

Supplementary Information for:

Human-Enhanced Tsunami Hazard in Large Lakes

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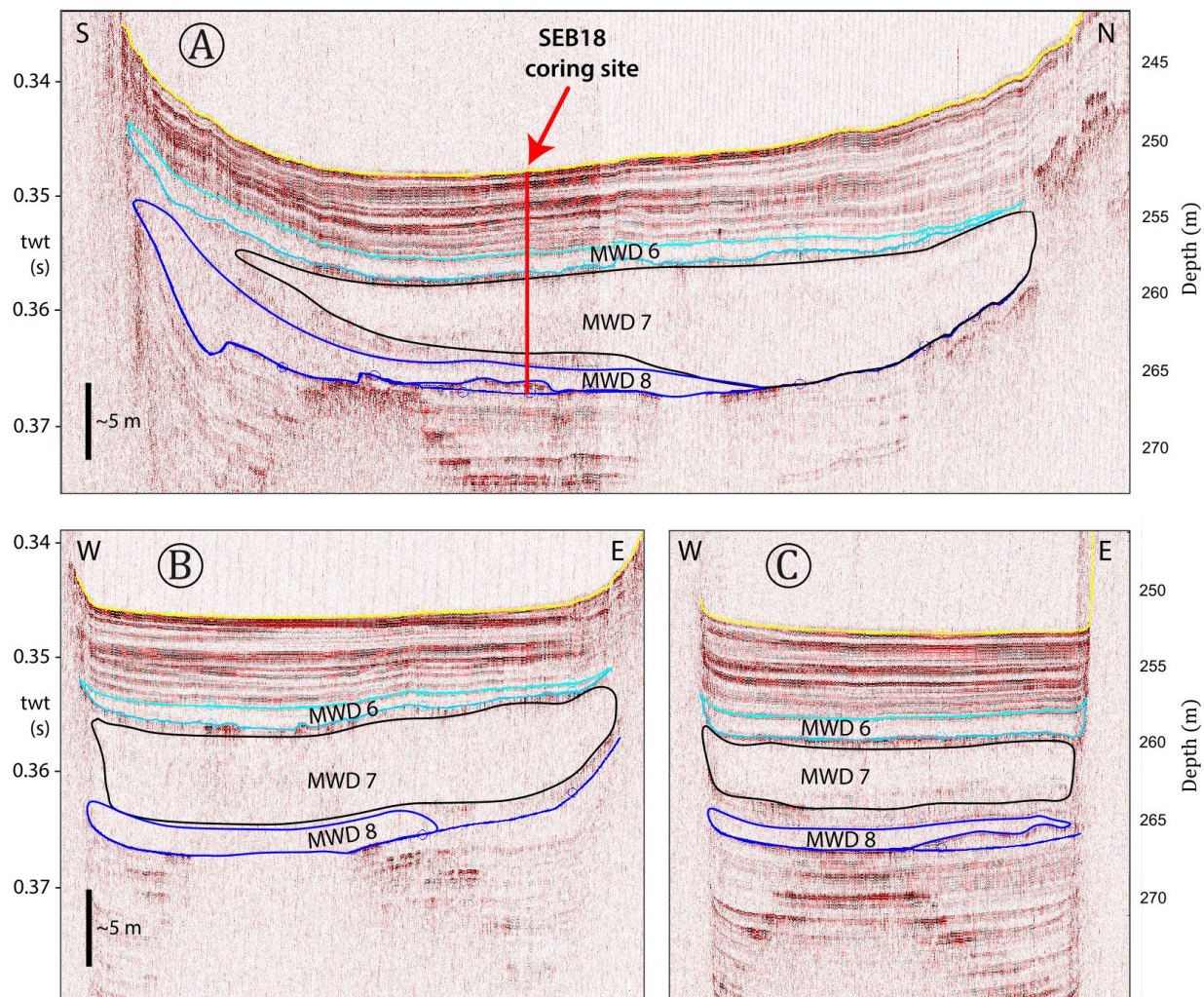
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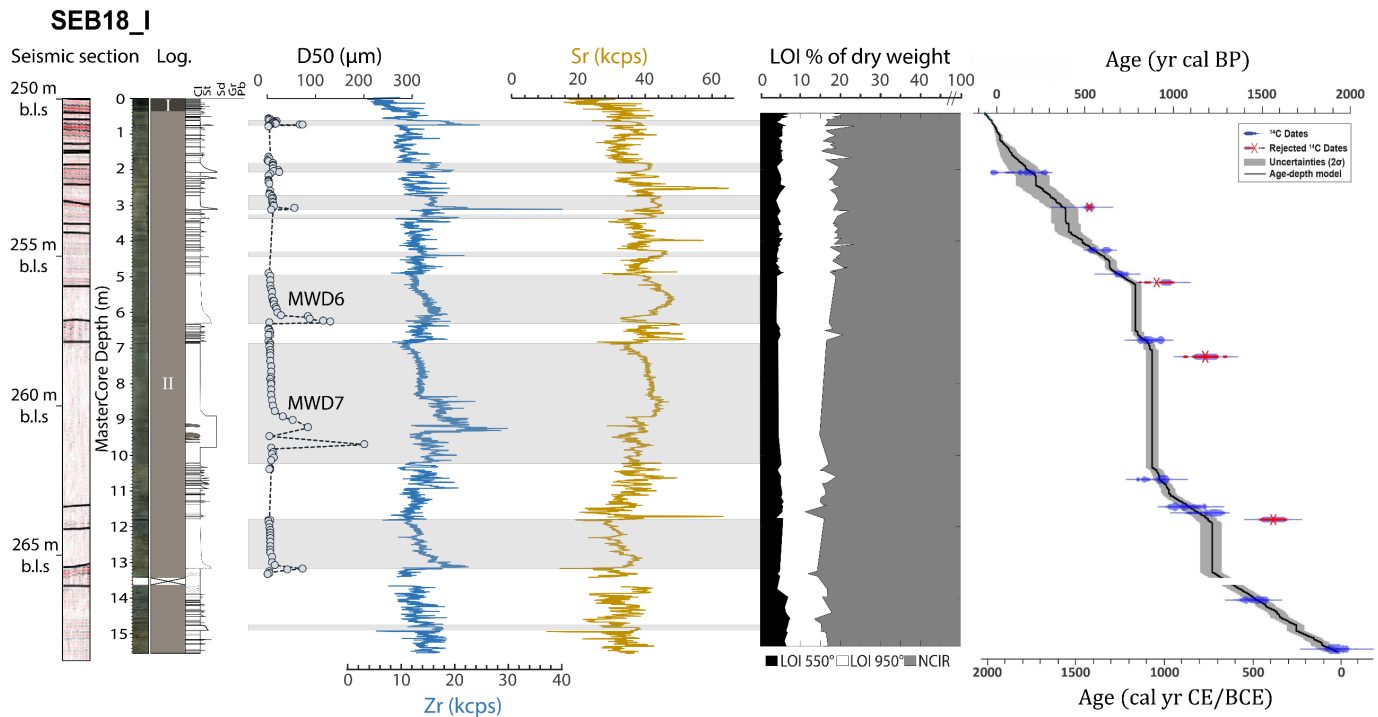
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Supplementary Fig. 1: Seismic profiles across the deep basin of Lake Iseo (locations in Fig. 1c). (a) Profile A with core site SEB18 (vertical red line) and (b–c) profiles B and C. Mass-wasting deposits are highlighted: MWD6 (1222 CE event), MWD7 (1117 CE event), and MWD8 (6th century event), modified from Rapuc *et al.*¹⁷. Depth is expressed in m below the lake surface (m b.l.s.), assuming a mean P-wave velocity of 1450 m s⁻¹ in water and sediments.

