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## The Key Influence of Fluid in Metamorphic Rock Preserves, Mineral Assemblages, Compositions and Structures: Study from High-Pressure Eclogite and Its Amphibolization in the Western Dabie Mountains, Central China

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The most of high/ultrahigh-pressure (HP/UHP) terranes of the world are characterized by the occurrence of numerous pods, lenses or layered blocks of eclogite and amphibolites (e.g. O'Brien, 1997; Elvevold and Gilotti, 2000; Zhang et al., 2003; and references there in). Field and petrological features suggest that amphibolites should

have retrograded from eclogites (Zhang and Liou, 1994; Eide and Liou, 2000; Song et al., 2003; Liu et al., 2004), but the textural evidence of transformation from eclogite to amphibolite has not been observed from most of them.

Pseudosection modeling for the garnet amphibolite samples (Fig.1) from the Western Dabie Mountains show

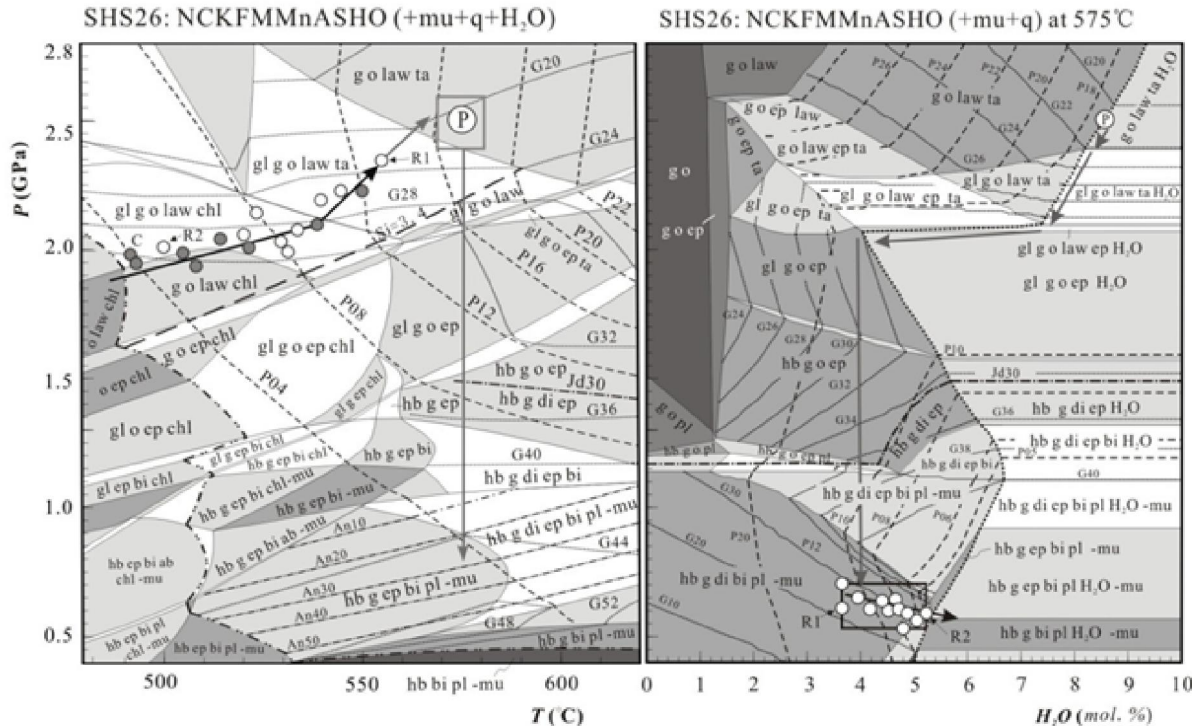


Fig.1 P-T pseudosection for garnet amphibolite sample SHS26 from the Western Dabie Mountains (modified after Lou et al., 2013). The di- and trivariant fields are unshaded, and for the higher variance fields, the darker the color is shaded the higher the variance is. The bold dotted line in right picture refers to the water saturation line. Projection of the garnet core-mantle and rim compositions is shown as dark and white circles. The bold and dashed arrow lines represent the metamorphic paths determined by garnet compositions. The point P refers to the probable peak P-T.

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they have experienced similar HP metamorphic evolution with that of the adjacent eclogites (Fig.2). The common assemblage of the garnet amphibolite stage involves garnet, hornblende, epidote, plagioclase (albite) and quartz, with or without biotite and muscovite. The different size of the mineral grains and the compositions show that garnet amphibolite has not reached equilibrium conditions. Like the grains that grew prior to omphacite and barroisite in the matrix they have been transformed into symplectite, composed of hornblende and albite. The pargasite corona or hornblende+plagioclase±epidote reaction rim grows around garnet. The garnet preserves the growth zonation like that in eclogite, and the embayed rim composition like the rim of garnet in eclogite, but has lower pyrope-contents, representing stronger modified metamorphism. On the pseudosections, the garnet rim compositions, within garnet amphibolite, plots in the H<sub>2</sub>O-undersaturated fields indicate the *P-T* range of 0.5-0.8 GPa at 500-580°C. With the development of the retrograde path, the garnet within the rocks is finally consumed (< 0.5 GPa), while the size of mineral grains of the rock becomes equal and turns into epidote amphibolites (Lou et al., 2009, 2013).

