Geophysical Research Abstracts
Vol. 16, EGU2014-7377-1, 2014
EGU General Assembly 2014


# Distinguishing metacarbonatites from marbles - Challenge from the carbonate-amphibolite-epidotite rock association in the Pelagonian zone (Greece)

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Carbonate rocks were found in association with amphibolites and epidotites in the greenschist- to amphibolite-facies metamorphic basement of the Pelagonian zone (Greece). The mafic rocks both include and are truncated by the carbonates, hinting to a cogenesis of siliceous and carbonatic magmas/fluids. The carbonates have an isotopic signature of $\delta$13C ranging from -5.18 to -5.56 (‰ vs. PDB) and of $\delta$18O from 10.68 to 11.59 (‰ vs. SMOW) giving them the geochemical characteristic of carbonatites (magmatic carbonates). Mafic rocks have high Nb and Ta concentrations, typical for alkaline basalts. Therefore, textural relationships and geochemical signals in both the silicate and carbonate rocks hint at a cogenetic, mantle origin. SHRIMP U-Pb zircon ages from a carbonate bearing amphibolite date the intrusion at 278 Ma (magmatic zircon cores), well before the metamorphic event at 118 Ma (metamorphic zircon rims).
However, the concentration of rare earth elements (REE) in the carbonates, amphibolites and apatites is lower than in typical carbonatites, probably because of the interaction with metamorphic fluids during the Cretaceous metamorphism. Since these low REE concentrations raise doubts regarding the carbonatitic origin, other processes altering the $\delta$13C have to be considered. Skarn metasomatism can fractionate the $\delta$13C in the carbonates to carbonatitic values, but the absence of a Cretaceous contact metamorphism speaks against that possibility leaving the suggestion that the carbonatite rock association sign the Permian opening of the Tethys Ocean in the eastern Mediterranean.