



Optical study of soil samples contaminated by heavy metals from the São Domingos Mine (Mértola, Portugal)

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Abstract

The study of soils contaminated by heavy metals (HMs) is a hard task that implies the collecting of soil samples in an area representative of the contaminated space. For example, for water samples, the law requires the creation of a study grid with 5 ha spacing. Considering this spacing requirement, to the soil from the São Domingos Mine, that have an area of approximately 2000 ha, we need to collect 400 samples. This is an expensive task, but is necessary to quantify the contamination, and while recovery actions are being applied, more soil analysis is needed to control the evolution of the contamination.

In this frame, we present here the project INCOME (Instruments for managing areas contaminated by metals) that proposes the creation of an environmental management model for mining areas contaminated by HMs. This model integrates the results of the application of a set of analytical methods and instruments for monitoring contaminated areas, such as biophysical analyses, soil, and water chemistry, geophysics, and satellite hyperspectral remote sensing. The resulting dataset will be used as inputs to artificial intelligence (AI), aiming to create contamination models using less on field observations than the standard methodologies.

The optical characterization of the mining heap using satellite data available from the Copernicus program (EU Space Program) allows extracting information about the surface to make the correspondence with HMs.

As a step prior to studying the hyperspectral satellite data, it is necessary to carry out an optical study of soil samples collected at the site, using portable devices. The first results of the project, namely the identification of HMs spectral features within the collected samples, are presented and discussed.

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