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Imaging the Walter Munk lake: Sedimentary dynamics and water resurgence derived from high-resolution seismic reflection survey in Lake Altaussee (Salzkammergut, Austrian Alps)

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Alpine lake sediments in the critical zone have proven their efficiency to record regional climate variability and geohazard history at several time-scales. However, the understanding of lake responses to external environmental factors depends on a precise knowledge of internal lake functioning. High resolution imaging of lake sedimentary infill is crucial to unveil internal and external factors impacting sedimentary processes. In memory of Walter Munk and to his considerable contribution to underwater geophysics, we present 29 high-resolution seismic reflection lines data (8 cm resolution/10 meters penetration) from Lake Altaussee (Walter Munk hometown lake in Austrian Alps), recently acquired using iXblue Echoes 10 000 sub-bottom profiler. Interpretations are supported by multibeam echosounder bathymetry and hydrochemical data.

Lake Altaussee is situated at 713 m a.s.l. in Northern Calcareous Alps (Salzkammergut, Austria). Lake depression is 2.6 km long, 1 km width and mean water depth is 53 m. Three main echofacies are observed: High/low intensity reflectors following the lake bed topography, Structureless weak amplitude layer on top of the bedrock, Massive and discontinuous structures at the eastern part of the lake.

First type suggests a great potential to reconstruct Late Holocene environmental and climatic events. Second type is probably associated to a landslide. Third type is located on top of holes and water resurgence (also visible in the bathymetry) and is attributed to carbonate sedimentation due to supersaturation and oxygenated conditions at the karstic system output. This hypothesis is supported by lower temperature and salinity measured at the karstic system output. Using Delph Seismic software, we constructed 3D modeling of the lake sediments by generating isopaches of main reflectors and estimated spatial distribution of sediment volume. Our model help at deciphering different sedimentary dynamics along the lake infill history and to suggest the deposition of historical earthquake, flood, etc, on top of the bedrock.