Processing and the Interpretation Possibilities of Multichannel Seismic Data from Lake Balaton, Hungary

Zsuzsanna Tóth

Eötvös Loránd University, Department of Geophysics and Space Science, Budapest

In September 2005, a group of researchers from University of Bremen participated on a geophysical fieldwork organized by the Department of Geophysics, Eötvös Loránd University (Budapest, Hungary). The seismic measurements took place in the framework of cooperation for an experimental study. The aim of the survey was to test a multichannel seismic equipment, originally developed for marine acquisitions, in a shallow, lacustrine environment. In my diploma thesis I focus on the processing and interpretation possibilities of these multichannel seismic data.

During the 8 days of data acquisition, more than 250 km long seismic profiles had been recorded, out of which I processed altogether 145 km long seismic data consisting of 20 single profiles. They provide a detailed image with ca. 10 m resolution down to the depth of 150-200 m, and cover the whole eastern part of Lake Balaton.

Data processing followed the steps of the conventional seismic data processing flow. Since it was an experimental survey, several parameters (i.e. source, time between shots) were changed a number of times during measurements, in order to reach the best possible results. Therefore, data processing was greatly influenced by some of the characteristics of the data. I carried out analyses at every key stage so that the best practice and value would be determined (e.g. spectral analysis, gain, filtering and deconvolution).

In order to highlight the value and interpretation potential of the processed data, three multichannel profiles and several single channel profiles parallel to them were selected and interpreted. The latter ones were acquired with an ultra-high resolution single channel equipment (Seistec^{TM}), providing a very detailed image down to the depth of 30-50 m. The combined application of the two seismic methods provides an opportunity to study in details the uppermost 150 m below the lake, with an emphasis on the structural and sedimentological features.

The profile BAL-01 was selected because of its stratigraphic characteristics. The other two, BAL-03 and BAL-06 became interesting due to their tectonic features. On BAL-01 fluviatile sediments can be seen deposited in a prograding delta system and are separated by several unconformities. These sediments give us an insight of how Lake Pannon became filled up by river(s) coming from N-NW and NE. Faults seen on the BAL-03 and BAL-06 confirm the hypothesis that fault zones, previously reconstructed from single channel seismic data and running parallel to the lake axis, are the near surface manifestation of the Balatonfő shear zone. Individual fault zones are organised in flower structures, typical for the left-lateral strike-slip fault zones under Lake Balaton.