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

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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

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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

hardness testing and time-lapse photography. Such a field experiment approach provides an ideal way of testing links between climatic and environmental variables and stone deterioration and validating output from numerical modelling approaches (such as Hydrus, which has been used in this project). Further observations of moisture regimes and decay features have been made from CWG stones within cemeteries near our experimental sites.

Hand held resistivity and capacitance probe surveys, in conjunction with electrical resistance tomography, provide detailed, spatially-resolved data on moisture distributions which can be compared with mapping of the nature and severity of decay and monitoring of surface water patterns from time-lapse photography. Here we show direct evidence of damp conditions (both surficial and deep-seated) at the base and top of gravestones, associated with two types of deterioration, with a drier central area characterised by less weathered stone. Decay surveys indicate extensive surface damage within the upper parts of the gravestones, and considerably less damage below this.

The structural-metallogenic maps of ore districts of F.Y.R.O. Macedonia

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The metallogenic characteristics, tectonic setting, and structure of F.Y.R.O. Macedonian territory, Kozuf-Aridea and Kadica-Bucovic ore districts and its specific formation features are discussed in this paper on the basis of new results and data obtained by previous investigations. The interpretation of satellite images and morphostructural analyses were employed successfully for revealing the ore-concentrating structural features. The tectonic elements of the present-day topography were marked out and compared with the structural features that existed during the period of ore formation. The use of the present-day structural landforms of F.Y.R.O. Macedonia for reconstruction of the tectonic elements of ore-bearing periods became possible after substantiating their inherited evolution. The ring structure occupies a special position in southern F.Y.R.O. Macedonia and ore districts are controlled. Geological, geochemical, and morphostructural attributes allow interpretation of this structure as a center of long-term endogenous activity that evolved since the Jurassic-Cretaceous time.

Cretaceous magmatic evolution of the Srednogorie Zone (Bulgaria) and the continuous evolution into the Rhodopen Massif (Bulgaria, Greece)

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The Apuseni–Banat–Timok–Srednogorie (ABTS) belt of extensive calc-alkaline magmatism and Cu–Au mineralization is related to the subduction of the Tethys ocean beneath the European continental margin during the late Cretaceous time. Major economic porphyry-style and high-sulphidation ore deposits are restricted to certain segments along the belt and are aligned on the Panagyurishte corridor (Central Srednogorie) in Bulgaria and the Timok region in Serbia. The resent study reviews the geology, geochemistry and geochronology of igneous events in the Srednogorie/Timok Zone, some features of the related Cu-Au mineralization and the continuos magmatic evolution to the South (Rhodope Masif).