Impact of a zinc processing factory on surrounding surficial soil contamination

David Dumoulin[1], Ludovic Lesven*[1], Nicolas Proix[2], Hélène Frérot[3], Maxime Pauwels[3], Pierre Saumitou-Laprade[3], and Gabriel Billon[1]

[1]LAboratoire de Spectrochimie Infrarouge et Raman (LASIR) – CNRS : UMR8516, Université Lille I - Sciences et technologies – Bâtiment C8 59655 Villeneuve d'Ascq Cedex, France

[2]INRA Arras (INRA) – Institut National de la Recherche Agronomique - INRA (FRANCE) – Laboratoire d'Analyses des Sols, 273, rue de Cambrai, 62000 Arras, France, France

[3]Laboratoire Evolution, Ecologie et Paléontologie (EEP) – Université Lille I - Sciences et technologies, CNRS : UMR8198 – Université Lille 1, 59655 Villeneuve d'Ascq, France

Abstract

Zn smelting plants located at Auby (Northern France) for more than 100 years have strongly polluted the surroundings through dust emissions, storage of ores and slag without strong environmental concerns. Although highly contaminated surficial soils have been removed in the private and public gardens to safeguard at least partly health of the inhabitants, one small public area, called the Peru Park, has not been treated because of the presence of peculiar calamine grasslands. Our investigations in the soils of this park clearly evidenced a very strong contamination by several metals with great variations because some small areas were treated allowing recreational activities. The maximal total values measured were: 21000 mg kg-1 for Zn, 3500 mg kg-1 for Pb and 160 mg kg-1 for Cd. Additionally, the mobility of these metals is important in soils and increases with the pollution level. In the pore waters of strongly polluted zones, our findings are more contrasted with high concentrations of free dissolved Zn (3.6-32 mg L-1) and to a lesser extent Cd (0.02-0.25 mg L-1), whereas dissolved Pb remains at low concentrations (0.0001-0.021 mg L-1) and is quite exclusively bound to humic substances. Finally, this study obviously underlines that this severe pollution and the high mobility of Zn and Cd could strongly impact the ground water quality (at least in the surficial aquifer) and the trophic chain present in this area.

Keywords: soil metal pollution zinc lead toxicity calamine grassland

*Speaker