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Melting relations of tholeiitic and calc-alkaline amphibolites from the Mabujina Complex, Caribbean Cretaceous paleoarc

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The Cretaceous Volcanic paleoarc of the northern Caribbean constitutes a good example to study the evolution of intra-oceanic island arc systems. Basaltic and andesitic magmatism is represented by the Mabujina amphibolite complex (central Cuba), which constitutes a deformed and metamorphosed (at 93-90 Ma.) lower part section of the arc and is intruded by post-metamorphic batholith-sized granitic bodies of calc-alkaline affinity (89-83 Ma.). Protolith ages of gneisses and amphibolites of the Mabujina complex displays ages from 133 to 93 Ma. The metabasites, are classified into three compositional groups: (1) basaltic amphibolite with tholeiitic affinity; (2) low-K andesitic amphibolite and (3) high-K andesitic amphibolite with calc-alkaline affinity. Phase equilibria of partial melting processes have been studied experimentally in order to test the capability of the arc rocks to get recycle into more silicic magmatims. Anhydrous and water-added melting experiments were carried out at 0.8 and 1.2 GPa on three representative samples of each of these groups. The results of this experimental study show that the melts obtained from low-K andesitic amphibolite display compositions from tonalite-granodiorite at 1000 ºC to trondhjemite at 900 ºC. The amount of FeO and MgO increases with temperature at constant pressure, and CaO increases with pressure in the three studied samples. The compositions of the melts obtained from water-added melting experiments are more enriched in CaO and more silicic that those in dry conditions at the same conditions. In general, from this experimental study it is possible to be concluded that cordilleran-type magmas in intraoceanic arcs can be produced by melting of the arc root due to the burial of the arc crust because melting is favored at high pressure within the garnet stability field.