

## Responses to CC1

Dear Giacomo!

Thank you for the time you dedicated to reviewing our manuscript, and we greatly appreciate your insightful and very encouraging comment helped us in improving the manuscript.

Herewith, we provide a point-by-point response to your useful comments. Also, the modifications were done on the track changes version of the manuscript.

#1	<b>Comment 1:</b> Line 45. “of the lakes” must be deleted, there is a repetition.
	Response 1: Thank you. Now, it is deleted.
#2	<b>Comment 2:</b> Lines 55-56. “the properties of aquitards beneath lakebeds, particularly the distribution of low-permeability materials such as clay, play a crucial role in regulating vertical exchanges between groundwater and surface water”. Statement non backed-up by references; insert specific references on the role of aquitards in areas characterized by rivers and lakes:  Medici, G., Munn, J. D., Parker, B.L. 2024. Delineating aquitard characteristics within a Silurian dolostone aquifer using high-density hydraulic head and fracture datasets. <i>Hydrogeology Journal</i> 32(6), 1663-1691.  Taviani, S., Henriksen, H.J. 2015. The application of a groundwater/surface-water model to test the vulnerability of Bracciano Lake (near Rome, Italy) to climatic and water-use stresses. <i>Hydrogeology Journal</i> 23(7), 1481-1498.
	Response 2: Thank you. we added them to the manuscript.
#3	<b>Comment 3:</b> Line 63. “2D profiling” of? Please, be more specific.
	<b>Response 3:</b> We added ‘GPR’ to be more specific.
#4	<b>Comment 4:</b> Lines 136-175. Describe the local stratigraphy for the sediments.
	<b>Response 4:</b>

	<p>We have added it the following subsection to the manuscript.</p> <p>2.1 Local geological and sedimentary stratigraphy</p> <p>The lake basin is underlain by unconsolidated Quaternary sediments typical of the Danube–Tisza Interfluve. The subsurface stratigraphy is dominated by sandy deposits of aeolian origin, locally interbedded with fine-grained lacustrine sediments that accumulated during phases of higher and more stable water levels (Dövényi, 2010; Molnár et al., 2019).</p> <p>Sediment sampling indicate that the uppermost lake-bed deposits consist primarily of sand and clay with strong lateral variability. Sandy sediments occur mainly along the western and marginal parts of the lake and represent permeable units with relatively high porosity. In contrast, the central and southern areas are dominated by clay-rich lacustrine muds deposited under low-energy conditions, forming low-permeability surface layers.</p> <p>Beneath both sandy and clayey lake-bed sediments, laterally extensive fine-grained layers were detected, with thicknesses ranging from approximately 25 to 65 cm. These buried units are interpreted as former lacustrine or palustrine deposits and likely act as semi-confining layers (aquitards) that restrict vertical groundwater flow.</p>
#5	<p><b>Comment 5:</b> Lines 361. Can you estimate the approximate thickness of the aquitard units? Is it available from other information?</p> <p><b>Response 5:</b> Due to the depth limitations of waterborne GPR and strong signal attenuation in clay-rich and saline sediments, the full thickness of the aquitard units cannot be resolved. The GPR data allow identification of the upper portions of fine-grained aquitard layers and provide minimum thickness estimates; however, deeper boundaries are beyond the effective penetration depth of the 200 MHz antenna. This limitation has now been explicitly clarified in Section 5.1 of the manuscript:</p> <p>”Although GPR data allow the identification and partial thickness estimation of clay-rich and fine-grained aquitard units, the full thickness of these units cannot be resolved. Signal penetration is strongly limited by attenuation within electrically conductive, water-saturated clay and saline sediments, which results in rapid loss of</p>

	<p>signal energy with depth. Consequently, only the upper portions of the aquitard units are imaged reliably, while their deeper boundaries remain beyond the effective penetration depth of the 200 MHz antenna. The thickness values derived in this study therefore represent minimum or observable thicknesses rather than the complete vertical extent of the aquitard units, which would require complementary subsurface information (e.g., drilling or lower-frequency geophysical methods).”</p>
#6	<p><b>Comment 6:</b> Line 445. Specify water seepage.</p> <hr/> <p><b>Response 6:</b> We have clarified the meaning of water seepage in the manuscript. In this study, seepage refers to the potential vertical downward movement of lake water into the subsurface through permeable sediments or local discontinuities within fine-grained layers. This process is inferred from GPR-derived stratigraphic and hydrostratigraphic evidence rather than from direct hydraulic measurements. The clarification has been added near Line 445.</p> <p>”In this study, water seepage refers specifically to the potential vertical downward movement of lake water from the lake bed into the underlying water-saturated sediments and the saturated aquifer system, rather than flow through an unsaturated (vadose) zone. This process is facilitated by permeable sandy units or by local thinning and discontinuities within otherwise fine-grained, low-permeability layers. Seepage is inferred from GPR-derived stratigraphic patterns and sedimentological contrasts, rather than from direct hydraulic measurements, and it denotes zones of enhanced hydraulic connectivity between the lake and the subsurface rather than quantified groundwater fluxes.”</p>
#7	<p><b>Comment 7:</b> “Line 445. Seepage in the un-saturated zone of the aquifer or not? Please, specify the point.”</p> <hr/> <p><b>Response 7:</b></p> <p>Seepage in this study does not occur through an unsaturated (vadose) zone. Because Lake Vadkertı is a permanent water body, the lake-bed sediments are water-saturated, and any downward seepage refers to vertical percolation directly into the saturated sediments and underlying aquifer. This clarification has been explicitly</p>

	<p>added to the manuscript near Line 445. We have clarified this point in the answer of the previous comment and added it in the manuscript.</p>
<p>#8</p>	<p><b>Comment 8: Figures and tables</b></p> <p>Fig. 1. You need to insert a much larger map with the country/state visible.</p> <p>Fig. 5. Increase graphic resolution for the traces.</p> <p>Fig. 8c. Contouring method for the time slices? Please, provide methodological details.</p> <p>Fig. 10. Coordinates too small.</p> <p>Fig. 10. Legend too small and difficult to read.</p>
	<p><b>Response 8:</b></p> <p>We thank you for this suggestion.</p> <p>Regarding Figure 1: it was intentionally designed to emphasize the lake body and its immediate surroundings, which are the focus of the geophysical measurements and sediment sampling. The current map scale allows the lake geometry, GPR profile layout, sediment sampling locations, and coordinate grid to be displayed clearly and at sufficient resolution. Expanding the map to include the entire country or regional extent would require reducing the relative size of the lake within the figure, which would compromise the visibility and interpretability of these key study-specific details. Also, the figure includes clearly labeled coordinate borders that unambiguously locate the study area. For these reasons, we believe the current zoom level is the most appropriate for the objectives of this study.</p> <p>For Figure 5, it has been re-exported from CorelDRAW at a higher graphic resolution and has been replaced with the improved version in the revised manuscript (tracked-changes file). The updated figure provides clearer and sharper GPR traces.</p>

Regarding Fig. 8c, The contouring and interpolation method used for the GPR time slices has been specified in the Materials and Methods section. The time-slice amplitude maps were generated using inverse distance weighting (IDW) interpolation within GPR-Slice, followed by low-pass smoothing. The methodological details have been added to the manuscript.

Regarding Fig. 10, The coordinate labels and legend were carefully checked and are readable at the final figure size used in the manuscript. Increasing the coordinate font size further would require reducing the map extent or overlapping with other map elements, which could negatively affect figure clarity. For this reason, the current formatting was retained.