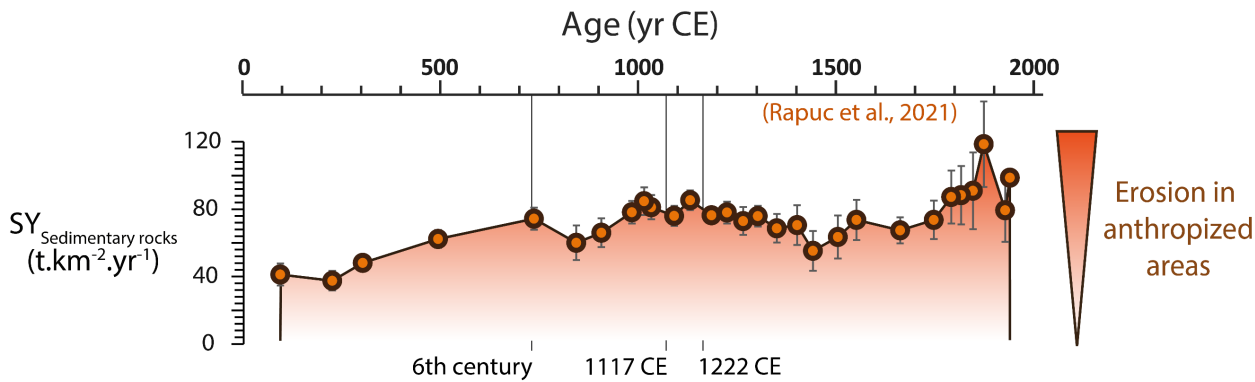
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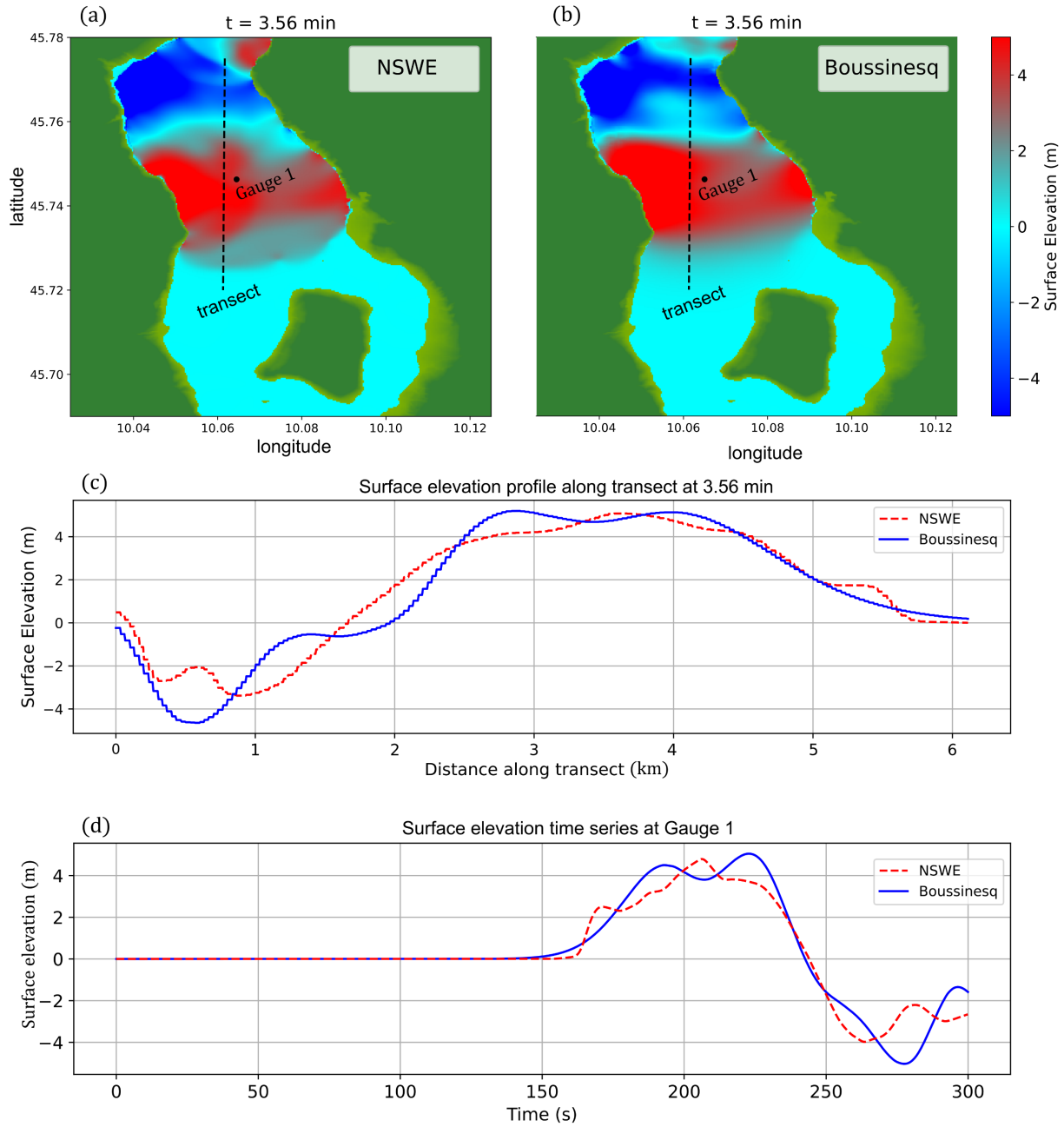


