

Response to Anonymous - Reviewer 1

The authors present a potentially valuable Holocene dataset of TOC and carbon accumulation rates from the Danube floodplain although I am not convinced that this merits publication in Biogeosciences as it does not present substantial new ideas or concepts. Below are my specific comments intended to improve the paper:

We thank the reviewer for the careful evaluation of our manuscript and for recognizing the value of the Holocene TOC and carbon accumulation dataset. We have addressed the reviewer's concerns regarding the broader significance and novelty of the study and revised the manuscript accordingly, as detailed in our responses to the specific comments below.

1. A map of the lower Danube floodplain is needed. The satellite view of the study region in Fig. 1 does not contain delineations of geomorphic zones and is hard to read for somebody who is not familiar with the region. It does appear that only the most distal sector of the floodplain has been considered.

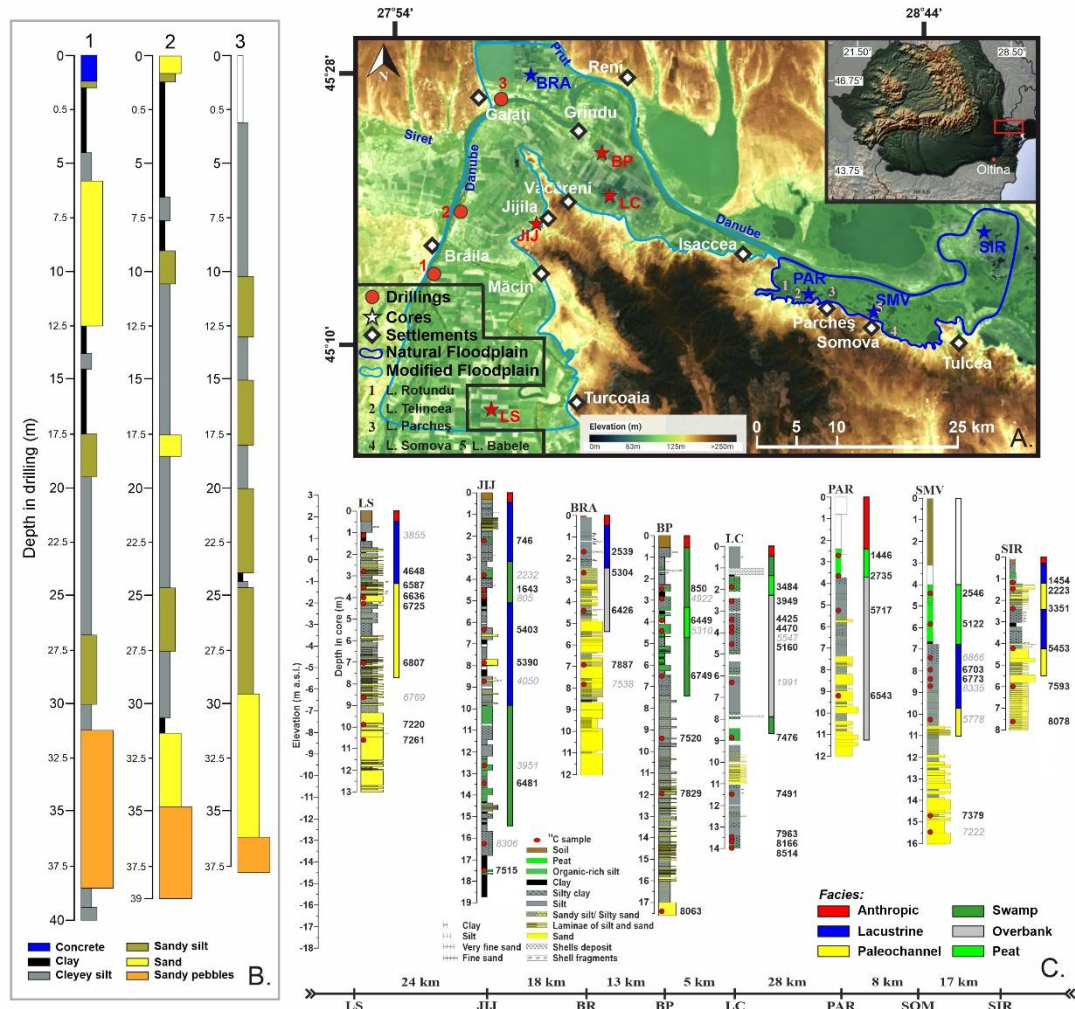


Figure 1. Distribution of sediment cores and stratigraphic framework of the LDF. (A) Location of the study area in SE Romania and spatial distribution of sediment cores shown on FABDEM Dataset (Hawker, L., Uhe, P., Paulo, L., Jehn, F., Kjeldsen, T. R., & Neal, J. (2022). A 30 m global map of elevation with forests and buildings removed. Environmental Research Letters, 17(2), 024016. <https://doi.org/10.1088/1748-9326/ac4d4f>) and Sentinel-2 Data (Satellite Overlay, European Space Agency (ESA). (2023). Copernicus Sentinel-2 MSI Level-2A Surface Reflectance. Processed on Google Earth Engine): newly recovered (red stars) and previously published (blue stars). Historical ISPIF drillings are shown as red circles and nearby settlements as white diamonds. Core sites are labelled using abbreviations corresponding to site names: LS – Șerban Lake, JIJ – Jijila Lake, BRA – Brateș Lake, BP – Popina Swamp, LC – Crapina Lake, PAR – Parcheș, SMV – Somova, and SIR – Sireasa. (C) Floodplain stratigraphy along the river transect. Stratigraphic logs of the studied cores are shown below the map, with vertical colour bars indicating interpreted sedimentary facies.

Thank you for this suggestion. We agree and will redraw the map to clearly delineate the two sectors discussed in the text – the natural floodplain (~120 km²), extending from the Danube Delta apex to Isaccea, and the artificially embanked agricultural sector (~780 km²), extending from Isaccea to Turcoaia – with clear boundaries and core locations overlaid on a simplified base map rather than satellite imagery. We would also like to clarify that the study area is not restricted to the distal (natural) sector: five of the eight cores (BRA, BP, LC, JIJ, and LS) were retrieved from the upstream, embanked agricultural sector, whereas two cores (PAR and SMV), together with the previously published SIR core, are located in the natural, distal sector. The revised map will make this spatial coverage explicit.

