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Mapping of the total magnetic field in the area of Lake Balaton

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The Lake Balaton with 600 km^2 area represents the largest lake in Central Europe and a blank spot on the magnetic anomaly map of Hungary. It is because the construction of the Hungarian magnetic anomaly map dates back to the 1960s and relied mainly on classical vertical-field balance surveys. To fill the gap, we initiated a systematic mapping using modern magnetometers and positioning system in the framework of a complex geophysical study of Lake Balaton (National Research Project 109255 K). The main goal of this study has been to identify subvolcanic bodies and tectonic structures below the lake and correlate them with well-known features mapped onshore in the vicinity of Balaton.

During the magnetic survey an Overhauser field magnetometer (GEM System, GSM-19) was mounted on a plastic boat and towed behind a motorboat in a distance of 20 m with a speed of 6 to 16 km/h depending on weather conditions. Tests measurements showed that at this distance the magnetic noise generated by the motorboat was negligible. We measured total field values with a sampling interval of 1 to 2 s. As a result, the whole lake has been covered by magnetic profiles in an orthogonal grid with spacing of 1 km. During data interpretation we applied for correction of temporal variation of magnetic field registered in the Tihany Geophysical Observatory and normal field correction from a regional model.

The final anomaly map in the western part of the lake shows anomalies with amplitudes of 20 to 60 nT and a half wavelength of 0.5 to 1 km. A larger feature was recognized related to the Badacsony Hill a major basaltic bute at the northern shore of the lake. In the middle part of the lake the total field is rather smooth, no significant anomaly has been revealed. However, slight disturbances can be noticed in the proximity of a neotectonic fault zone mapped by high resolution seismic data. In the eastern part of the lake few low amplitude (5-20 nT) anomalies have been observed that are associated also with seismically mapped strike-slip faults.

As an interesting by-product a map was created showing short wavelength anomalies that are most probably caused by artificial metal objects sank and stuck in the lake mud. Some of these anomalies can be caused by parts of fallen warplanes and sunken tanks from military activities during the II. World War.