CO2 released from carbonated eclogites during their exhumation

JIANJIANG ZHU[1], LIFEI ZHANG[1*], YINGWEI FEI[12] AND RENBIAO TAO[1]

[1]School of Earth and Space Sciences, Peking University, Beijing100871, China. (*correspondence: Lfzhang@pku.edu.cn)

[2]Geophysical Laboratory of Carnegie Institution of Washington, DC 20015, USA.

Carbon is transported into the mantle by subducting slab and returned to the surface by volcanic and metamorphic degassing. Carbon is thought to be released via fluid-induced dissolution of carbonate during subduction. However, carbon release during exhumation is poorly explored. Here we use C and O stable isotopes and thermodynamic models to investigate the fate of carbon in carbonated eclogite during their exhumation. We found a graphite rich vein in carbonated eclogite in South Tianshan, NW China. Graphite is widespread in the vein, occurring as small disseminated grains or as flaky aggregates. On the contrary, graphite is a minor phase in the host eclogite. The porphyroblastic garnet in the vein shows a core crowded with graphite and a rim almost free of graphite which may indicate the oxygen fugacity transformation during subduction and exhumation. Petrographic and phase equilibria modelling with pseudosections calculated using THERMOCALC in the MnNCKFMASHO-CO2 system for the coexisting host eclogite and vein eclogite suggest that the two rock types share similar P-T evolutional histories involving a decompression with heating from P_{max} to he T_{max} stage and a post-T_{max} decompression cooling stage. The dehydration metamorphism of carbonated eclogite may cause carbon dissolved in the fluid and converge to the vein. Carbon is reduced to graphite at reducing state during subduction, However, the formation of graphite is inhibited during exhumation as a result of increasing oxygen fugacity and cause CO2 release during exhumation.