

## **The subducted Mesoproterozoic oceanic crust in the North Qaidam: constraints from geochemistry, zircon U-Pb and Lu-Hf isotopic study on Yuka talc-bearing eclogite**

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The North Qaidam is an Early Paleozoic continental-type ultrahigh-pressure metamorphic belt in NW China, mainly composed of para- and orthogneisses and minor eclogites, garnet peridotite, pyroxenite and granulites. Recently, numbers studies identified concurrent 1.0-0.9 Ga magmatic and metamorphic event in the para- and orthogneisses and thus the North Qaidam was regarded as a fragment of Rodinia supercontinent in Proterozoic. However, up to now, no evidence for the existence of pre-Rodinia ocean was found.

The Yuka talc-bearing eclogite occurs as a big lentoid body in granitic gneisses. It mainly consists of garnet, omphacite, phengite, quartz, rutile, kyanite, talc and clinozoisite. Geochemistry data show that it has relatively low Ti (0.49-0.54 wt%), Na<sub>2</sub>O (1.56-2.31 wt%), K<sub>2</sub>O (0.08-0.19 wt%) contents and high Mg numbers (~65). It contains low abundances of REE (19.32-21.39 ppm, ~5.4-6.0×chondrite) and displays slightly LREE-depleted rare earth element patterns with slightly positive Eu anomalies ( $\delta\text{Eu}=1.15-1.19$ ). In primitive mantle normalized spiderdiagram, it shows left slope smooth patterns with strong enrichment of Sr.

Cathodeluminescence images show that zircons separated from the eclogite exhibit clear core-rim structure. The cores are typical magmatic origin with oscillatory internal structure and high Th/U ratios (0.34-1.35) while the rims are eclogite facies metamorphic origin with patchy zonation, flat HREE patterns without Eu anomalies and low Th/U ratios (0.01-0.09). LA-ICP-MS U-Pb dating obtained protolith age of 1239-1292 Ma from the core and eclogite facies metamorphic age of  $437\pm 2$  Ma from the rim. Zircon Lu-Hf analyses on the cores show that their  $\epsilon\text{Hf}(t)$  values are similar with the contemporaneous depleted mantle, indicating that the protolith of the Yuka talc-bearing eclogite was derived from depleted mantle without continental crust contamination.

All the characters suggest that the protolith of the talc-bearing eclogite was a fragment of the pre-Rodinia ocean and it emplaced in the active continental margin of Qaidam block during Grenvillian orogenesis and underwent continental subduction in early paleozoic.