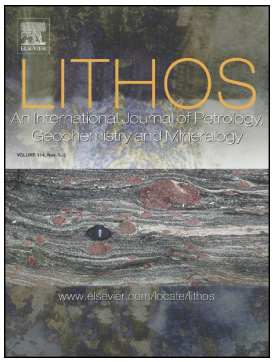

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Three types of element fluxes from metabasite into peridotite in analogue experiments: insights into subduction-zone processes

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A B S T R A C T

Piston-cylinder experiments with natural rocks and mineral separates were carried out at 750-900 ^{o}C and 2.9 GPa, conditions relevant to hot subduction zones, to study the mechanisms of metasomatic alteration of mantle-wedge rocks such as dunite and lherzolite, and the transfer of trace elements released from a carbonate-bearing amphibolite during its eclogitization. Element transfer from the slab to the mantle lithologies occurred in porous-, focused- and diffusive-flow regimes that remove melt and carbon, and partially water, from the metabasite layer. Porous flow is recorded by dissolution of clinopyroxene and growth of orthopyroxene ± garnet ± magnesite ± chlorite along grain boundaries in the peridotite layers, but is invisible in the metabasite layers. Porous flow of the same fluids/melts produces harzburgite mineralogy in both dunite and lherzolite. The transformation of lherzolite to harzburgite reflects breakdown of clinopyroxene in the lherzolite and diffusion of the liberated calcium into the metabasite layer, i.e. against the direction of major fluid/melt flow. Focused flow develops along the side walls of the capsules, producing a melt-free omphacite ± phengite ± quartz paragenesis in the metabasite, and melt segregations, separated from the host peridotite layers by newly-formed omphacite ± garnet ± phlogopite + orthopyroxene + magnesite. Diffusive flow leads to the formation of orthopyroxene ± magnesite ± garnet reaction zones at the metabasite-peridotite interface and some melt-peridotite interfaces.

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