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Crust-to-mantle fluid cycling, the origin of dolomite-peridotite and implications for carbonatite sources: the Ulten Zone case

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Petrological studies in the Variscan Ulten Zone [1], a high-grade basement containing lenses of mantle wedge peridotite, indicate that C-O-H fluids interacted with peridotites at different depths within the wedge. Two major metasomatic stages have been recognized: a high-pressure stage (about 2.5 GPa, 850–900 °C) produced garnet-amphibole ± dolomite peridotites whereas a low-pressure event (1.5–1.8 GPa, T < 700-750 °C) generated spinel-chlorite-amphibole ± dolomite peridotites. The trace element composition of metasomatic amphibole and dolomite is characterised by large ion lithophile elements and light rare earth elements enrichment over other incompatible elements. This geochemical fingerprint is related to the flow of crust-derived, CO2-bearing aqueous fluids into the mantle. In the case of the high-pressure garnet-amphibole peridotites, the fluid was extracted by an early hydrous silicate melts derived from the subducted continental crust [2,3], which attained high-grade conditions and anatexis through the consumption of white mica. Conversely, in the case of the low-pressure peridotites the subducting crust was possibly not hot enough to produce anatectic hydrous granitic melts. In this situation, CO2-bearing metasomatic fluids were sourced from the devolatilization reactions consuming white mica from the metapelitic crust. Dolomite formation in the UZ peridotite is thus best explained by C recycling via subduction fluids at different depths, from relatively deep levels (about 75 km, high-pressure peridotites) up to shallow and cool conditions (< 45 km, low-pressure peridotites). If dolomite-bearing peridotites like those from the Ulten Zone are involved in a new subduction zone into deeper parts of the lithosphere they would be a potential source of carbonatite and/or carbon silicate melts, thus recycling the crust-derived carbon into new metasomatic liquids.

[1] Sapienza GT, Scambelluri M, Braga R (2009) Contrib Mineral Petrol 158:401–420
[2] Rampone E, Morten L (2001) J Petrol 42:207–219
[3] Scambelluri M, Hermann J, Morten L, Rampone (2006) Contrib Mineral Petrol 151:372– 394