

## B/Nb and $\delta^{11}\text{B}$ Systematics in the Phlegrean Volcanic District (PVD) and Aeolian Islands (Relationship between Calc-alkaline and Potassic Orogenic Magmatism in Southern Italy)

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The PVD products were erupted through a continental crust in a region where the tectonic setting is unclear due to the recent evolution of the Tyrrhenian Sea. Several models, reflecting the complexity of the region, have been proposed in which the Central Campanian magmatism is considered: a) to be an extension of the Aeolian arc, a Mediterranean equivalent of Pacific arcs; b) to be distinct from Aeolian arc but still subduction related and c) not to be related to subduction. The  $\delta^{11}\text{B}$  and B-enrichment relative to incompatible immobile elements were determined on PVD products in order to investigate the role of subduction over the magma chemistry and to study the transition from calc-alkaline rocks of Aeolian Islands to the potassic orogenic magmatism of Stromboli and PVD (Campi Flegrei and Procida). The boron content of the Campi Flegrei lavas ranges from 22 to 77 ppm with the lowest values in the least evolved rocks; Procida samples display significantly lower B content in the range 4.6 to 11 ppm. Although B concentrations of the lavas are at the high end of the reported range for arc lavas, the B/immobile incompatible element ratios overlap the fields of OIB and MORB suggesting the absence of a clear subduction signature in these products. Similar B/Be ratios of 4-5 were observed by Morris et al. (1993) on historical lavas of Mt. Vesuvius, while B/Be ratio of Aeolian volcanics ranges between 5 and 18.  $\delta^{11}\text{B}$  measured on Campi Flegrei products varies in a narrow range (-6.8 to -10 permil), whereas Procida samples display higher  $\delta^{11}\text{B}$  of -3.6 to -5.4 permil.  $\delta^{11}\text{B}$  of Campi Flegrei are not correlated with B content as well as with B/immobile incompatible element ratios. On the other hand, considering the Campi Flegrei data set alone, the boron isotopic composition is negatively correlated with  $^{87}\text{Sr}/^{86}\text{Sr}$  ratios (the evolved products

of the Campanian Ignimbrite eruption and the trachybasalt of Minopoli 2 eruption represent the extremes of the observed range). This correlation suggests that mixing between these magmas occurred, in agreement with the hypothesis that residual portions of the Campanian Ignimbrite and Neapolitan Yellow Tuff magmas, present in a shallow reservoir, can mix with poorly evolved magmas that rise to the surface along the regional fault system.  $\delta^{11}\text{B}$  for the most mafic lavas of Aeolian Islands shows significant variations between -5.9 and +2.3 permil and it is positively correlated with mobile/immobile element ratios. Calc-alkaline lavas of western islands (Alicudi and Filicudi, back-arc) exhibit the lowest B contents, B/immobile ratios and  $\delta^{11}\text{B}$ . The source of these lavas closely resemble unmodified mantle and are inferred to have the least contribution of slab-derived materials. Progressively higher  $\delta^{11}\text{B}$  and ratios of fluid-mobile elements to Nb with distance eastward from Alicudi is indicative of increasing subduction contributions toward the volcanic front. Only the potassic lavas of Stromboli (and to a lesser extent the Vulcano ones) deviate from this pattern in having relatively low  $\delta^{11}\text{B}$  and B/immobile element ratios. The PVD data fall in the trend defined by Stromboli alkaline lavas strongly suggesting the involvement in their genesis of a component depleted in B with low  $\delta^{11}\text{B}$  and high  $^{87}\text{Sr}/^{86}\text{Sr}$ . This component is consistent with B-depleted lower continental crust as well as one or more "continental components" introduced in the mantle wedge after a B-loss due to metamorphism

Morris JD, Ryan JG & Leeman WP, *J. Volcanol. Geotherm. Res.*, **58**, 345-358, (1993).