Monitoring mineral extraction and processing sites in the West and Southwest Romania by remote sensing-derived information and laboratory analyses

Vîjdea A.M.[1], Bindea G.[1], Zoran M.[2], Coltoi O.[1] and Dumitrica C.[1]

[1]Department of Geosciences, Environment and Geological Hazard, Geological Institute of Romania (IGR), 1 Caransebes St., RO-012271, Bucharest, Romania, tel:+40(0)213060429, anca.vijdea@igr.ro
[2]Environmental Remote Sensing Department, National Institute for Research and Development for Optoelectronics (INOE), 409 Atomistilor St., MG-5, RO-077125, Magurele, Ilfov, Romania, tel:+40(0)314050793, m.zoran@inoe.inoe.ro

Samples collected from eight mineral extracting and processing sites, representing commodities of different origin and in different environments (lignite, bituminous coal, porphyry copper and gold extraction mines, copper flotation, metallurgic waste dump), were analyzed in the laboratory for: mineralogy on thin sections, X ray diffraction (XRD), gamma spectrometry, density and spectral reflectance measurements. In sample locations, estimated ground reflectance spectra were extracted from Landsat-TM images, in order to verify the OH-FeOx anomalies, obtained by processing the satellite images with a methodology previously developed for mapping mining wastes at regional scale. The processed satellite images highlighted, by means of the extent and type of OH-FeOx anomalies, the area coverage of the deposited mined material and pointed out the modifications in time. Diagnostic spectral features given by iron ferric/ferrous ions, OH-metal and/or molecular water stay at the basis of the remote sensing OH-FeOx anomalies and the minerals which they indicated, were confirmed either by the microscopic observations on thin sections, or XRD, or both. A differentiation of the sites was performed by statistically analyzing the remote sensing anomalies and comparing with the results of the microscopic analyses and XRD.

Observations and modeling of moisture and decay patterns in stone monoliths in Southern England

Viles H.A., Eklund J., Hamilton A. and Hall C.

School of Geography and the Environment, OUCE, South Parks Road, Oxford, OX1 3QY, United Kingdom heather.viles@ouce.ox.ac.uk

Stone deteriorates as a result of a range of natural and human-induced processes, and such deterioration can be unsightly and costly, especially where it affects important stone monuments such as gravestones. Moisture is a fundamental influence on stone deterioration as it provides a medium for transport and reactions (chemical weathering), as an essential factor for micro-organism growth (biological weathering) and as cyclical changes of state (liquid/solid/gas) exert a key control on many physical weathering processes. Despite this importance, little is known about the patterns of moisture distribution and movement within stone, how they vary over time and how they may be correlated with the nature and severity of deterioration.

Commonwealth War Grave (CWG) stones are found widely across the UK and Europe, dating largely from the early to mid 20th century and provide a natural test of the variation of stone deterioration under different climatic and environmental conditions involving single blocks (monoliths) which are more amenable to modeling. We report here on results from a linked field experiment, modeling, and field survey-based study to investigate the nature and causes of moisture and decay patterns in relation to microclimatic and environmental conditions at two areas in southern England (Dorset and Oxfordshire). At each field experimental site 8 gravestones and similar sized Portland stone monoliths have been erected, and climatic and environmental monitoring equipment emplaced (automatic met stations, evaporation gauges, soil moisture probes, piezometers). A suite of novel non-invasive and non-destructive methods to investigate moisture regimes and the early stages of deterioration has been developed, including 2D resistivity surveys, hand-held moisture meters, Equotip