# Complex geophysical investigations on the site of Tihany observatory

András Csontos, Péter Tildy

**The appearance of a little systematic baseline instability with large spatial differences motivates us to perform a detailed geophysical survey on the site of Tihany observatory including electric resistivity tomography (ERT), geomagnetic measurements and susceptibility measurements. Soil samples were also collected based on the measurement results, on them an X-ray powder diffraction (XRD) measurement was completed to identify the minerals of the sediments. After these investigations deposits with different magnetic properties could be linked to structures created by hydrothermal processes.**

Tihany Geophysical Observatory was founded in Tihany National Park on the peninsula of Lake Balaton, Hungary. The volcanic origin of Tihany peninsula has been repeatedly studied. Phreatomagmatic eruptions occurred in the area approximately 7-7.5 million years ago. According to the survey the NW-part of the peninsula shows the existence of strong anomalies of volcanic rocks, but in the SE region, where hot springs appeared previously, the spatial variation of the geomagnetic field was relatively week. That is why the place of the observatory was selected in the SE region of the peninsula near to the top of a geyser cone.

The knowledge of the distribution of crust anomalies near to the geomagnetic recording systems can be important for observers. In order to determinate the distribution of different deposits, as the first step geophysical surveys were performed.

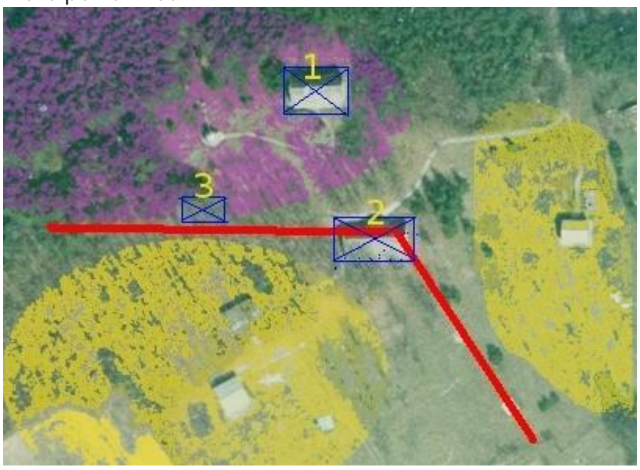


Figure 1: The picture shows the ground of Tihany observatory. The red lines are the fractures where the eruptions of hot water occurred. They separate the geological characteristics.of the site i.e. rocky (purple) and clayey (yellow) areas. The blue rectangles are the places of geomagnetic measurements. 1 marks the absolute house, 2 marks the variation house and 3 marks a new underground hut.

As results of ERT and geomagnetic surveys we could separate different types of sediments based on resistivity contrast and magnetic properties. Reverse magnetization was observed by geomagnetic survey.

Perhaps these areas are the marks of eruptions of hot water. Eruption(s) may occurred near tectonic lines or other fractures. (Csontos et al., 2017) The detected structures separate the ground of the observatory also into a rocky and a clayey part. (Fig.1)

According to XRD measurements we can characterize the above described geological formations which were mostly created by geochemical processes:

1.) The minerals of the rock are mostly hydrocalcite (40%) and dolomite (44%). This rock is free from the magnetic minerals.

2.) Clayey deposit is practically a mixture of different minerals. We could find smectite, quartz, illite+muskovite, calcite and chlorite with relatively high percentage in the samples. Goethite (α-FeOOH) was also reported in the deposit but we can not exclude the appearance of further type of magnetic mineral in the ground.

Along the fractures (Fig.1) the susceptibility map of the surface shows structures, i.e. parallel to the fractures we can measure relatively high susceptibility values. These can be marks of lode. After heavy mineral separation X-ray powder diffraction measurement detected maghemite, hematite and goethite in the samples of these deposits. The appearance of maghemite can be the reason of the relatively high susceptibility.

We could identify the structures of deposits created by hydrothermal processes and minerals of different facies so the impoundment of magnetic anomalies of the crust were performed. As a consequence of our study we verified, that the absolute control of the geomagnetic observatory is not influenced by strong crust anomalies.

**References:**

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**Author:**
A. Csontos[1]. P. Tildy[1]
1) Mining an Geological Survey of Hungary

**Corresponding author:**
András Csontos
Mining an Geological Survey of Hungary, Tihany Geophysical Observatory
H-8230 Tihany, Kossuth u. 91., Hungary
Tel.: +36 (87) 448-501
e-mail: csontos.andras@mbfsz.gov.hu