



Concentration and distribution of heavy metals in two Andisols of the Azuay Andes (Ecuador)

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At present many governmental and environmental bureaus are interested in establishing reliable soil quality criteria for heavy metals to enable the detection of polluted sites. To evaluate the variation of heavy metal natural concentration and to assess heavy metal contamination in soils, it is necessary to survey heavy metal baseline levels in order to understand their migration and distribution during pedogenesis. Many nationwide projects report elemental baseline values in soils. Baseline levels of heavy metals in soils have also been determined at local scales. Data is scarce on qualitative and quantitative trace elements content of Ecuadorian soils. The soils in the Azuay Andes (S of Ecuador) are thought to be generally non-contaminated. The objective of this study is to determine and evaluate the natural concentrations and distribution of seven heavy metals (Cd, Co, Cr, Cu, Ni, Pb and Zn) in Andisol of Azuay Andes. Soil samples were grounded in an agate mill prior to pseudototal heavy metal analysis. Cadmium, Co, Cr, Cu, Ni, Pb and Zn were determined by a masses spectrometer (MS-ICP) after aqua regia extraction according to ISO standard procedures. Soil particle size distribution, organic carbon, electrical conductivity and pH have been previously determined. Andisols are dominated by amorphous aluminium silicates and Al-organic complexes. The soils of volcanic area usually have an Ah-Bh-Bhs/Bw-C horizon sequence. The Ah horizon is dark-coloured and normally very high in organic matter, ranging from 6.4 to 15.2 %. A strong rise in pH upon addition of a fluoride solution is used to signal the presence of allophane. The pH usually rises to 10.5 bellow 20 cm. The range of total soil values in mgkg^{-1} is as follows: Cd (0.03-0.3), Co (0.8-5), Cr (7-15), Cu (9-25), Ni (2-4), Pb (11-41) and Zn (12-37). All heavy metal contents, except for Cd, are strongly correlated with pH. For the pseudototal fraction, there was significant difference between the soil horizons in regards to complex profile development.