Phase calculation shows that fluid plays an important role during the preservation of the HP eclogites and its retrogradation to amphibolites. All pyrope containing garnet rims in garnet amphibolite reflect the H<sub>2</sub>O-

undersaturated conditions, but the compositional change reflects even higher water-contents than that in eclogites. The lowest pyrope-content garnet rim, in garnet amphibolite, may have reached or come near equilibrium conditions with the minerals in matrix (Fig.1).

Thus, we can conclude that within the low and middle crust the preservation of eclogite, which still preserves the HP/UHP mineral assemblages, compositions and structures, is controlled by H<sub>2</sub>O-undersaturated conditions. The transformation from eclogite to amphibolite in many HP/UHP terranes of the world, implies H<sub>2</sub>O-undersaturated conditions and hydration by the external fluid influx. Under H<sub>2</sub>O-undersaturated conditions, metamorphic reactions hardly reach equilibrium condition. Therefore, the mineral assemblages and compositions of eclogite and garnet amphibolite can often reflect multistage metamorphism and disequilibrium structures.

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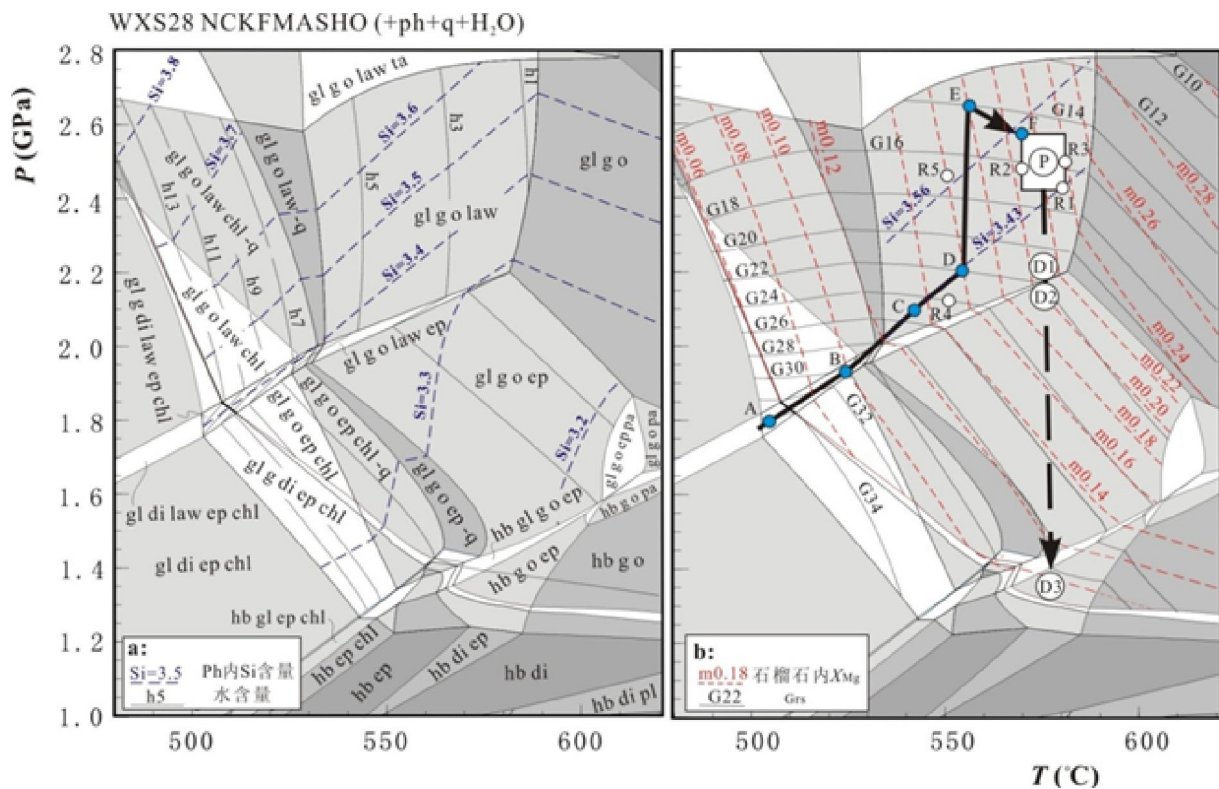


Fig. 2 *P-T* pseudosection for glaucophane-bearing hornblende eclogite sample WXS28 from the Western Dabie Mountains (modified after Lou et al., 2009).

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