Lu and Sm zoning profiles in garnet indicate that the Lu–Hf and Sm–Nd ages are biased towards the age of the garnet inner rim. These isochron ages are thus interpreted as the age of blueschist-facies metamorphism. Previous  $^{40}\text{Ar}/^{39}\text{Ar}$  ages of phengitic muscovite from blueschist/eclogite in this area likely represent a cooling age due to the higher peak metamorphic temperature than that of the argon retention. The difference of peak metamorphic conditions and the distinct metamorphic ages for the eclogites and blueschists of intimate occurrence in the same high-pressure belt indicate that this region likely comprises different slices, which had distinct  $P$ – $T$  histories and underwent high-pressure metamorphism at different times. The initiation of the opening of the Qilian Ocean can be traced back to the early Paleozoic, and its ultimate closure was no earlier than c. 466 Ma in the North Qilian orogen.

