Assessment of heavy metals concentrations in sediments of Bogdanas river at the Assiros-Lagadas area, Northern Greece

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Bogdanas river flows east of Thessaloniki in Northern Greece. Its sources are found at the western part of the Vertiskos mountain and flows along the Assiros and Lagada plane towards Koronia lake. In this study, variations of the heavy metal concentrations in Bogdanas river sediments have been evaluated. Sediment samples were collected at 8 representative sampling sites along the river, during two sampling periods. Chemical analysis indicated that the sediment samples show variable concentrations of heavy metals. Sediment quality assessment according to the limits determined by the European Community's legislation indicated that the river sediments were not contaminated, apart from 3 samples and 1 sample concerning Zn and Cu, respectively. On the other hand, sediment quality assessment according to the US EPA Sediment Quality Guidelines (SQG) revealed that there was heavy metal pollution with respect to especially Zn, Cu and Ni. Concerning Zn, only 1 sample is close to the EPA's moderately polluted level, while 10 samples surpass it and 5 samples exceed the EPA's heavily polluted level. Concerning Cu, 7 samples are classified as moderately polluted and 9 samples as heavily polluted. Finally, no pollution is defined for Ni, apart from 2 samples which are classified as moderately polluted. In conclusion, the research showed that the revealed heavy metal pollution is more attributed to the lithology of the area and less to human activity.

Morphotectonic analysis and branching for Mygdonia active fault system (Macedonia, N. Greece)

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The Mygdonia basin is considered to be of a rather moderate seismicity rate area, with strong earthquakes occasionally occurring and affecting the northern Greek mainland. It corresponds to a complicated extensional setting bounded from normal faults that reveal a characteristic S – shape development. According to previous studies, the central part of the basin which mainly consists of faults trending E – W, are active structures that played a basic role in the formation of the basin. Both active faults and earthquakes appear in populations, characterized by certain spatial properties. A composite examination is attempted in order to investigate both earthquake and fault population properties taking into account all the available information that can be extracted from the correlation of seismicity and topographic data of the broader Mygdonia domain. It is known that the establishment of a dense seismological network contributes to the detailed analysis of the majority of the active structures since the distribution of the earthquake foci reveal the presence and particular properties of the active seismogenic zones. All earthquakes with magnitude $M \geq 1.0$ which were recorded during the time period 2007 to 2009 from the National Greek Seismological Network are thoroughly examined. For this reason, arrival times of well recorded events that occurred in the basin were taken into account. The Wadati method was applied, to compute the Vp/Vs ratio and the origin times of the earthquakes with adequate data. Using the origin times derived from the best fitting data, travel times of the P waves were constructed to define the crustal structure in the area. In addition, time residuals were calculated in order to take into account the lateral variations of velocities. According to the results, all earthquakes that occurred in the area were relocated and their focal properties were determined again.

Hypocentre determination was improved with the use of the VELEST algorithm. Cross sections perpendicular to the fault zones were plotted in order to approximate their depth. It is also known that innovative advanced tools lately applied in geosciences, provide a versatile approach in studying active fault systems. For this reason, high quality topographic maps along with any available tectonic data regarding active faulting were also used in order to investigate the properties of the faults population that dominates in the study area. Fault outcrops with a wide range of sizes are depicted as tectonic lineaments and GIS methodology is used for their analysis. Accurate digital elevation models (DEMs) of the area were constructed, while, cross sections and topographic profiles were produced mainly where seismicity is clustered. Similarities extracted from both methods, give combined interpretation about the fault possible segmentation or linkage either at the surface or at depth. The combined results from such an investigation provide important contribution to fault interaction, fault segmentation, seismotectonic zoning and seismic hazard assessment.

Neogene andesite intrusions along the Carpathian calc-alkaline volcanic arc

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Numerous magmatic intrusions follow the Inner-Carpathian calc-alkaline volcanic arc with decreasing age towards the East-Southeast. At the West Carpathians intrusions located: in south-eastern Moravia (internal Biele Karpaty nappe of the Magura flysch unit); and in the Pieniny Mts. between the Magura flysch unit and the Pieniny Klippen Belt. At the internal East Carpathians a big volume subvolcanic body (Ţibleş-Toroiaga-Rodna-Bârgău) found between the Gutâi and the Călimani volcanic massifs.

The Moravian high-K pyroxene-amphibole basalt and andesite intrusions extend southeast of the Morava River. They are sills, dykes and irregular bodies. Emplacement of intrusions was post-tectonic, and the intrusive rocks have been generally affected by post-magmatic alteration. Towards the east at the Slovakian/Polish border, products of intrusive activity form approximately a 20 km long belt of the Pieniny Andesite Line. It post-dates the Early Miocene folding and strike-slip movements. The magma made its way along tensional fissures that opened above a steeply bent downgoing North European Plate. Emplacement of intrusions took place in two phases: 1st phase intrusions are mostly dykes, parallel with the strike slip fault at the northern part of the Pieniny Klippen Belt; the 2nd phase intrusions are restricted to the westernmost part of the Pieniny Andesite Line and follow transversal faults that cut the 1st phase andesites. The Toroiaga intrusive area situated north of the Rodna Mts., consist of a complex subvolcanic intrusions with pierce metamorphic rocks and its southern part, Paleogene to Miocene sedimentary deposits, suggesting a multiphase intrusive activity. Hydrothermal activity and mineralisation processes are related to the 2nd and 3rd phase intrusions.

Major and trace element chemistry of the examined intrusive rocks are indicating subduction-related magmas. Compared to the Pieniny intrusives, the Moravian and the Toroiaga intrusive rocks are relatively enriched in potassium, sodium and other incompatible elements. These latest are lying at the boundary of high-K calc-alkaline- and shoshonitic suites. The LILE enrichment reflects the contribution from the subducted slab, at least the parental magma derived from metasomatised subcontinental lithospheric mantle. Source composition and partial melting was more important then the FC, AFC processes and/or crustal contamination. Partial melting process was triggered by the flux of heat coming from the rising asthenospheric material once the delamination of the subducting European Plate occurred. The B content of the Pieniny andesites is between 2.97 and 29.5 µg/g. The western and the eastern part of the Pieniny Andesite Line can be well separated by the geochemistry. The heat of the 2nd phase intrusions hydrothermally modified the 1st phase intrusions, enriched