Supplementary Fig. 2: Sedimentological and geochemical characterization of the SEB18 core from the deep basin of Lake Iseo, modified from Rapuc et al.¹⁷. Close-up view of the seismic profile section compared with lithological (log, median grain-size and loss on ignition) and geochemical data (Zr and Sr signals obtained from XRF analyses) of the SEB18 sediment sequence. Gray shading represents the thickest graded layers. The right-hand panel shows the complete age-depth model, combining radiocarbon dates and varve counting.

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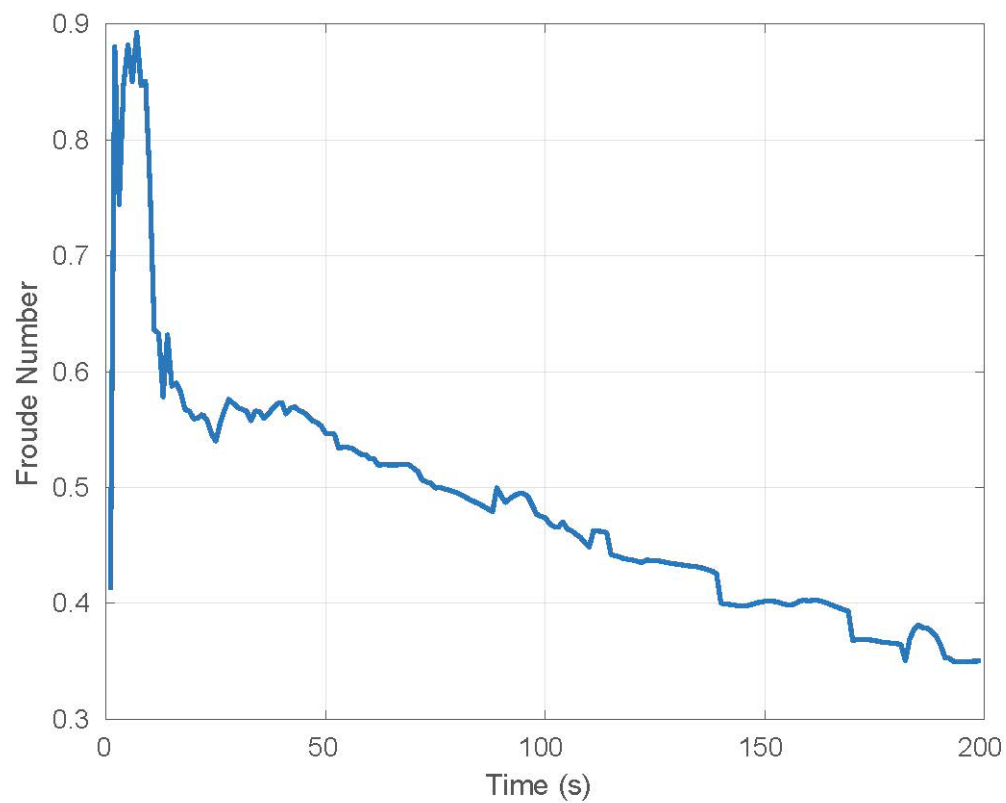
Supplementary Fig. 3: Erosion in Lake Iseo catchment over the last 2000 years. The ages of the three main earthquakes that triggered delta collapses in Lake Iseo is indicated. The record shows sustained human-induced erosion since the last delta collapse, peaking during the Industrial era and continuing to the present. Modified from Rapuc et al.³².



