BLUESCHIST-FACIES METAMORPHISM & GEOCHEMISTRY OF METABASITES FROM UPPER TECTONIC UNIT IN LAVRION AREA (SE ATTICA, GREECE)

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The broad area of Lavreotiki peninsula is a part of the Attic-Cycladic crystalline complex. It consists of two tectonic units that underwent a HP/LT metamorphism of Tertiary age. The lower tectonic unit comprises a thick marble sequence intercalated with schists. The upper tectonic unit is mainly composed of phyllites, calc-schsits and quartzites. Metabasic bodies are tectonically mixed with the surrounding sediments. Primary volcanic features are observed in the metabasic rocks; i.e. porphyritic textures with clinopyroxene phenocrysts.
The mineral assemblage of the metabasites is: Ca-Amp + Na-Amp + Ab + Ep + Chl + Pmp ± Phg ± Bt ± Cpx ± Law ± Stp. Based on the dominant amphibole phase in the rock, the metabasites are divided into blueschists and greenschists. Blue amphibole has the composition of glaucophane to ferroglaucophane. Zoned blue amphiboles show an increase in Al^{IV} and Al^{VI} from the core to the rim and decrease in Al^{VI} at the outermost rim. Actinolitic inclusions in glaucophane, glaucophane inclusions in actinolite and zoned blue amphiboles record the prograde and retrograde path of metamorphism. Magmatic clinopyroxene is augite. Metamorphic clinopyroxene is omphacite to aegirine-augite with a jadeite component ranging from 23 to 35 mol%. Iron-rich pumpellyite (FeO = 9.19 - 12.58 wt%) coexist with iron-poor ones (FeO = 1.12 - 5.08 wt%). Lawsonite inclusions in epidote and albite show that the rocks passed from the lawsonite-blueschists to the epidote-blueschists field (EVANS, 1990). The composition of glaucophane, omphacite and phengite (Si = 3.65 a.p.f.u.) constrain minimum pressure of ~8 - 9 kbar for assumed temperature 300 - 350 °C.
The greenschists and blueschists have basaltic composition with subalkaline affinities and tholeitic character. Trace elements and REE contents indicate MORB environment for the protoliths. The greenschists have higher contents in MgO compared to the blueschists. TiO_2, Zr, Y, LREE and HREE show a positive, Al_2O_3, Ni and Cr a negative and V a positive and then a negative correlation trend with decreasing #Mg. Such correlations are expected during magmatic fractionation processes. Also, the #Mg shows that the more evolved compositions are enriched in REE compared to the less evolved ones, indicating fractionation of basaltic magmas rather than variable degrees of partial melting in the mantle source region or post-magmatic processes such as alteration or metamorphism.

References

EVANS, B. (1990): Phase relation of epidote-blueschists. Lithos, 25, 3-23.