



Concentration and distribution of Cr and Ni in soils of Talcahuano, Chile.

Pedro Tume (1), Elizabeth Gonzalez (2), Robert King (1), Manuel Alvarez (1), Nuria Roca (3), and Jaume Bech (3)

(1) Universidad Católica de la Santísima Concepción, Civil Engineering, Concepción, Chile (ptume@ucsc.cl), (2) Faculty of Sciences, Universidad Católica de la Santísima Concepción, Concepción, Chile., (3) Soil Science Laboratory, Faculty of Biology, University of Barcelona, Barcelona, Spain.

Urban soils can serve as a recipient for a large amount of trace elements from multiple sources, including, municipal wastes, vehicular emissions and industrial wastes. Several researchers have pointed out the need for a better understanding of urban soils in order to assist in developing strategies to protect urban environments and human health against the longterm accumulation of trace elements. The objectives of this study were to (1) define the background levels of chromium (Cr) and nickel (Ni) in soil of Talcahuano; (2) evaluate the site contaminated by trace metals. In this study, 140 soil plots (420 samples: TS:0-10 cm; SS:10-20 cm and BS:150 cm) located approximately in a 1 km regular grid covering the Talcahuano city (94 square km) have been examined. Soil samples (<2mm fraction) were analyzed by standard methods. Aqua regia digest (ISO 11466:2002) of Cr and Ni were analyzed by Atomic Absorption Spectrophotometry. The median concentrations (mg kg^{-1}) obtained include: Cr 134 (range 66.6 - 657) and Ni 56.1 (26.4 - 137). In weakly developed urban soils, Ni follows the same pattern without any real distinguishing features. Chromium displays slight surface enrichment (Cr content in topsoil (mg kg^{-1}): 145 ± 70 ; Cr content in basement (mg kg^{-1}): 138 ± 53). However, the differences are not significant. Different methods were evaluated in order to facilitate the best diagnosis of contamination. First, the trace metal geochemical background was determined using basic descriptive statistics. The upper limit (Upper Whisker value) of the background content in $\text{mg} \cdot \text{kg}^{-1}$ is 266 for Cr and 112 for Ni. Secondly, the basic descriptive statistics were then compared with Dutch guidelines, in order to evaluate whether the concentrations measured in soils were abnormally high or not. By comparing the results of the different methods, we estimate that 5% of the soils demonstrate anthropogenic signatures of Cr and Ni. The greatest enrichment anomalies in heavy metals were detected in top soil due to an unauthorized rubbish dump.