2. Many local names discussed in text are not provided in figures so the reader can understand what is being discussed.

Thank you. All place names mentioned in the text (lakes, settlements and rivers) will be labelled directly on the revised base map.

3. References are missing regarding previous work on stratigraphy of the region. Several old boreholes (1, 2, 3) that are presented graphically in Fig. 1 are not referenced and are not properly described in text.

We thank the reviewer for raising this point. Unfortunately, the documentation available to us for these historical boreholes is limited. What we can state is that they were drilled in the 1950s; no information on the drilling method or on the fate of the recovered material has survived. What we have access to are the original ISPIF (National Research and Development Institute for Soil Improvement) borehole description sheets – rudimentary lithological logs – which came into the possession of a former member of our research team; at the time they were obtained, these sheets no longer carried institutional registration numbers and were, in fact, scheduled for disposal. We used them solely to support the observation that coarse gravel deposits, interpreted as pre-Holocene (Late Glacial) in age, occur below ~30 m depth across the floodplain, consistent with, and providing regional context for, the base of the Holocene sequence captured by our own dated cores. In the revision we will state this provenance explicitly in the text and cite the logs as “unpublished ISPIF borehole records, 1950s,” confining their use strictly to this qualitative observation.

4. In general Fig. 1 is too busy. Previous boreholes are not presented at their ground elevation as their newer equivalents. I suggest splitting the figure: map with locations spelled out, old cores, new cores.

We agree. Fig. 1 has been restructured into three panels (see the revised figure shown under comment 1): (a) a geomorphological map of the study area, with all sites and place names labelled; (b) the historical ISPIF boreholes; and (c) the cores analysed in this study. In panel (c), the cores are plotted at their ground-surface elevation on a common elevation axis (m a.s.l.), so that their relative position in the floodplain is directly visible. For the ISPIF boreholes this is not possible: their locations are known only from hand-drawn field sketches referring to landmarks that no longer exist, so their ground elevation cannot be reconstructed reliably. In panel (b) they are therefore aligned to a common reference depth, and the caption states that this panel is schematic with respect to elevation.

