



## **Pedogeochemical mapping of Al, Ba, Pb, Ti and V in soils of the Barcelona Province (Catalonia, NE Spain): relationships with soil physico-chemical properties.**

J. Bech (1), F. Reverter (2), P. Tume (3), M. Sokolowska (4), P. Sanchez (2), L. Longan (1), J. Bech (5), M. Zhiyanski (4), A. Lansac (1), and M.T. Oliver (1)

(1) Soil Science Chair. Faculty of Biology. University of Barcelona, Avda. Diagonal 645 (08028) Barcelona, Spain. jbech@ub.edu, (2) Department of Statistics. Faculty of Biology. University of Barcelona. Avda Diagonal 645 (08028).Barcelona, Spain, (3) Facultad de Ingenieria.Universidad Católica de la Santísima Concepción.Casilla 297.Concepcion.Chile, (4) Forest Research Institute-BAS. 132 Kl. Ohridski Blvd. 1756 Sofia. Bulgaria, (5) Department of Astronomy and Meteorology. Faculty of Physics. University of Barcelona. Avda Diagonal 647 (08028), Barcelona, Spain

Pedogeochemical mapping is a useful tool for estimating the local background of potentially toxic elements (PTE), which is essential for environmental regulation.

The aim of this study is to estimate the levels and distribution of Al, Ba, Pb, Ti and V in surface soils of the Barcelona province (Catalonia, NE Spain) and their relationships with administrative-geographic districts, texture, pH, organic carbon and CaCO<sub>3</sub>.

The studied region has a surface area of 7731 Km<sup>2</sup>. The geology is varied: granites and Paleozoic shales predominate in SE-E. and Mesozoic and Cenozoic limestones, dolomites, marlstones, gypsum and sandstones in the remainder of the studied area. 319 top soil samples (0-20 cm) were collected at 5 km intervals on a regular grid, dried and sieved (2mm). General soil properties were analysed by standard methods. Aqua regia digests (DIN 38414-S7) of Al, Ba, Pb, Ti and V were determined by Inductively Coupled Plasma Spectrometry.

Statistical data treatment was carried out using SPSS 12.0 and Statgraphics Plus 5.1. We applied Exploratory Data Analysis (EDA) techniques to statistically describe the data.

The software used for mapping was ESRI's Arc View 9.0, Desktop version. Analytical data is represented using growing dot maps. The values of every mapped variable were grouped into a few cartographic classes in order to produce limited legends. The limits for the cartographic classes were chosen by the percentile method (5th, 25th, 50th, 75th, 90th, and 98th).

Some results are: Al mg kg<sup>-1</sup>min 4410.0, max 194786.0, mean 18145.6, sd 12112.1, med 16273.3 ; Ba mgkg<sup>-1</sup>min 7.32, max 1709.0, mean 128.4, sd 149.2, med 91.7; Pb mg kg<sup>-1</sup>min 2.76, max 485.7, mean 52.2, sd 46.3, med 46.0; Ti mg kg<sup>-1</sup>min 11.6, max 3540.0, mean 268.0, sd 421.6, med 132.2, and V mg kg<sup>-1</sup>min 2.15, max 289.2, mean 31.4, sd 25.7, med 26.0. .

The highest mean value of Ba (328mgkg<sup>-1</sup>), Pb (139.6 mgkg<sup>-1</sup>) and V (54.7 mgkg<sup>-1</sup>) corresponds to the Barcelonés district with mainly urban soils. The Al contents have a pedogenic influence (it is essential component of clay minerals). The highest mean value (27016.7 mgkg<sup>-1</sup>) is found in the Garraf district, with abundant Luvisols located in karst sinkholes and dolines.

The Ti concentration depends mainly of geogenic influence, thus the highest mean value (1048.5 mgkg<sup>-1</sup>) is found in the Maresme district, over an granitic batholite.

The maximum mean contents of Ba, Pb, and V versus pH are reached at pH 5-5.5 and the maximum of Al and Ti are reached at pH <5.

The maximum mean contents of Ba, Pb and V versus Organic Carbon are reached at % OC > 11.7 and the Al at % OC 4-6.3 and Ti at % OC < 0.4.