

Research Advances

Discovery of the Dagele Eclogite in East Kunlun, Western China and Its Zircon SHRIMP U-Pb Ages: New Constrains on the Central Kunlun Suture Zone

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Objective

Eclogites are important indicators of ancient plate boundaries or paleosuture zones. Despite their great geological significance, very few investigations have been carried out in the Kunlun region. The Central East Kunlun fault zone was believed to be an Early Paleozoic suture zone, but there has been no reliable evidence for this, though studies on ophiolite, granite, and basic granulite indicate that the Early Paleozoic orogeny occurred in the East Kunlun. This work focused on the Dagele eclogites in Central East Kunlun to provide new constraints for the Central East Kunlun suture zone.

Methods

Mineral chemical compositions were obtained using a JXA8100 microprobe at the Key Laboratory of Western Mineral Resources and Geological Engineering Ministry of Education, Chang'an University, Xi'an, China. Sample crushing and zircon separation were conducted at Honesty Geological Services Company, Langfang, Hebei. Target fabrication, cathodoluminescence (CL), reflected light and transmitted light were performed at the Beijing SHRIMP Center. Zircon SHRIMP U-Pb dating was performed at Beijing SHRIMP Centre, CAGS. The detailed experimental process, analysis steps and data analysis method followed some references.

Results

The Dagele eclogite consists of garnet+omphacite+amphibole+symplectite+quartz+rutile. The edge of the garnet develops needle-like hornblende and particulate

plagioclase symplectic corona texture, forming white eye rims. Most omphacite grains have been replaced by the symplectites of fine-grained clinopyroxene and plagioclase. Electron probe microanalyzer analyses show that garnets with end-member components of Alm_{55–65}, Sps₁, Grs_{20–27} and Prp_{14–20}. Omphacite contains (4.6–5.0)wt% Na₂O and has a jadeite content of 28%–31%. Zircon grains from eclogite samples are ovoid or irregular in shape, euhedral to subhedral, with grain sizes ranging from 50 to 100 μm. zircon grains have cedar leaves structure and fan-shaped zoning structure, and some grains show a weak core-rim structure. These characteristics are commonly observed in zircons in high-grade metamorphic rocks. The results show zircon grains have very low concentrations of Pb (1.58–7.12 ppm) and U (24.7–118.8 ppm), consistent with typical metamorphic zircon characteristics. The analyses yielding a weighted mean age of 433±5.1 Ma.

It is believed that the Central East Kunlun fault zone is a ancient suture zone based on the Qingshuiquan ophiolite fragments distributed along the Central East Kunlun fault zone and geophysical data. However, there remains some controversy about the age of the ophiolite as well as the age of the suture. The discovery of the Dagele early Paleozoic eclogites provides a new constraint and further confirms that the Central East Kunlun Fault represents a paleosuture zone. In addition, the Dagele Early Paleozoic eclogites (433 Ma) in conjunction with eclogites have been found in the Central East Kunlun fault zone reveals an important HP metamorphic belt in East Kunlun related to Early Paleozoic subduction.

Conclusions

(1) The Dagele eclogites as typical high pressure eclogite almost retrograded to amphibolitic eclogites, with assemblages of high-pressure metamorphic minerals

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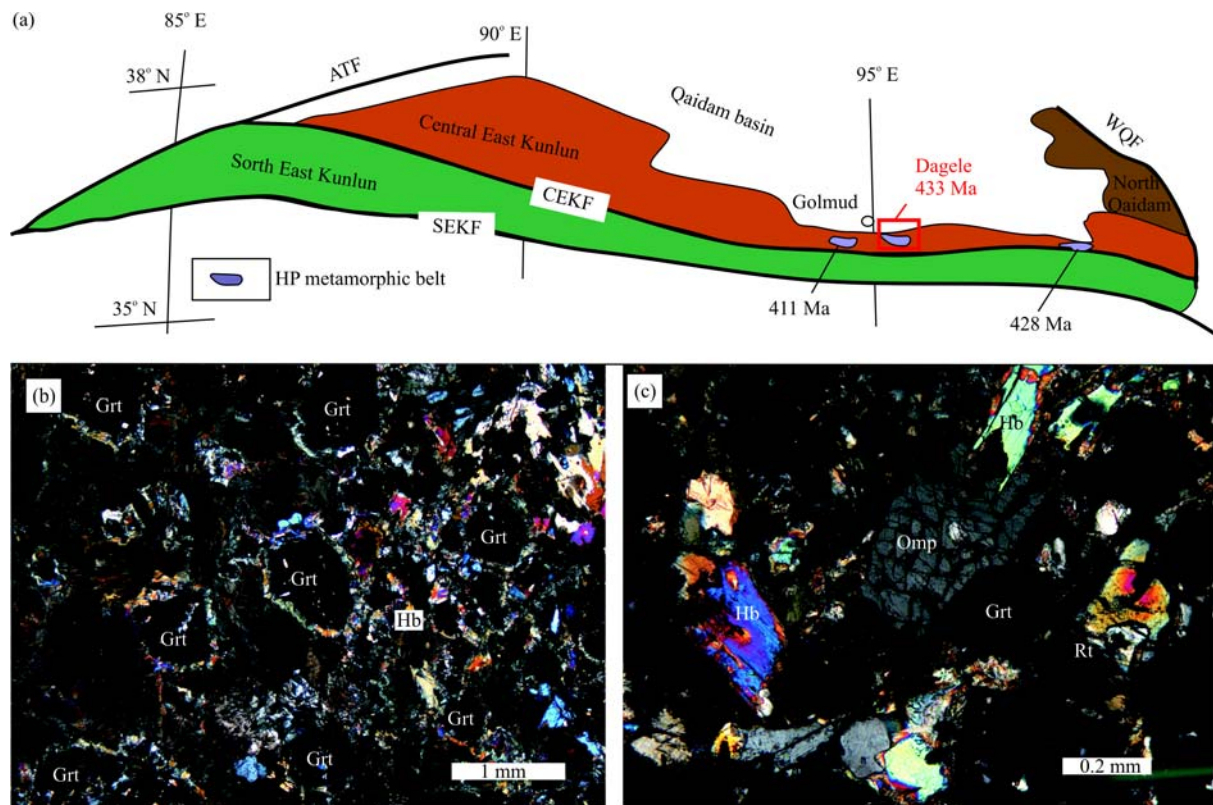


Fig. 1. Geological map (a) and photomicrographs (b,c) of the Dagele eclogites.

ATF, Altyn Tagh Fault; CEKF, Central East Kunlun Fault; SEKF, Southern East Kunlun Fault; WQF, Wenquan Fault; Grt, Garnet; Pl, Plagioclase; Omp, Omphacite; Rt, Rutile; Hb, Hornblende.

(omphacite+garnet+rutile). The edge of the garnet develops needle-like hornblende and particulate plagioclase symplectic corona texture, forming white eye rims.

(2) Zircon SHRIMP U-Pb dating of metamorphic zircons from eclogites constrains the timing of metamorphism as 433 Ma.

(3) The identification of the eclogite indicates that the Central East Kunlun Fault marks the zone of an Early Paleozoic HP metamorphic belt.

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