



“Gheorghe Asachi” Technical University of Iasi, Romania



HEAVY METALS MOBILITY IN EXPERIMENTAL DISTURBED AND UNDISTURBED ACID SOIL COLUMNS IN SPANISH PYRENEES

Delia Rodríguez-Oroz, Esther Lasheras*, Janire Aldabe, David Elustondo, Jesús Miguel Santamaría, Jordi Garrigó

LICA, Laboratorio Integrado de Calidad Ambiental, Department of Chemistry and Soil Science, University of Navarra, Pamplona 31080, Spain

Abstract

In this study we explore the processes of sorption and mobility in experimental soil columns in order to assess the response of natural soils to a hypothetical increase of pollution. The soils were sampled in a forest catchment situated in the Bertiz Natural Park at the western end of the Pyrenees. 21 columns, reproducing 21 soil profiles, were treated with a solution of heavy metals four times more concentrated than under actual conditions of deposition. An undisturbed soil column was tested simultaneously. The competition between cations and the content of clay and oxi-hydroxide compounds in the soils were the main factors determining the mobility of metals along with the influence of temperature. Calculated distribution coefficients show retention of Cr^{3+} , Cu^{2+} , and As^{5+} , and in a lesser extent of Pb^{2+} and leaching of Mn^{2+} , Zn^{2+} , Cd^{2+} and Ni^{2+} . Consequently, Mn^{2+} and Zn^{2+} have a greater tendency to contribute to groundwater pollution, whereas Cr^{3+} and Cu^{2+} are more likely to remain on soil surface. In undisturbed soil column, Ni^{2+} and Zn^{2+} were preferably sorbed onto dissolved organic matter (DOC), and the sorption of Mn^{2+} , Cu^{2+} and Zn^{2+} was controlled by the ambient temperature. The simulation shows the presence of weakly sorbed metals and of others clearly desorbed (Ni^{2+} , Cd^{2+} and Pb^{2+}), which suggests that in the near future they will reach groundwater becoming a risk for its quality and for the biota. This kind of experiments in disturbed soils did not prove to be successful, hence their analysis in undisturbed soils is suggested.

Key words: distribution coefficients, heavy metal, pollution, Pyrenees, soil columns

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* Author to whom all correspondence should be addressed: E-mail: elasheras@unav.es; Phone: +0034 948425600 ext. 803326; Fax: +0034 948425649