AGU FALL MEETING
New Orleans, LA & Online Everywhere
13–17 December 2021

Supervised Learning to Quantify Metallic Content from Past Metallurgical Site Residues using Geoelectric Methods and Laboratory Measurements – NS31A-06

Itzel Isunza Manrique[1], David Caterina[1], Benoît Mignon[2], Frédéric Nguyen[1]

[1]Urban and Environmental Engineering, University of Liege, Belgium

[2]Centre Terre et Pierre, Belgium

Past metallurgical industries used to produce a large quantity of residues which were typically deposited in landfills or tailings ponds. While generally considered as waste and even a potential source of pollution, these residues may still contain resources that can be valorized and recovered by more recent extraction techniques. However, to assess the material recovery potential from such residues it is important to characterize them quantitatively. In this contribution we present the results of a geophysical survey conducted in a slag heap of a former iron and steel factory located in Belgium. The geophysical survey consisted in a 3D electrical resistivity tomography (ERT) and induced polarization (IP) acquisition followed by samples collection targeting the observed geophysical anomalies. Electrical properties of samples were first analyzed in laboratory columns and results compared with X-ray fluorescence analyses of major elements such as Fe, Mg, Al, Ca or Zn. The electrical properties and the metallic content measured in laboratory were then used to train a neural network. Finally, the trained network was implemented on the geophysical 3D ERT and IP models to predict the metallic content in the studied slag heap. Such an approach combining on-site geophysical data collection, targeted sampling, calibration of artificial intelligence tools and creation of resource distribution models represents a cost-effective way of estimating the economic potential of buried resources not only in the context of the study of former metallurgical sites.

NS31A - Geophysical Investigations for Environmental and Human Processes in the Near-Surface I Oral