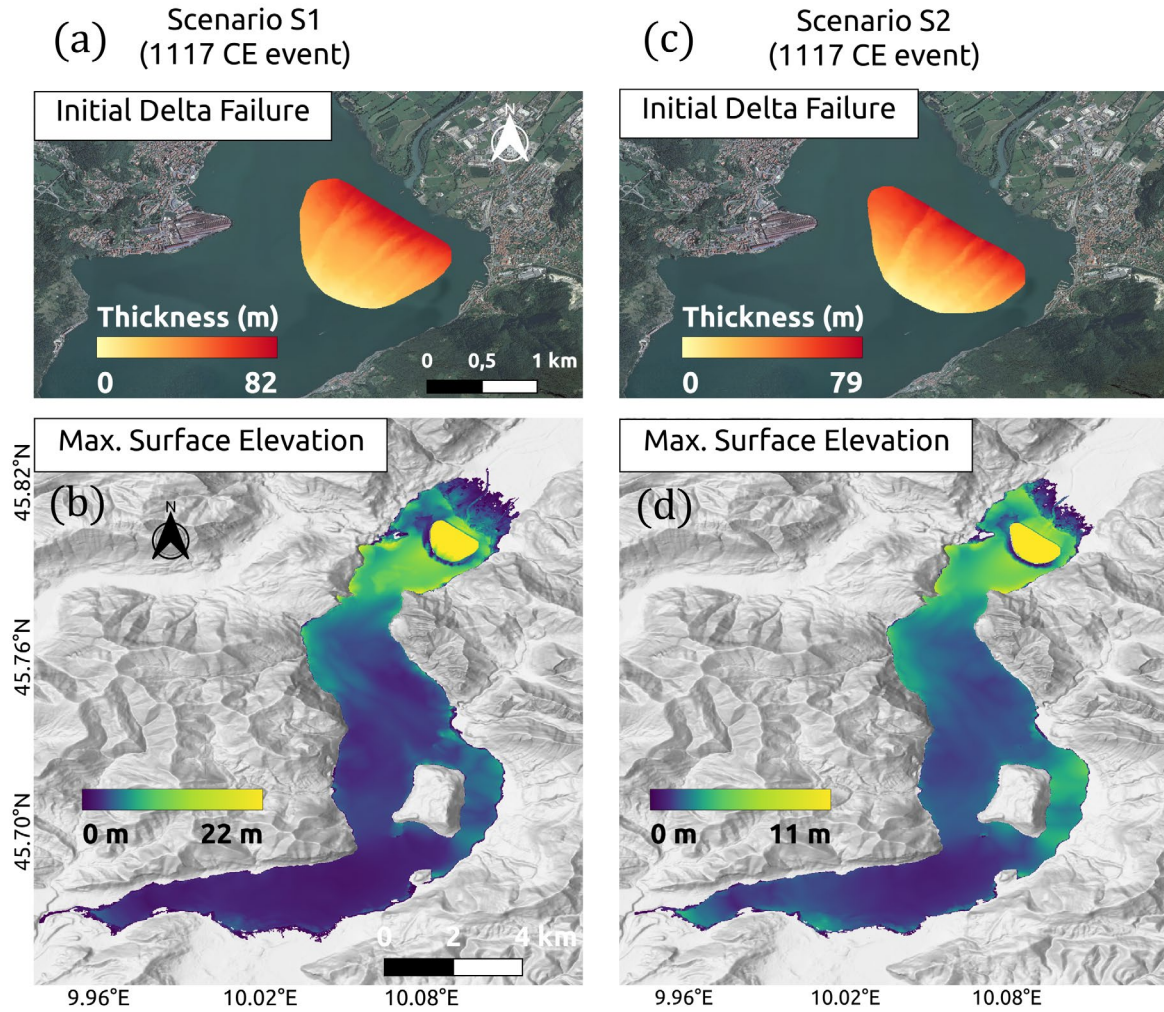
Supplementary Fig. 4: Dispersive sensitivity analysis. Free-surface elevation at $t = 3.56$ min from the (a) nondispersive shallow-water model (NSWE) and (b) weakly dispersive Boussinesq model. The dashed line indicates the transect, whereas the dotted line represents the location of synthetic Gauge 1. (c) Surface-elevation cross-sectional profile along the transect at $t = 3.56$ min. (d) Surface-elevation time series at Gauge 1.

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Supplementary Fig. 5: Froude number evolution. Temporal evolution of the Froude number during the first 200 s for the 1117 CE event.



Supplementary Fig. 6: Landslide initiation depth sensitivity analysis. (a, c) Initial reconstructed landslide volumes for scenarios S1 and S2, in which the failed mass was initiated from depths of 45 and 75 m along the delta front, respectively. (b, d) Maximum tsunami surface elevations generated by the corresponding scenarios. Background satellite imagery in (a, c): Google ©2026 CNES/Airbus, Maxar Technologies.