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Mobility of major- and minor- element and trace metals in soil solutions: distribution, speciation and controlling factors

A. Pelfrêne, N. Gassama and D. Grimaud

Laboratoire GéEAC, UPRES EA 2100, Faculté des Sciences et Techniques, Université François Rabelais, Parc de Grandmont, 37200 Tours, France
(aurelie.pelfrene@etu.univ-tours.fr)

The behaviour of trace metals linked to human activity in soils have been largely discussed by various authors. Potentially toxic trace elements are naturally present in unpolluted soils (in solid and solute phases). The study of trace metals distribution in this kind of soil could provide a lot of information on mechanisms regulating their mobility and their speciation. Indeed, conclusion about their bioavailability and toxicity depend on the determination of the different chemical forms of trace metals i.e. their speciation. The aim of this study is to determine the physico-chemical characteristics of subsurface waters circulating in an unpolluted soil. Soil solutions were collected in a concretion-rich horizon (Fe- and Mn- oxihydroxides) in order to assess its impact on solution composition.

The study area is located on the Aigurande plateau in the northern part of the Massif Central (France). The substratum is composed of a Paleozoic gneiss and intrusive granitic rocks. Three water sampling sites were chosen according to topographical characteristics. For each site, two piezometers were placed: above and in the concretion-rich horizon. Sampling was made from 2004 to 2006 during the soil saturation period (i.e. from november to may).

Data were obtained using usual analytical techniques allowing to make a global assessment of the distribution of major- and minor-element and trace metals in soil solutions. The results allowed us to underline different trace elements behaviours: solide-solute interactions and redox reactions. Voltammetry and potentiometry data give evidence about relationships between trace metals, organic matter and soil compounds.

Using thermodynamic database, the ongoing study will provide new data on trace elements speciation in soil solutions.