For one project area were used in addition to the simple heuristic method also a neural networks method to produce a susceptibility map. From the visual comparisons of the results can actually see any big differences. A comparison with the results of other methods shows only small differences exist, however, all validation results using artificial neural networks are slightly better than those using heuristic method.

However due to the random and selective available process data, there is a risk, that the generated susceptibility maps lead to good validation results. This means that the causes of the well-validated results are not clear and further developments are necessary.

Isotopic tracking of the Western Carpathians Hercynian granitic rocks sources

Kohút M.

Dionýz Štúr State Institute of Geology, Mlynská dolina 1, SK-817 04 Bratislava, Slovakia,milan.kohut@geology.sk

The present-day structure of the Western Carpathians was derived from Late Jurassic to Tertiary (Alpine) orogenic processes connected with the evolution of the Tethys Ocean, in a long mobile belt sandwiched between the stable North European Plate and continental fragments of African origin. A typical feature of this mobile belt is the presence of huge reworked slices of Hercynian crystalline basement within the Mesozoic and Cenozoic sedimentary successions that have been deformed into large-scale nappe structures. Granitic rocks of various origins form an important constituent of these basement fragments. The Hercynian granitic rocks were related to distinct sources and/or geotectonic position. They present spatially developed granitic suites from subduction-related I-type, through syn-collisional S-type to late- and post-orogenic A-type granites. The genesis and history of the local crust sampled by the granitoid rocks can be traced back to the Early Palaeozoic and/or Neoproterozoic times, consistent with a derivation from the north-Gondwanan margin. A complex study integrating petrological, geochemical and/or isotope data have been performed during last decades, resulting in distinguishing of following rock suites: *a)* the older sheared granitic rocks – orthogneisses (OG) with intrusive age 495–475 Ma; *b)* related mafic suite gabbros & diorites rocks (M-s) intrusive age 370 Ma; *c)* biotite granodiorite to hornblende-biotite tonalite (I-s) with intrusive age 365–355 Ma; *d)* two micas granodiorites to granites (S-s) intrusive age 360–350 Ma; *e)* biotite granodiorite to granite (A-s) intrusive age 270–260 Ma; and *f)* suite of specialised ore-bearing, biotite granodiorite to biotite-muscovite granite (S_s-s) intrusive age 265–250 Ma. The Sr isotopes with $^{87}Sr/^{86}Sr_{(i)}$ values 0.707–0.720 (OG), 0.702–0.706 (M-s), 0.704–0.709 (I-s), 0.706–0.714 (S-s), 0.705–0.709 (A-s), and 0.715–0.730 for S_s-suite suggest for significant crustal recycling and mantle related influence for mafic varieties of Carpathians granites. Similarly Nd isotopic characteristics with $\varepsilon Nd_{(i)}$ values -7.4 to -2.0 (OG), +0.9 to +5.8 (M-s), -2.8 to +2.2 (I-s), -7.0 to -1.3 (S-s), -3.1 to +1.9 (A-s), -4.4 to -0.2 (S_s-s) indicate recycling of vertically zoned lower and/or middle crust with significant contribution from basic metaigneous rocks. The stable isotopes with $\delta^{18}O_{SMOW}$ (in ‰) for OG = 11.0–11.7; M-s = 6.6–8.4; I-s = 7.6–9.9; S-s = 9.0–11.3; A-s = 7.8–8.0; and S_s-s = 9.9–11.5 together with $\delta^{34}S_{CDT}$ (in ‰) for M-s = +0.3 to +0.8; I-s = -2.9 to +2.6; S-s = -1.0 to +5.7; A-s = -2.0 to -0.7; and S_s-s = +4.5 suggest for mixed sources in metasedimentary and basic metaigneous rocks. The OG suite has δ^7Li = -4.5 to +1.6‰ indicating crustal source. Mafic rocks (gabbros and diorites), associated with several occurrences of granites, are uniformly Li-rich and isotopically light (δ^7Li = -0.5 ~ -3.7 ‰), precluding a direct derivation from the mantle, and require an explanation invoking an initial loss of original Li inventory, followed by a secondary enrichment in light Li via ingress of diffusing or percolating fluids. The Carpathian I-suite granites (δ^7Li = -1.2 to +0.5 ‰) are on average isotopically lighter and show minimal scatter pointing to a homogeneous meta-igneous source; the S-type granites on the other hand (δ^7Li = -3.2 to +7.0 ‰) testifying to highly variable meta-sedimentary/igneous precursors. The A-type granites are systematically heavier than the other types or even Earth's mantle (δ^7Li = +4.7 ~ +6.6 ‰), which could hint to a significant role of a material processed in a subduction event modified by slab-derived fluids. The S_S-suite of the ore-bearing granites with δ^7Li = -0.42 to +1.22 ‰ looks to have a metapelitic parentage. The zircon Hf isotope study of the Western Carpathians granitic and related rocks brings following average $\varepsilon Hf_{(t)}$ values: OG = -4.50 ±1.38 (*St.dev.*); M-s gabbro = +0.54 ±2.1; I-suite tonalites = -0.34 ±2.18; S-suite granites = -1.69 ±2.64; A-type granites = +0.55 ±1.65 indicating substantial crustal recycling and/or significant participation of mantle material as potential source for M-s, I-s, and A-s rocks types. Noteworthy, that mantle contribution to their genesis has rather character of melted mantle derived mafic lower crust than fresh input of mantle melt to the Devonian (Permian) subduction zone what suggest the Hf model ages of zircons from these rocks.

