

Universität Berlin. Thus preliminary studies of sediments from 5 boreholes drilled during 2007-2008 and kindly provided by ENEMONA, were carried out.

Neogene sedimentary succession in the boreholes studied is represented by deposits of Brusartsi and Archar Formations. The full thickness of Brusartsi Fm. has been drilled and only the upper parts of the Archar Fm. Sediments drilled from Archar Formation are thick up to 10 m - light gray and almost white sand, very well sorted (mainly quartz and less feldspars, some epidote, garnet and sphene; rare ore minerals are present). Sediments from Brusartsi Formation are varying from 70 to 105 m in thickness. They are represented by thick 2-5 up to 22 m clays and silty clays, gray and gray-greenish in color, and with massive or laminated structure. Some of clays contain significant amount of diatoms up to 50% of the rock volume and in some samples 1 mm thick layers are extremely composed of diatoms. Main rock forming minerals are chlorite (clinochlore), smectite (montmorillonite), illite, quartz and feldspar according to data from X-Ray diffraction analysis. Clay particles are oriented parallel to sedimentation surface and their composition evidenced for chiefly detrite origin. Sand is medium to very well sorted, medium to coarse grained, light grey in colour. These sands show lower mineralogical and structural maturity compared to those from Archar Fm. Well sorted sand from Brusartsi Formation is composed of relatively equal amounts of quartz, plagioclase and potassium feldspar, and very few grains of garnet, amphibole, sphene and epidote. Pyrite represents opaque minerals.

The diatom flora is freshwater one. The planktonic representatives of genus *Aulacoseira* Thw. have the highest abundance – and they compose the rockforming complex. On some levels there are periphytic (epiphytic) forms, belonged to genera *Fragilaria* Lyngbye *sensu lato*, *Tetracyclus* Ralfs, *Navicula* Bory *sensu lato*, *Cymbella* Ag. *sensu lato*, *Eunotia* Ehr., *Amphora* Ehr. The most abundant species is *Pinnularia nobilis* var. *neogena* (Grun.) Cl. It can be considered as biostratigraphic marker for Late Miocene-Pliocene age. Based on our SEM investigation on the frustules of *P. nobilis* var. *neogena* high stages of dissolution of the frustules were determined. Dissolution occurred progressively and centripetally, and the final stage was the corroded silica matrix of the central area.

The grain-size composition and mineralogy of clay minerals led to the conclusion that sedimentation occur in a relatively shallow broad basin with low hydrodynamics. Results from diatom analysis confirm this conclusion and indicate that the basin was eutrophic freshwater lake. The temperature regime was similar to the lakes of the moderate latitudes.

## **Geochemical characteristics of Upper Cretaceous volcanics in the north of Istanbul, Turkey: implication for the subduction zone magmatism**

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The volcanic rocks Upper Cretaceous in age are exposed along the Black Sea coasts east-west trending in the northwest Turkey and Srednegorie zone through Bulgaria. The geological and geochemical data, petrographic and mineralogical findings have been presented respectively. The basement rocks in the north of Istanbul are represented by sedimentary rock groups Paleozoic and Triassic in age. The volcanic rocks Upper Cretaceous in age overlay the basement rocks disconformably. The basement rocks and volcanic sequence are covered by Neogene sediments disconformably. Volcanic rocks are dominated by andesite, basaltic andesite and associated with lesser proportion of basalt, dacite, rhyodacite, less olivine basalt and their volcanoclastic equivalents. The volcanic rocks in the region have been differentiated volcanic breccias, poorly sorted volcanoclastic deposits, massive lavas and volcanic originated sandstone considering their lithological facial features and field characteristics. In some locations hyaloclastite type of rocks are common. Some of them are reworked in the marine environment. This is the evidence that the volcanism was formed as submarine volcanic activities. The volcanic units are cut by some basaltic and/or

basaltic andesite dykes. Lavas show microlitic porphyritic, hyaloplitic, spherulitic and hyaloporphyratic textures. When petrographically examined, the samples give evidence of hydrothermal alteration or devitrification. Corroded quartz, oscillatory zoning of plagioclase phenocrysts and reverse zoning are the evidences showing thermal and compositional disequilibrium produced by magma mixing. In this paper the geochemical characteristics of volcanic rocks have been discussed. Subduction of the Neotethys under the Istanbul zone (Pontides) created a new active continental margin arc. The volcanic rocks outcropped in the north of İstanbul are included in High-alumina basalt (>17 %  $Al_2O_3$ ) group firstly with this study. The petrochemical characteristics of volcanism have been defined on the analyses of 24 representative lava samples covering the whole stratigraphic sequence, the major-oxide, trace and rare earth element data. In order to better understand the genesis of subduction-related volcanism, we also performed an electron microprobe study on phenocryst phases of two hydrous lava samples and one unhydrous olivine basalt sample (e.g., pyroxenes, amphiboles and olivine). All lava suits are calc-alkaline with arc-like signatures and characterized by LILE and LREE enrichment and N-MORB-like patterns of HFSE and HREE. Such signatures are consistent with melts being derived from a mantle that was metasomatized by slab-derived aqueous fluids and silicic melts. With these features İstanbul volcanics have been attributed to crystal fractionation and interaction with the subduction zone and modified mantle wedge and to be enriched mantle origin. Geochemically volcanics show negative anomalies in Nb, Ta, P and Ti typical of arc magmas. Nb-Ta-Ti depletions are evidences of aqueous fluid metasomatism since fluids were depleted in these elements due to residual rutile in the dehydrating slab. Mantle-derived rocks have The Zr/Nb, Nb/Y, Ba/Nb and Y/Nb ratios are akin to continental margin volcanics and also Zr/Y-Zr binary diagram show that there is similarity between continental margin volcanics and İstanbul volcanics. We assume that basaltic andesite and andesite dykes to be the source of volcanic products.

## **Ground penetrating radar investigation of Gönen Tumulus in Isparta/Turkey**

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Prior to 1940s, excavation was the only method for locating buried archaeological studies. By the middle 1950s, along with archaeological searches, geophysical methods are used very often. Geophysical methods have proven to be very useful to archaeologists in order to detect, map and study the characteristics of different types of objects and structure in the subsurface. Among these methods, ground-penetrating radar (GPR) is particularly useful, because this active electromagnetic technique is able to detect the presence of buried objects having different dielectric properties with respect to the surrounding material.

Ground-penetrating radar (GPR) is a method that is able to provide very high resolution, three-dimension information. It is a fast and effective electromagnetic (EM) method. It is based on the propagation and reflection of EM waves, it is sensitive to variations of the EM parameters in the subsoil, specially the dielectric constant and the electric conductivity. Despite its relatively low penetration depth (specially with high-frequency antennae and in moderately conductivity environments), the GPR resolution capability (also depending on frequency and soil properties) is far greater than obtained by other geophysical methods. This makes the technique suitable for high-resolution shallow studies such as archaeological applications and shallow stratigraphy mapping.

The study primarily aims at providing adequate imaging resolution of large and prominent targets of archaeological interest, such as tumuli, at all depth levels. We implemented an integrated ground-penetrating radar (GPR) technique to perform high-resolution imaging and characterization of tumuli (burial mounds).