5. The new cores in Fig. 1 should be simplified. Too many colors are used making them hard to read. I suggest adopting a black and white scheme for sedimentology/stratigraphy. Keep the facies interpretation with colors and extend to the bottom of each core. Why does facies identification end mid-core in most cases?

We appreciate the concern about readability and will substantially enlarge the legend and increase the visual weight/spacing of the lithological symbols in the revised figure. However, we would like to retain the colour-coded lithological scheme rather than switch to black and white, as this is a graphic convention our group has used consistently across our previous publications on these same cores and region (Vespreameanu-Stroe et al., 2017; Țuțuianu et al., 2018, 2021; Hanganu et al., 2023), and we consider it more informative once properly explained: green denotes peat, black denotes clay, grey denotes silt and yellow denotes sand, with intermediate sediment types shown as combinations (e.g., grey with black inclusions for clayey silt, grey with yellow dots for sandy silt); in addition, the width of each lithological bar itself encodes relative grain size, with wider bars corresponding to coarser sediment (hence sand, in yellow, is plotted wider than clay). We will make this legend/convention much more explicit and prominent in the revised caption and legend panel so that it is self-explanatory to a reader unfamiliar with our previous work, directly addressing the readability concern without discarding a scheme we consider more information-dense than a black-and-white lithological log. Regarding the extent of the facies interpretation: our facies assignment currently only covers the interval younger than ~7000 cal BP, which is the timeframe presented in this manuscript. Below this depth, the stratigraphy becomes more complex; we have preliminary indications from several samples of a brackish influenced layer, but this analysis is not yet complete, and we are therefore not in a position to confidently assign facies to these older, deeper intervals at this time. We will clarify this explicitly in the revised figure caption and text rather than extending the facies interpretation into an interval we cannot yet reliably characterise.

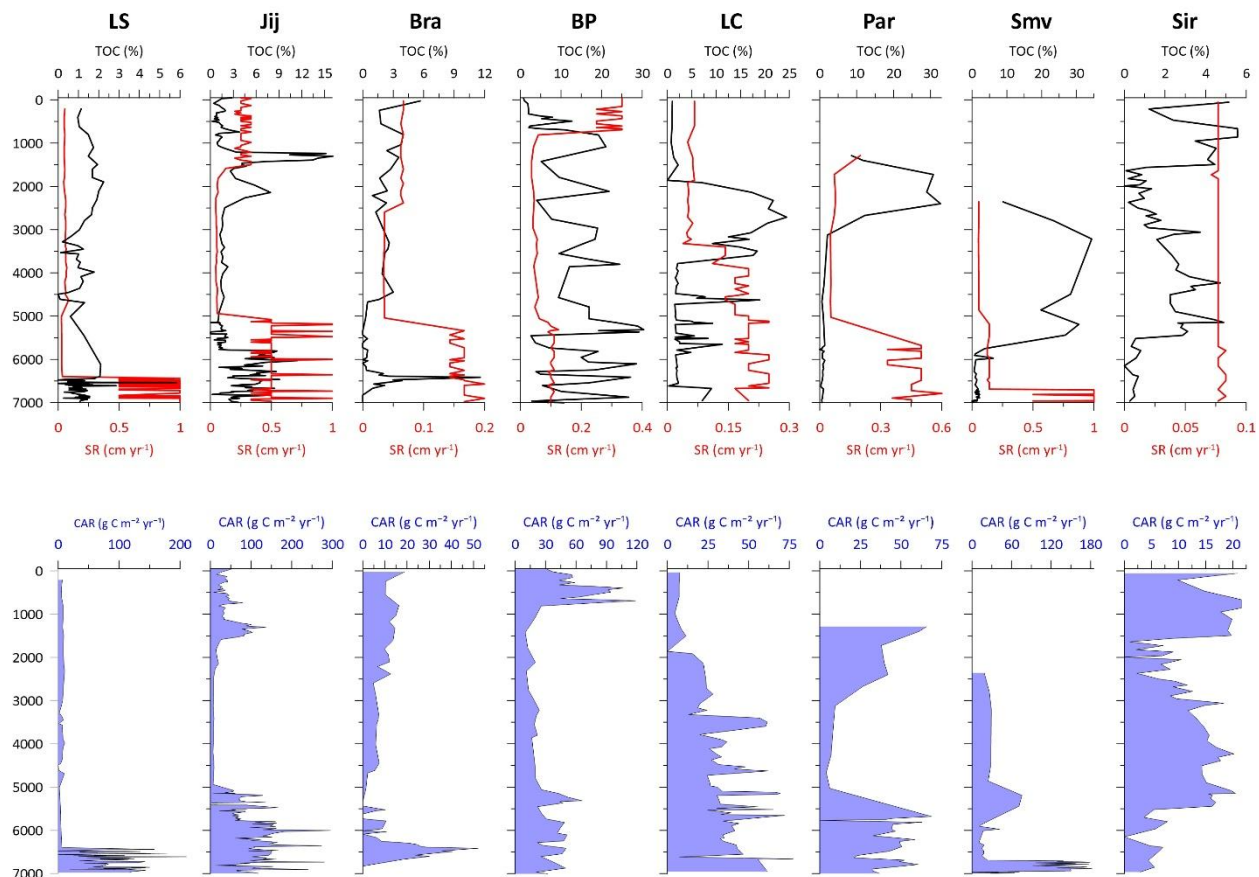
6. Fig. 2 is also very hard to read. I suggest using lines instead of filled pattern for TOC and sed rates as drivers and keep filled pattern only for CAR as a derived parameter. Text is unreadable due to font sizes – needs to be addressed. Take inset for the top 1 m out – see comment below.

