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Neotectonic implications by geophysical surveys of topographic features identified by Airborne Laser Scanning in the Neusiedlersee/Ferto area (Austria/Hungary)

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The area around the Lake Neudsiedlersee (Lake Fertő in Hungarian) was analysed to understand its neotectonic activity and gather possible explanations of the features of the topography and microtopography.

The area consists of two, considerably different parts in terms of topography and geomorphology. The western and north-western shores of the lake are connected to the Leitha Mts., a low ridge (its relative height is about 300 meters) that connects the Alpine orogen in the SW with the Carpathians to NE bounded by active strike-slip faulting. In this part of the area, several outcrops were investigated, of which the one at St. Margarethen was systematically measured by multielectric sounding and GPR, and an other one at St. Georgen, north of Eisenstadt, was used for auxiliary data gathering. The eastern and southern shores, belonging to the Pannonian Basin, are mostly flatlands, parts of the Little Hungarian Plain with extremely low relief and no real natural drainage. The small variations of the surface altitude (less than ten meters), referred to as microtopography here, are due to elongated ridges and extremely shallow perennial or temporal playa lakes. In order to understand better the subsurface structure, a multimethod approach has been applied.

Geophysical survey methods (vertical electric sounding, land seismics, gravity measurements) were carried out to describe the layer structure of this area, especially a zone, north of Illmitz, connected to interesting elements of microtopography. The identification of microtopographic features were carried out using high resolution digital elevation datasets, derived from Aerial Laser Scannings (ALS). Seismic measurements were carried out also in the lake itself to understand the structural geological settings of the lake bottom to the depth of ca. 50 meters. All of these measurements were made in the framework of a common student fieldwork of the Eötvös University, the University of Leeds and the University of Vienna.

Fault lines that can be interpreted active in neotectonic point of view were found below the lake by water seismic. These faults displaced young sediments as well. Similar patterns were found at the outcrop of St. Margarethen near to the western shore of the lake and were followed underground by the geophysics. However, in the eastern shore the geophysics showed no sign of active tectonics in the upper fifty meters of the sediment. Changes in physical characteristics (resistivity, wave propagation velocity) were mapped in 3D and were connected to the ALS microtopographic features. The material of the small elevated zones occurred to be gravel and coarse sand and the basement of this layer was a low-resistivity clay. Previously these structures were interpreted as large-scale deformations bands; this solution is still feasible in the light of the results. A further possible interpretation of this structure is that the topographic undulations are connected to the former alluvial fan of the Paleo-Danube River, sedimented from north.

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