

## **Exploring remote sensing as a cost effective tool to monitor contamination of mangrove wetlands**

Johannes H. Schellekens and Fernando Gilbes-Santaella

Department of Geology, University of Puerto Rico at Mayagüez, PO Box 9017,  
Mayagüez, PR 00681

Spaceborne and airborne remote sensing allows a synoptic view of large areas of the Earth's surface in a cost effective way. It has been successfully applied to mineral exploration, where metals in the substrate affect the spectral response of the vegetation growing on chemical anomalies. A structural response of vegetation to chemical anomalies is the physiological change in pigment concentration, especially chlorophyll. This study aims to investigate whether the changes in pigment synthesis can be used to discern metal contamination in mangrove wetlands. The health of mangrove wetlands is of critical importance for society, including coastal protection, wildlife refuge, and as nursery of marine life. A remote sensing technique to monitor metal contamination in mangroves will help law enforcement to visit these areas where possible contamination is suspected. During the first stage of the project a number of test sites were studied, including the Joyuda Lagoon with possible high Ni and Co in the substrate derived from the adjacent laterite, the Guayanilla Bay with reported mercury contamination, the Arecibo area in the drainage basin of the porphyry copper deposits, and the Guanica area as a possible pristine area. The study requires chemical analyses of the sediments and the leaves in the top of the canopy, followed by reflectance measurements of the leaves and comparison with digital images. A pilot study was performed to investigate whether metals were transported from the substrate into the red mangrove (*Rhizophora mangle*). Sediment samples were taken from the test sites and their content compared to the chemical compositions of the top leaves of red, black, and white mangroves. Reflectance spectra of leaves of red, black, and white mangroves were determined and NDVI calculated for the different trees. NDVI was determined from AVIRIS images and compared to the NDVI determined on the ground. Initial results show that not all metals are taken up by the plants to the same degree and reflectance spectra of mangroves leaves show a wider variability than expected in shape and magnitude.