Thank you. We accept the redesign of the profiles – TOC and sedimentation rate will be displayed as shaded curve (TOC) and line profiles, CAR will be kept as a filled/shaded curve and we will substantially enlarge all fonts, axis labels and legends. As detailed in our response to Reviewer 2

(Fig. 2 comment), the 1-m inset has been moved out of the main Fig. 2 and will be presented as a separate supplementary figure, to keep Fig. 2 consistent on a single, age-based axis. The reasoning is as follows: the upper 1 m of the agricultural cores represents a single continuously accumulated sedimentary sequence. In such a continuous sequence, we would not expect, on purely depositional grounds, a localized TOC minimum within this interval; however, it can be seen to decrease by up to 2.5 times compared to the immediately underlying, mechanically undisturbed interval of 50–100 cm. This close spatial coincidence between the depth at which TOC begins to decrease and the known depth of mechanical ploughing, in an otherwise uninterrupted depositional sequence, leads us to interpret it as a direct result of aeration and oxidation caused by mechanical ploughing of previously buried organic matter, rather than a natural depositional signal. We used agricultural cores for this comparison because, in cores from the downstream part of the study area, the upper part of the sequence is either missing or has been affected by channel dredging, making the comparison inappropriate.

Proposed new paragraph for Section 4.2 (after “...where concentrations are up to 2.5 times lower than those measured at a depth of 50–100 cm (Fig. 2).”):

“The upper meter of these cores represents a continuously accumulated sedimentary sequence, without a depositional hiatus or facies transition separating the shallower and deeper intervals. Within such a continuous sequence, a localized TOC minimum within the tillage-affected zone (0–50 cm), most pronounced at 20–30 cm, would not be expected on purely depositional grounds. We therefore interpret this pattern as evidence of aeration and oxidation of previously buried organic matter driven by tillage, rather than a natural signal of deposition. We restrict this comparison to cores from the artificially modified agricultural sector because, in cores recovered from the downstream part of the floodplain, the upper part of the sedimentary sequence is either absent or has been disturbed by channel dredging activities and is therefore not suitable for this type of comparison.”



7. The material dated by radiocarbon needs to be presented in Table 1 – what has been dated: bulk carbon, peat, plant parts? This should be done for all dates ideally but certainly for the new ones and old ones that have not been documented in this manner in their original papers. Justifications are needed for each eliminated outlier rather than a blanket statement in methods.

