Is slab-derived melt present beneath the southern Philippine arcs?

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Melt derived from melting of the basaltic portion of the subducted oceanic plate is enriched in Si and Na, and has high Sr/Y and La/Yb ratios. Such melt typically occurs in convergent margins where young, and thus still hot, oceanic slabs are being subducted and is called adakite. Commonly occurring with adakite lavas are rare high-Nb basalts (>20 ppm Nb), which are mafic medium-K to high-K calc-alkalic lavas that contain relatively higher amount of high field-strength elements (HFSEs) than typical arc lavas. The association of high-Nb basalts with adakites has been used to argue that the unusually high HFSE content of these basalts results from metasomatism of their mantle wedge source by slab-derived melt. Results of several regional studies [e.g., 1,2] suggest that melt derived from the subducted basaltic crust is present beneath the southern Philippines arcs because of the presence in the region of differentiated lavas with adakite-like chemical characteristics and basaltic lavas that are slightly enriched in Nb (~16 ppm Nb). However, results of more detailed investigations of individual volcanic centers in the southern Philippines [3,4] are inconsistent with this notion. Major and trace element modeling, combined with Sr, Nd, and Pb isotopic data, indicate that most of the differentiated lavas with adakite-like composition are produced by periodic injection of parental basaltic magmas into shallow magma chambers containing magmas undergoing fractional crystallization. The most likely source of parental arc magmas in the southern Philippines is the underlying mantle wedge metasomatized by a subduction component mainly derived from subducted sediments. Moreover, new geochemical and isotopic data for primitive, high-K calc-alkalic basalts that contain the highest HFSEs (~50 ppm Nb) among the southern Philippine arc lavas are distinctly different from those for seafloor basalts subducting directly into the source of the primitive high-K basalts. This makes it unlikely that the source of HFSE enrichment in southern Philippine arc lavas is the melt derived from the subducted seafloor basalt or metasomatism of the mantle wedge by such melt. The HFSE enrichment in southern Philippine arc lavas most likely results from melting of a geochemically enriched mantle component that appears to be ubiquitous in the western Pacific marginal basins.

Reference

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Cu and Zn transfer in an ecosystem impacted by pig manure : soil and soil solution data

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The aims of this project were to study the distribution of Copper and Zinc in the soil and the soil solution from an experimental field contaminated by pig manure. Numerous pig slurry applications were performed from 1991 to 1995 on the experimental field ‘SOLEPUR’ in Brittany (France). Two series of samples were obtained : (i) soil samples from 1991, 1996 and 1999 at three depth (0-20, 20-40 and 40-60 cm depth) and (ii) soil solution and soil samples collected in 2001.

Total Cu and Zn concentrations significantly between 1991 and 1996 in the two upper layers, 0-20 and 20-40 cm (Fig. 1a) but not in the bottom layer (40-60 cm). Since the stop of the slurry application (1995), metal concentration decreases in the surface layer. The distribution of Cu and Zn in the different soil compartments (exchangeable, organic matter, Fe and Al oxy-hydroxydes and acido-soluble) shows that metal ions are mainly associated to oxides prior the slurry application. After application, in addition to Cu and Zn geochemical background, Cu and Zn are associated to organic matter and sorbed on oxides.

Although the concentrations of Cu (Fig.1-b) and Zn in the soil solution are low, the concentrations versus depth of the two metals are not similar : unlike Zn , Cu is retained in the 20-40 layer. The calculated soil solution speciation of Cu and Zn show that 100% of Cu is bound to dissolved organic matter but 80% of Zn; the last 20% is in solution as free aquo-ion.

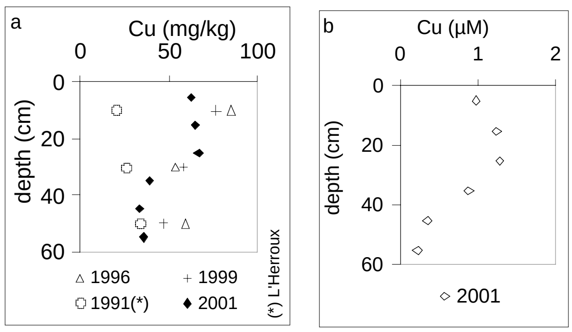

Figure 1 : a- Cu distribution in the soil; b- Cu concentration in the soil solution.

Reference

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