Partial melting of bimineralic eclogite by clinopyroxene breakdown

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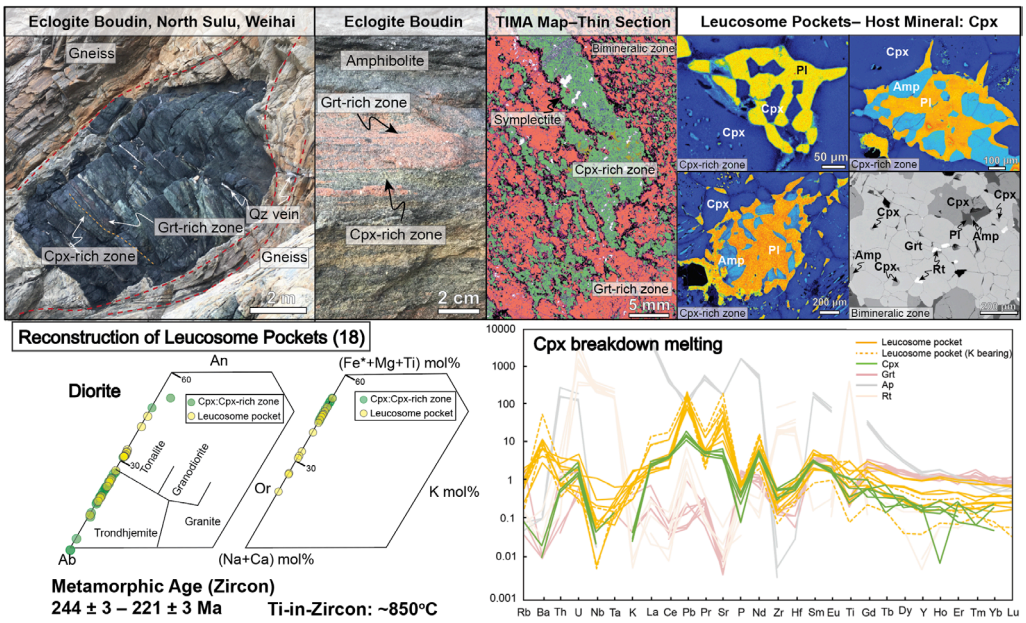
Partial melting of eclogite is a key to understanding fluid-melt evolution in subduction zones and the dynamics of subduction and exhumation. In the Sulu belt, during early exhumation, intergranular solute-rich supercritical fluid or melt commonly formed by dehydroxylation of nominally anhydrous minerals in eclogite, before partial melting by breakdown of phengite and/or omphacite at lower P-T conditions. However, whether anhydrous bimineralic eclogite can melt is unclear due to a lack of direct evidence and a generally low bulk water content. Here we report the first natural case of partially melting in bimineralic eclogite from a basic boudin in gneisses from Weihai, north Sulu. The eclogite preserves micrometer-scale intergranular leucosome pockets consisting of Ca-rich amphibole and Ca-rich plagioclase. The calculated bulk-rock composition of the leucosome pockets is diorite, with trace element patterns that are consistent with an origin by decomposition of dominantly clinopyroxene. We propose that partial melting of bimineralic eclogite by the breakdown of dominantly clinopyroxene may be a common process during exhumation of UHP terranes, probably triggered by the release of structural water by dehydroxylation during decompression.



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