Twenty-five years of ultrahigh-pressure metamorphism and continental deep-subduction

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Because of its lower density than the oceanic crust, the continental crust was considered to be not subductable in the classic plate tectonics theory. However, this precept has been changed since discoveries of coesite as inclusions in minerals from metamorphic rocks of supracrustal origin. It was 25 years ago that metamorphic coesite was reported to occur in pyrope quartzites from the Dora-Maira Massif in Western Alps [1] and in eclogites from the Western Gneiss Region in Norway [2]. Five years later, coesite was reported to occur in eclogites from the Dabie orogen in China [3, 4]. It was reinforced by discoveries of diamond as micro-inclusions in garnet and zircon in gneisses and associated rocks from the Kokchetav Massif in Kazakhstan [5] and in garnet in marble-associated eclogite from the Dabie orogen in China [6]. The discoveries of coesite and diamond provide the petrological evidence that crustal rocks were subducted to mantle depths of at least 100 km and later exhumed to the surface by tectonic processes. As a consequence, the term ultrahigh-pressure (UHP) metamorphism is coined with reference to those rock types that were formed or embedded in shallow levels of the continental or oceanic lithosphere and subsequently experienced P-T conditions within or above the lower limits of the coesite stability field. Since then, about 25 terranes with metamorphic coesite and diamonds have been reported on the earth. The P-T diagrams of metamorphic conditions in continental subduction zones have been extended to 2.8-4.0 GPa, corresponding to burial depths of about 100-140 km. While almost all disciplines of solid earth sciences in the world have been affected as a result of these studies, the development of China earth sciences has particularly benefited from intensive studies of UHP metamorphism and continental deep-subduction [7]. So far there are 6 terranes in China to contain metamorphic coesite and diamond, with tectonic settings varying from oceanic seduction to continental collision [8]. Among these terranes the Dabie and Sulu orogens have been studied most comprehensively on twelve aspects of continental subduction and exhumation [9], presenting a type example dealing with the geodynamics of continental subduction zones.

[1] Chopin (1984) *CMP* **86**, 107–118. [2] Smith (1984) *Nature* **310**, 641–644. [3] Okay *et al.* (1989) *EJM* **1**, 595–598. [4] Wang *et al.* (1989) *Geology* **17**, 1085–1088. [5] Sobolev & Shatsky (1990) *Nature* **343**, 742–746. [6] Xu *et al.* (1992) *Science* **256**, 80–82. [7] Zheng (2009) *CSB* **54**, 4266–4270. [8] Zheng *et al.* (2009) *CSB* **54**, 2549–2555. [9] Zheng (2008) *CSB* **53**, 3081–3104.

Geochronology and Hf isotopic composition of mafic dykes in Qinling orogen, central China

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The Qinling orogen is sandwiched between North and South China blocks. In which, numerous mafic dykes are outcropped in the Early Palaeozoic meta-sedimentary rocks of the South Qinling belt.

The mafic dykes are diabases. The analysis for the diabases yield a weighted mean $^{206}Pb/^{238}U$ age of 433.3 ± 0.98 Ma and a $^{40}Ar/^{39}Ar$ plateau age of 431.10 ± 4.92 Ma, consistent with the forming age of 431.10 ± 3.03 Ma from the mafic volcanics in the South Qinling [1], indicating an important mafic magmatic event in Qinling orogen during early Silurian.

The ε_{Hf} (t) of the zircons from diabases ranges from +1.25 to +7.87. Based on their OIB-like characteristics [2] and combined new Hf isotopic data with previously published isotopic data [3] from the South Qinling, the mantle source shows a mixture of the DMM and EMII, HIMU as well as minor EMI end members, being resulted from the subducted oceanic crust and terrigenous sediment recycled into depleted mantle. Furthermore, because of long-term consentaneous mantle of South Qinling from Neoproterozoic to Early Paleaozoic, we suggest that the diabases had been formed in a rift environment trigged by the plume activity and derived from the depleted mantle mixed by ancient subducted oceanic crust and continental margin sediments along the northern margin of Yangtze block in the Early Neoproterozoic.

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[1] Huang *et al.* (1992) *Acta Petrologica Sinica* **8**, 243–256.
[2] Zhang *et al.* (2003) *Science in China (D)* **46**, 1292–1306.
[3] Zhang *et al.* (2007) *Science in China (D)* **50**, 1293–1301.