Genetic linkage between calc-alkalic andesites and continental crusts: contributions from NE Japan

Yoshiyuki Tatsumi[1], Yoshihiko Tamura[1]

[1] IFREE, JAMSTEC

The occurrence of two types of andesites, calc-alkalic and tholeiitic, typifies magmatism in subdcution zones. Examination of geochemical characteristics of those andesites in the NE Japan arc and the bulk continental crusts reveals marked compositional similarity between calc-alkalic andesites and continental crusts. One of the principal mechanisms of calc-alkalic andesites, at least those on the NE Japan arc, is mixing of two magmas, having basaltic and felsic compositions and being derived from partial melting of the mantle and the basaltic crust, respectively. It may be thus suggested that this process would also have contributed greatly to continental crust formation. If this is the case, then the melting residue after extraction of felsic melts should be removed and delaminated from the initial crust in order to form 'andesitic' crust compositions. These processes are examined by geochemical modeling of dehydration, partial melting, and fluid-solid reactions, suggesting that such processes can explain both the major and trace element compositions of the andesitic bulk continental crust. Isotopic modeling further shows that an inferred pyroxenitic delaminated component produced at 3-4 Ga possesses Sr-Nd-Pb isotopic compositions similar to those of the EMI reservoir in the mantle. Continental crust formation and complementary accumulation of the EMI reservoir in the deep mantle may thus have taken place simultaneously in Archean subduction zones.