We will add a “dated material” column to Table 1 for every sample (bulk sediment organic carbon, peat, wood/plant macrofossil, etc.), sourcing this information from laboratory records for the new dates and, where necessary, rechecking the original publications for the previously published dates. Each of the sixteen excluded dates will be given an individual, sample-specific justification (e.g., age reversal relative to stratigraphically adjacent dates, reworked/redeposited material, disproportionately large uncertainty relative to the local age gradient) rather than the current blanket statement, and this will be presented in a supplementary table together with the individual age-depth models (see also our response to Reviewer 2’s general comment on age models).

8. Bayesian age–depth modeling does not fully account for the highly variable sedimentation on floodplains. This is a major point that should be discussed: how representative are the TOC measurements for highly heterogeneous stratigraphies? How is a simple averaging justified? A Monte Carlo approach is more warranted for such cases.

We thank the reviewer for this comment. The Bacon approach used here is itself a Monte Carlo method: it samples the age–depth model with an adaptive Markov chain Monte Carlo algorithm (the t-walk; Christen and Fox, 2010), producing an ensemble of age–depth realisations that respects stratigraphic order, allows the accumulation rate to vary between sections and accommodates outlying dates through a Student-t error model (Blaauw and Christen, 2011). Bacon was applied to four of the eight cores (LS, JIJ, LC and BP); for BRA, PAR, SMV and SIR the published chronologies are linear interpolations between dated levels, which we now state explicitly in the Methods. In the submitted version, only the median of the age–depth ensemble was carried into the sedimentation and carbon accumulation rates.

To address the reviewer’s concern directly, we have propagated these uncertainties by Monte Carlo sampling (age–depth realisations for all eight cores, together with the uncertainties of the TOC and bulk-density regressions and the choice of cores); the results are summarised in Fig. R1 below and in a short supplementary section. (i) Highly variable sedimentation: allowing accumulation within each dated interval to range from uniform to strongly episodic changes the millennial-scale phase sedimentation rates by less than 0.1 mm yr^{-1} (Fig. R1a), because a rate averaged over a millennium is total thickness divided by total time. (ii) Simple averaging: phase CAR is now computed as accumulated carbon mass divided by elapsed time, rather than as the arithmetic mean of per-sample values. The revised values are 37 (95 % interval 19–61), 17 (9–30) and 20 (10–33) $\text{g C m}^{-2} \text{ yr}^{-1}$ for Phases I–III, against 45.6, 16.1 and 23.2 in the submitted Table 2 (Fig. R1b); the ordering of the phases is unchanged, and the method is stated in the revised Methods. (iii) Representativeness: halving the number of TOC samples changes the phase means by less than 4 %, so the sampling density is adequate. 73–91 % of the CAR variance comes from differences between cores, against 4–20 % from the age models and 3–6 % from the TOC and bulk-density regressions (Fig. R1c). The limiting factor is therefore the number of cores rather than the age model, which we now state in the Discussion, and the revised Table 2 reports each phase value with its 95 % interval.

