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Evidences of Mantle Heterogeneity Beneath Spain from Post-Hercynian Magmatism in the Variscan Belt

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In the Iberian Peninsula continental collision occurred during the upper Devonian (Dallmeyer et al., 1997) but during the late-carboniferous an extensional tectonic regime prevailed (Doblas et al., 1994). Syn and post-collisional magmatism is represented mainly by large volume of granitic complexes and sporadic mafic magmas (Villasecca et al., 1998 and references therein). We aim to understand how mantle reservoir vary in response to changing geodynamics studying the most mafic magmas erupted during Permo-Carboniferous times in the Iberian peninsula. In the Iberian Variscan belt mafic magmatism occurred during post-collisional stage of the orogeny. Nb/Y ratio indicates that it encompasses sub-alkaline (Nb/Y < 0.7) and alkaline (Nb/Y > 2.8) magmas. Mafic magmas with intermediate Nb/Y ratio (0.8-1.4) were also discharged. The rocks are basalts (sub-alkaline and alkaline) and andesite (sub-alkaline). The alkaline magmas were erupted slightly later than the sub-alkaline magmas. Normalising the trace element concentrations of the basalts to the primordial mantle these have comparable degree enrichment except for the alkaline rocks. The low and intermediate Nb/Y basalts have high field strength element (HFSE) negative anomalies. Also for Sr and Ti negative concentration anomalies has been observed. These characteristics persist in the most mafic rocks with high MgO (> 7 wt%) and compatible elements (Cr> 400 ppm; Ni > 100 ppm) contents, indicating that they are not related to crustal contamination. Fractional crystallisation of feldspar seems not to influence the Sr concentration of the most mafic basalts. Thus the sub-alkaline basalts have geochemical characteristic of arc-related magmas as the plutonic complexes emplaced during the orogeny (e.g. Dias and Leterrier, 1994). The most mafic alkaline basalts do not have the negative anomalies of the calc-alkaline rocks and the normalised (to the primordial mantle) Nb and Sr concentrations are higher than that of crustal rocks. The trace elements characteristics of the alkaline basalts were inherited by their mantle source. The calc-alkaline basalts have similar incompatible/incompatible element ratios (e.g. Zr/Nb, Y/Nb) but they are different in the alkaline basalts. The Zr/Nb ratio of the calc-alkaline basalts is in the range of 16-19 whereas that of the alkaline basalts is 3. High Zr/Nb ratios are found in arc-related rocks (Pearce and Norry, 1979) and in MORB (Sun and McDonough, 1989) whereas low ratios are typical of rift-related alkaline rocks (Pearce and Norry, 1979). The ratios (Y/Nb)/(Zr/Nb) of the calc-alkaline and alkaline basalts are constant being 0.2 and 0.08-0.1 respectively. This indicates that the calc-alkaline basalts were generated from a different mantle source than that of the alkaline basalts. The mantle beneath the Iberian Peninsula is heterogeneous and geochemical data indicates that with time progressing and changing tectonic regime mantle reservoirs with different characteristics were melted.

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