Tracking industrial pollution

The precision of hyperspectral imagery makes it an effective tool for detecting pollutants and forecasting their dissemination, whether in the water, the air or the soil. The evaluation methods developed can be useful for rehabilitating abandoned industrial sites. Hyperspectral data also make it possible to provide private companies with precise information in real time on harmful industrial emissions, enabling managers to take the necessary measures to protect human health while also optimising the use of infrastructures.

MINPACT

Assessing environmental damage

Assessing health and environmental risks caused by mining and industrial pollution requires an accurate determination of the pollutants at work. As existing methods of assessing this pollution are both imperfect and generally costly, hyperspectral imagery presents an interesting venue worthy of exploration. The MINPACT project sought to do so, characterising pollution mechanisms at work at test sites and focusing on soil contamination, the deposit of polluted dust and vegetation stress. It looked at the Meuse Valley, near Liege, the site of waste products and residues originated from major chemical and ironworks plants as well as historical contamination at abandoned mines or coking plants. The pollutants present are very complex and varied, including heavy metals, cyanide, volatile organic compounds, and mineral oils. Although correlations proved difficult to establish between the hyperspectral measurements and precise pollutant concentrations, significant results were obtained in detecting industrial dust deposits in the Meuse basin in the area of Liege. As Eastern Europe faces particularly serious problems in this respect, the mining site of Rosia Poieni in Rumania was also the subject of a study using multispectral imagery. Affected mainly by the problem of acid mine drainage, processing showed it was possible to determine the extent of these acid water zones as well as the zones with weathered minerals. This study is an initial approach prior to the launch of a hyperspectral campaign.

Coordinators

- **Keyobs**
- **Département GeoMac, ULg**

Partner

- **Laboratoire de Toxicologie environnementale, FUSAGx**

WALMET

Help in rehabilitating mining sites

Unfortunately, the pollution caused by the mining of metal deposits is not limited to local surface pollution. Due to leaching and run-off, the polluted waters affect the soils and groundwater throughout the catchment area, with major consequences for the health of populations and for the environment. Both the industries themselves and the authorities need to draw up a reliable inventory if they are to improve and rehabilitate these sites. Although a problem all over the world, it is particularly present in Great Britain with its long history of mining. The WALMET project was concerned with a number of former lead mining sites in the Rheidol Valley in central Wales. By combining field analyses and hyperspectral imagery and using image processing techniques previously developed by a European project, the project sought to characterise the waste and mining residues and identify the extent of the pollution. Vegetation stress was identified thanks to measurements in the visible short wave infrared obtained by the HyMap sensor. The project result is a map of the contaminated areas drawn up more quickly and reliably than it is possible using geochemical field analyses.

Coordinator

- **Africa Museum**

Partner

- **British Geological Survey United Kingdom**

CONTAM

Detecting contamination by metals

The project assessed the pertinence of using data provided by the CASI-2 and SASI instruments to, on one hand, detect highly contaminated sites and roads covered with zinc ash, together with their geographical distribution, and on the other hand to determine the effects of this ground contamination by heavy metals on plant growth. The region studied is in northeast Belgium, between the municipalities of Balen and Lommel, home to non-ferrous metal industries. The area shows high concentrations of heavy metals such as cadmium, zinc, copper and lead caused by present or past industrial emissions and the composition of roads made of industrial by-products, such as zinc ash or lead slag. The SASI sensor proved suitable for the detection of vegetation subject to stress and, to a lesser extent, for quantitative road detection. Further studies will be necessary to establish a possible relationship between plant stress and the presence of heavy metals, as well as to apply the method on larger scales.

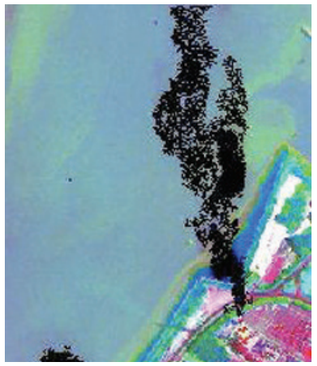
Coordinator

- **Milieumetingen, VITO**

Partner

- **Centrum voor Milieukunde, UHasselt**

TIRIS



Analysing the dispersal of gas pollutants

The port of Antwerp is home to the largest petrochemical complex in Europe. Four oil refineries jointly occupy almost 175 ha, refining and producing millions of tons of oil and chemical products a year, subsequently emitting into the atmosphere a gaseous plume bringing a mixture of pollutants to neighbouring urban areas. The project aims to detect the presence and concentrations of polluting gaseous compounds in the atmosphere on the basis of the hyperspectral data obtained in the medium and far infrared by the AHS sensor. Many chemical compounds have a spectral signature in these wavelengths. A number of image processing techniques were applied to try and detect a plume against a sometimes homogenous (vegetation, water surface) and sometimes heterogeneous background. A synoptical map of SO_2 concentrations was produced, detecting emissions of this colourless gas throughout the plume emitted from the emission chimney.

Coordinator

- **Signal and Image Centre, RMA**

Partners

- **VMM**
- **ONERA, France**