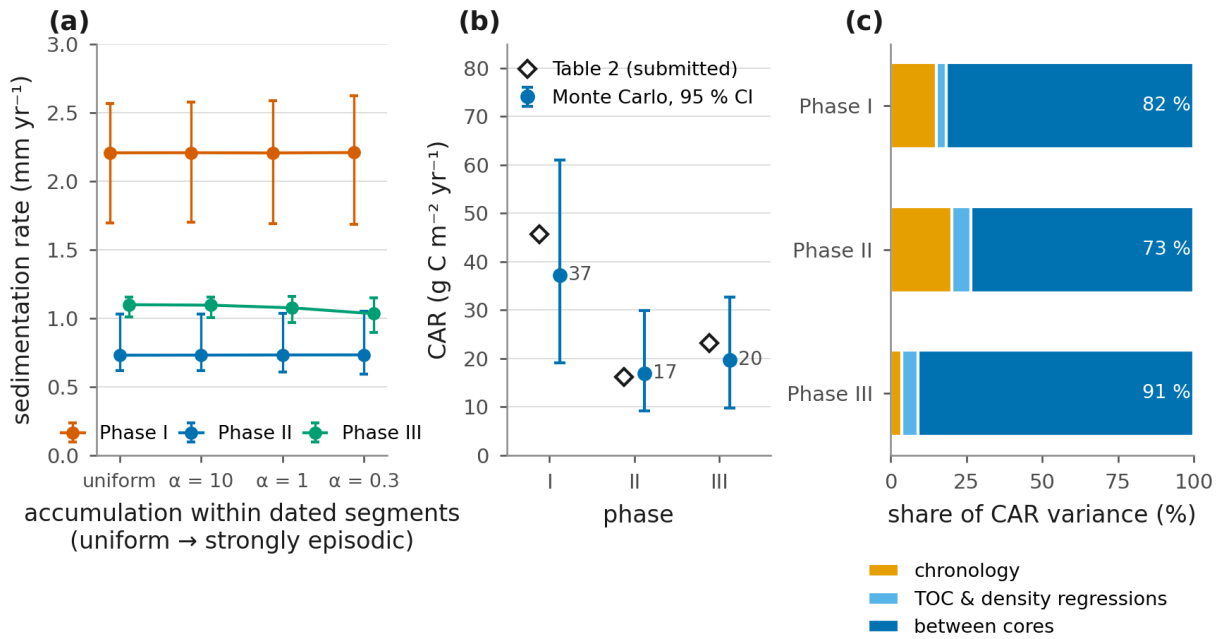


Figure. Monte Carlo propagation of the age–depth, TOC and bulk-density uncertainties (density conversion as in the manuscript). (a) Pooled phase sedimentation rate (median and 95 % interval) as accumulation within dated segments is made increasingly episodic (Dirichlet concentration α ; uniform = linear accumulation). (b) Phase CAR from the submitted Table 2 (open diamonds) and from the mass-conserving Monte Carlo estimate with its 95 % interval. (c) Share of the CAR variance due to the age models, the TOC and bulk-density regressions, and the differences between cores.

9. More documentation is needed (photos, x-radiography) as well as references on assigning depositional environment from facies. I checked some of the previous publications on cores presented here and such documentation is also missing there. Assigned lithostrat units for the region are not clear in the heterogeneous cores presented in this paper. Clearly delineate them in figures and support assertions by data.

Thank you for this comment. We agree that additional documentation of the sedimentary facies and a clearer justification of their depositional interpretation are needed. We do not have X-radiography for the cores analysed in this study; therefore, we cannot provide it. The facies were identified through detailed visual inspection of the cores, and their interpretation was supported by grain-size distributions and organic-matter content (see the figure below). To strengthen the facies interpretation, we will include representative core photographs in the Supplementary Material showing: (a) the transition between over-bank and lacustrine deposits in the Bra core, (b) the

transition between paleochannel and lacustrine deposits in the LS core, and (c) the transition between organic-rich and lacustrine deposits in the Jij core.

