Application of field spectroscopy and hyperspectral remote sensing to the detection and assessment metal-contaminated floodplains.

Metal contamination in floodplain soils can pose a serious threat to ecosystem health; assessing the level of potentially harmful elements (PHEs) (e.g. Pb, Zn, Cu, Cd) in a contaminated soil is therefore essential in order to prioritize soil remediation strategies and to reduce the risk of exposure via animal/human food chains. However, PHEs are often spread over large geographical areas, especially if they have been dispersed by rivers and then stored in floodplains. Traditionally, geochemical mapping of floodplains has been undertaken using a targeted soil sampling approach with subsequent wet chemistry analysis to determine metal levels. However, recent technological advances in hyperspectral remote sensing now afford the opportunity to undertake assessments over large areas in a rapid and cost-effective way.

The aim of this project is to assess the role of field spectroscopy and hyperspectral remote sensing imagery in the detection of PHEs in floodplain soils, and to develop a generic methodological protocol for large-scale mapping of contaminated floodplains. There are three specific objectives: ***First,*** to construct a spectral library by acquiring field-based hyperspectral data and soil-geochemical data. ***Second,*** to perform a spectral discrimination analysis of the reflectance spectra to identify the specific wavelengths/spectral-regions associated to PHE detection. ***Third,*** to explore the capability of hyperspectral Earth Observation (EO) imagery – either unmanned airborne vehicles (UAV) or satellite platform – in identifying and mapping floodplain soil contamination. As part of this project, advanced image analysis techniques will be implemented to explore the detection of the spectral variability response among the PHE components, including both parametric and non-parametric methods.