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High-resolution seismic reflection data acquisition on Lake Neusiedl, Austria

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A combined of 400+ km single- and multichannel seismic reflection data was collected on Lake Neusiedl in NE Austria in May of 2013. This one-week long geophysical campaign was a multinational academic effort between the Universities of Vienna, Budapest, Bremen and Southampton. The project was funded by OMV as a pilot study to test the boundaries of modern technology in the so-called “transition zone” between land and water. Lake Neusiedl is indeed an exceptionally shallow lake, with an average water depth of only about one meter.

Whereas single-channel seismic reflection data have been collected before on this lake, the towing of a 60 m cable and an air-gun behind a ferry-boat was a first here. The processed multi-channel data turned out to be exceptionally good, i.e. the high-frequency data illuminated the subsurface of the lake for the first time down to the acoustic basement at about 1 km depth. The most prominent findings of the new data include a) a consistent southeasterly dip of erosionally truncated Pliocene sediments beneath a very thin Holocene mud layer, b) the presence of major throughgoing fault systems (i.e. flower structures) which appear to be inherited from the extensional syn-rift structural fabric of the underlying Pannonian basin system, c) at least two progradational sequences defined by seismic clinoforms indicating water depth of about 40-80 m during the late Pliocene, d) flat-spots in several areas of the study area corresponding to possibly biogenic gas in a few hundred meter depth beneath the lake and e) vertical data wipe-outs which are interpreted as gas chimneys reaching the lake bottom. Interestingly, these gas chimneys are interpreted to correspond to the well-known “Kochbrunnen” in the Lake Neusiedl, which were historically described as locations on the lake where gas seepage keeps occurring including permanent holes in the ice cover during the winter or ignitable gas bubbles frozen into the ice during exceptionally harsh winters.

As the technology applied in the Lake Neusiedl turned out to be a powerful, very cost-effective and also fast method to acquire seismic data in exceptionally shallow water environments, OMV could employ the same exploration technology in any similar transitional zone where reflection seismic data acquisition was deemed impossible before.