Geophysical analysis for the Ada Tepe region (Bulgaria) - case study

Petya Trifonova, Metodi Metodiev, Dimcho Solakov, Stela Simeonova, and Rumiana Vatseva

National Institure for Geophysics, Geodesy and Geography - BAS, Sofia, Bulgaria (m.i.metodiev@gmail.com)

According to the current archeological investigations Ada Tepe is the oldest gold mine in Europe with Late Bronze and Early Iron age. It is a typical low-sulfidation epithermal gold deposit and is hosted in Maastrichtian-Paleocene sedimentary rocks above a detachment fault contact with underlying Paleozoic metamorphic rocks. Ada Tepe (25o.39'E; 41o.25'N) is located in the Eastern Rhodope unit. The region is highly segmented despite the low altitude (470-750 m) due to widespread volcanic and sediment rocks susceptible to torrential erosion during the cold season.

Besides the thorough geological exploration focused on identifying cost-effective stocks of mineral resources, a detailed geophysical analysis concernig diferent stages of the gold extraction project was accomplished. We present the main results from the geophysical investigation aimed to clarify the complex seismotectonic setting of the Ada Tepe site region. The overall study methodology consists of collecting, reviewing and estimating geophysical and seismological information to constrain the model used for seismic hazard assessment of the area. Geophysical information used in the present work consists of gravity, geomagnetic and seismological data. Interpretation of gravity data is applied to outline the axes of steep gravity transitions marked as potential axes of faults, flexures and other structures of dislocation. Direct inverse techniques are also utilized to estimate the form and depth of anomalous sources.

For the purposes of seismological investigation of the Ada Tepe site region an earthquake catalogue is compiled for the time period 510BC - 2011AD. Statistical parameters of seismicity - annual seismic rate parameter, $[U+F06C]$, and the b-value of the Gutenberg-Richter exponential relation for Ada Tepe site region, are estimated. All geophysical datasets and derived results are integrated using GIS techniques ensuring interoperability of data when combining, processing and visualizing obtained information from different sources.