Geochronological evidence for the *in situ* tectonic relationship in the Dabie UHP metamorphic terrane, Central China

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The Dabie Mountains and the Su-Lu region in central China are known to contain the largest distribution of ultrahigh pressure metamorphic (UHPM) rocks in the world. They are parts of the Qinling-Dabie orogen formed by collision between the Sino-Korean and Yangtse cratons. The preservation of UHP minerals has inspired different models to explain the deep subduction of continental crust and the mechanisms for subsequent unroofing of the UHPM rocks. In the absence of good constraints from geochemical, isotopic and age data for different lithotectonic units, numerous tectonic models have been proposed. It appears that the greatest controversy to date concerns the primary age and the nature of eclogite protoliths, their tectonic relation with the associated ultramafic rocks and enclosing granitic gneisses ('in situ' *vs* 'foreign' hypothesis), the areal extent of the UHPM rocks, and their mode of exhumation.

Here we report new geochemical and Sr-Nd for the host gneisses of the largest coesite-bearing eclogite body in this terranne - the Bixiling Complex. These data will be used to tackle the problem of eclogite-gneiss tectonic relationship. The Bixiling Complex has well preserved its UHP paragenesis of which coesite and quartz pseudomorph occur as inclusions within garnet or omphacite. In contrast, the host gneisses exhibit a typical phase assemblage of the albite-epidote amphibolite facies (plagioclase + biotite + zoisite + K-feldspar + quartz + muscovite + apatite) corresponding to the retrograde metamorphism of the Bixiling Complex. However, the presence of garnet, though very minor in amount, may suggest a previous higher metamorphic condition. The country rocks are paragneisses or orthogneisses of TTG composition (tonalite-trondhjemite-granodiorite). They are all characterized by negative Ti, P, Ta and Nb anomalies in their spidergrams, hence suggesting their protolith formation in ancient arc environments. Much of the protoliths of the gneisses from the Dabie UHP terrane was probably formed in late Proterozoic (750–800 Ma; Ames *et al.*, 1996; Rowley *et al.*, 1997; Hacker *et al.*, 1998). However, there is indication of older protoliths from Sm-Nd model age (T_{DM}) data for gneisses from Shuanhe (Chen and Jahn, 1998). The Bixiling gneisses have T_{DM} of 1.3 to 1.5 Ga, and ε_{Nd}(800 Ma) = +4.2 $\pm$ 0.4 , indicating their late Proterozoic formation and juvenile character.

Geochronological constraints are obviously essential for understanding the gneiss-eclogite tectonic relationship. Rb-Sr isotope analyses of whole-rock and constituent phases for five gneisses yielded a tight range of Ms-WR-Zo isochron ages from 194 to 198 Ma, and Bt-Zo isochron ages from 170 to 184 Ma (Fig. 1 and 2). On face values, the Ms Rb-Sr ages are only slightly younger than the Phg-WR Rb-Sr ages obtained on the coesite-bearing eclogite from the Bixling Complex (Fig. 3; 198 to 223 Ma; Chavagnac and Jahn, 1996). Moreover, the Bt Rb-Sr ages are also in agreement with that of an amphibolite near the Bixiling Complex. Thus, when combined the new age information with the published zircon age data (Ames *et al.*, 1996;

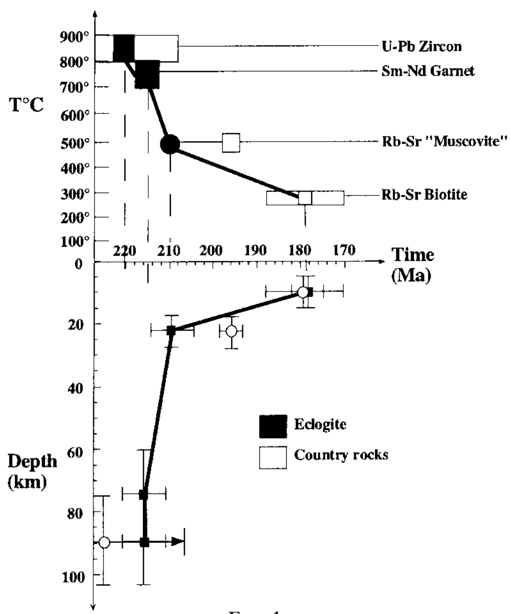

FIG. 1.

Rowley *et al.*, 1997; Hacker *et al.*, 1998), the eclogites and their host gneisses appear to have undergone a similar metamorphic history. Further age dating by Ar-Ar on Bt and Ms and fission tracks on Ap from the same samples are being carried out. The exhumation and cooling rates of the gneisses and enclosed Bixiling eclogite complex will be better evaluated by the combination of different isotopic ages.

References

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