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Infill and mire evolution of a typical kettle hole: young ages at great depths (Jackenmoos, Austria)

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Kettle holes are very common features in proglacial environments. Myriads of small, often circular shaped lakes are indicative of dead ice slowly melting out after the collapse of glaciers and subsequent burial of glaciofluvial sediments. Many of these lakes transformed into mires during the Postglacial and the Holocene. Still, little is known about the mechanisms leading to mire formation in such environments. We aim to analyse the shape and the postglacial history of infilling and peat accumulation of a typical dead ice kettle using 2D resistivity surveying, core-drilling, 14C dating and palynologic analyses. The kettle hole mire is located within a small kame delta deposit just south of the LGM extend of the Salzach Piedmont glacier (Austria/Germany). Today, the mire is a spot of exceptional high biodiversity and under protection.

Sediment core samples extracted in the deepest (c. 10-14 m) and central part of the kettle directly overly lacustrine fine sediments and yielded young ages covering the subatlantic period only. Young ages are in agreement with palynologic results comprising e.g. pollen of secale (rye) and juglans (walnut). However, these deposits are situated beneath a massive water body (10 m), only covered by a thin floating mat. A second, more distally situated drill core indicates the thinning of this water body at the expense of peat deposits covering the Late Glacial to Middle Holocene.

Multiple 2D resistivity data support drilling information and enabled us to reconstruct the shape of the basin. The transition from lacustrine sediments to the water body above is characterised by a sharp increase in resistivity. Furthermore, the resistivity pattern within the entire kettle indicates an increase towards the centre, most probably as a result of the changing nutrient content.

The postglacial evolution of the mire is in agreement with the concept of "floating mat terrestrialisation", representing a horizontal growth of the floating mat from the edges toward the lake centre. This concept further includes the deposition of strongly hydrated and loose debris peat formations under the floating mat. The process leads to decreasing basal ages from the edge towards the centre and therefore well explains the age distribution in the studied kettle hole.