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Magnetic properties of soils around local pollution sources (Crete, Greece)

Kokinou E.

Department of Natural Resources and Environment, Technological Educational Institute Crete, 3 Romanou Str. Chalepa,Chania, Crete, GR 73133 - Greece, ekokinou@chania.teicrete.gr

The main scope of the present study is to investigate the spatial and vertical distribution of the magnetic susceptibility in an area of possible industrial pollution and heavy traffic. For this purpose, a power plant with a dense traffic net around it, located in the SE section of Chania city was selected as the investigated area. In the context of the present work magnetic susceptibility measurements have been contacted in two phases. Surface soil samples have been collected in 2008 from the area under investigation and they were analyzed in order to estimate the spatial distribution of the magnetic susceptibility. Loci of high values of magnetic susceptibility within the study area gave rise to further proceed to coring up to a depth of 120cm at selected sites of the study area. GIS techniques were used for mapping the magnetic measurements on the various topographic and geological features of the area. Maps were created through interpolation algorithms indicating the spatial distribution of the above measurements. Spatial tools and statistical analysis proved the correlation between magnetic properties and the terrain attributes. Both investigations indicate high values of the magnetic susceptibility especially in the eastern part of the investigated area and along the main traffic branch.

Application of skeletonization on geophysical images

Kokinou E.[1], Panagiotakis C.[2] and Sarris A.[3]

[1]Department of Natural Resources and Environment, Technological Educational Institute Crete, 3 Romanou Str. Chalepa, Chania, Crete, GR 73133 - Greece, ekokinou@chania.teicrete.gr
[2]Computer Science Department, University of Crete, P.O. Box 2208, Heraklion, Greece, cpanag@csd.uoc.gr
[3]Laboratory of Geophysical-Satellite Remote Sensing & Archaeo-enviroment, Institute for Mediterranean Studies, Foundation for Research & Technology - Hellas, P.O. Box 119, Rethymnon 74100, Crete, Greece, asaris@ret.forthnet.gr

Skeletonization has been a part of morphological image processing for a wide variety of applications. The skeleton is important for object representation in different topics, such as image retrieval and computer graphics, character/pattern recognition and analysis of biomedical images. The purpose of the present work is to apply a sequential skeletonization algorithm on geophysical images, resulting from shallow depth mapping of archaeological sites. The accurate identification of curvilinear structures in geophysical images plays an important role in geophysical interpretation and the detection of subsurface structures. Experimental results on real data show that skeletonization comprises an important tool in image interpretation.