Spatial prediction of soil organic carbon using digital soil mapping techniques in Slovakia

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High-resolution and continuous soil maps are an essential prerequisite for precision agriculture and many environmental studies. Conventional, sample-based soil mapping is costly and time consuming, and the data collected are available only for discrete points in any landscape. Thus, sample-based soil mapping is not reasonably applicable for large areas like countries. Due to these limitations, geostatistical techniques can be used to map soil properties. Soil organic carbon (SOC) is one of the most important parameters shaping soil environment and it plays a key role in determining soil quality. Spatial prediction of soil organic carbon in a large scale has an important role in environmental studies and field practices for both soil quality and carbon sequestration. This study was conducted to interpolation of point data to produce continuous map of soil organic carbon content in Slovakia. The measured point data were extracted from LUCAS (Land Use/Cover Area Frame Survey) results for Slovakia region. The regression kriging approach is applied and Corine Land Cover (CLC), SRTM 90m, European Soil Database (ESDB), climate and land management data were used as covariates. Finally, the soil organic carbon prediction map was produced in raster format at a spatial resolution of 100×100m.

Geochemistry and $^{40}Ar/^{39}Ar$ geochronology of adakite-like porphyries in NW Turkey: Implications for slab breakoff induced adakitic magmatism

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A number of plutons and porphyries emplaced into the Izmir-Ankara suture zone (IASZ), which marks the collision zone between Anatolide-Tauride platform and Sakarya continent in NW Turkey. This study focuses on the geochemistry and geochronology of Adakite-like porphyries exposed in the IASZ.

Adakite-like porphyries are spatially and temporally associated with Eocene plutons that are intrusive into ophiolitic and blueschist rocks along the IASZ. The plutons range in age from 54 to 48 Ma and include granodiorite, quartz diorite, and syenite. They are medium- to high-K calcalkaline in composition and are predominantly metaluminous I-type granitoids. Geochemical compositions and Nd-Sr isotope systematics indicate that these plutons represent the products of hybrid magmas evolved from partial melting of subduction modified lithospheric mantle and, through assimilation, fractional crystallization of these melts at crustal levels.

Adakitic rocks are represented by rhyolite and dacite porphyries. They are peraluminous, and exhibit adakitic characteristics. They have high SiO_2, Al_2O_3, Na_2O contents, Sr/Y and La/Yb ratios and low Y, Yb contents, and display enrichments of LILE and LREE, depletion of HFSE and lack of Eu anomaly. Our $^{40}Ar/^{39}Ar$ ages are 53.7 to 54 Ma for the adakite-like porphyries.

These geochemical features, timing and nature of Adakite-like porphyries and geology of the region indicate that, collectivelly, adakitic magmatism was not formed above an actively dehydrating subducted slab but are consistent with a magmatism that is more typical of intraplate tectonic settings. We suggest that adakite-like porphyries likely formed by as a result of interaction between crustal and lithospheric mantle melts. These partial melts requere increased heat flow at about 54 Ma. High heat flow could have occurred by slab breakoff that is compatible with the geodynamic evolution of the region. As a consequence of slab breakoff, upwelling asthenospheric mantle would raise the geothermal gradient beneath the suture zone.