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The Neusiedl Fault: Results from ultra-high resolution seismics in Lake Neusiedl (Northern Burgenland, Austria)

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Lake Neusiedl, located at the border between Austria and Hungary, is the second largest steppe lake in Central Europe. The lake's drainage basin has an area of about 1120 km^2. From North to South, the lake is about 36 km long, and from West to East it is between 6 and 12 km wide. In the late 1950s a NE striking fault, the Neusiedl Fault, has been located in seismic sections North of the Lake Neusiedl. The openly folded Miocene sediments record no significant vertical displacements along the fault. Based on temperature anomalies in the Lake Neusiedl, which have been interpreted as thermal water discharge, a continuation of the Neusiedl Fault towards the SW was postulated in the 1980s. Apart from some resistivity textures measured by multielectrode geoelectrics from the Vienna University of Technology in the 1990s the Neusiedl Fault and its possible continuation have never has been investigated in detail. The fault cuts openly folded Upper Pannonian beds and therefore the fault has been probably active in the Pliocene and/or Quaternary. Unfortunately no tectonic structures have been reported from numerous local outcrops of Quaternary gravel pits, which might have proved Quaternary tectonics.

Neotectonic activities are documented by methane seepages, which are known from the western and eastern edge of the Lake Neusiedl. Therefore we tried to locate the postulated NE trending Neusiedl Fault in the upper tens of metres of the subsurface of Lake Neusiedl using ultra high-resolution seismics. The IKB Seistec™ equipment

with a sampling rate up to 100 kHz, decimetre resolution and a significant subsurface penetration in the soft sludge was used in order get optimal imaging of the subsurface layers. Within four days 57 profiles down to a depth of some 20 metres were measured crossing the postulated Neusiedl Fault in several fault-perpendicular sections.

The original data in SEGY-format were filtered in order to eliminate multiple structures. The data were processed using Landmark's GeoGraphix and visualized with the software package GOCAD.

Sedimentary structures northwest of the lake revealed local unconformities probably caused by fluvial erosion of the paleo-Wulka (the river Wulka is currently the only major tributary to the Lake Neusiedl). Local normal faults cutting the Upper Pannonian beds indicate minor post-Miocene extension. At the western and southern end of Lake Neusiedl the seismic signals were severely disturbed probably by emanating methane. Besides these observations, no evidence for a major fault structure in the speculated continuation of the Neusiedl Fault has been found in the upper 20 metres of Upper Pannonian beds.

Based on the interpretations of the ultra-high resolution seismic profiles we conclude that no continuation of the Neusiedl Fault towards the SW exists within the lake. The long known methane seepages derived from Upper Miocene sediments occur near the edges of the lake and are not lined up along a fault as indicated in the published geological maps.