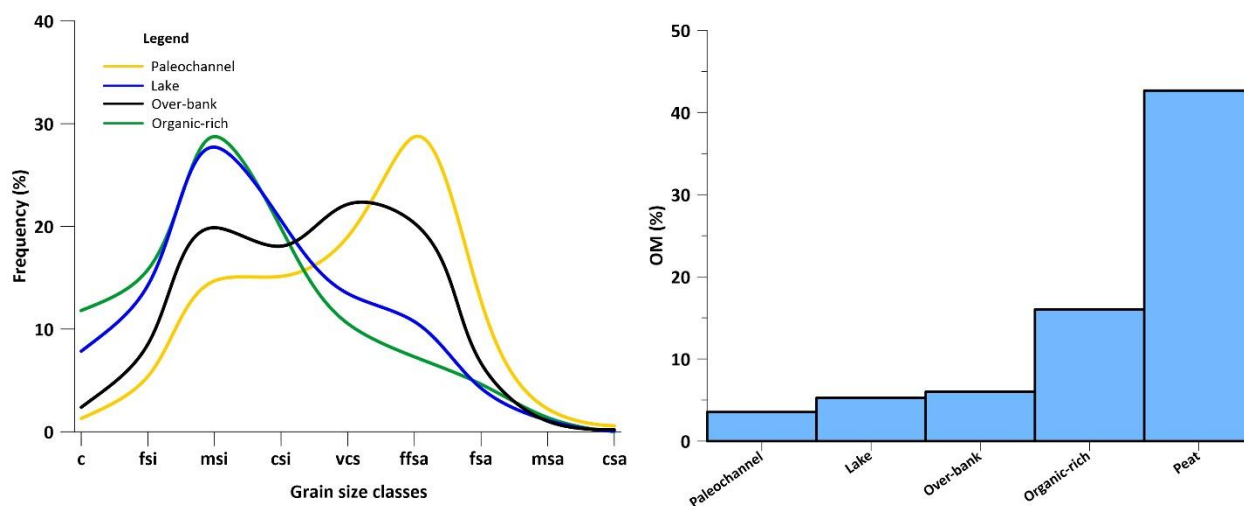


Figure. In the left panel is the mean grain-size frequency distributions for each environmental deposition showing a clear contrast between lacustrine and organic rich deposits that are dominated by medium silt and clay, over-bank deposits characterised by a bimodal with enrichment in coarser silt and very fine sand, and paleochannel deposits that are dominated by very fine sand. Grain-size classes follow Folk and Ward (1957): c = clay, fsi = fine silt, msi = medium silt, csi = coarse silt, vcs = very coarse silt, vfsa = very fine sand, fsa = fine sand, msa = medium sand, csa = coarse sand. In the right panel is the mean organic matter (OM %) content for each environmental deposition showing an increase in concentration from paleochannel to peat deposit. Peat is not represented in panel (A), as grain-size analyses were not performed on peat or highly organic samples.

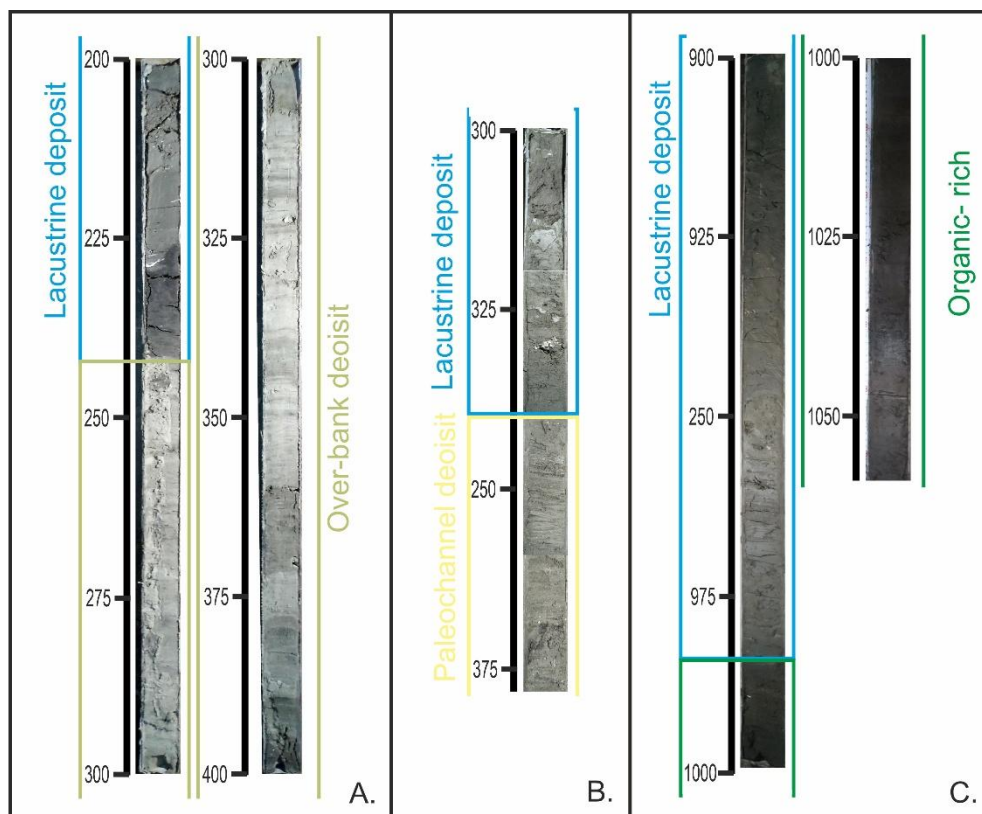


Figure. Representative core photographs illustrating the main facies transitions: (A) Transition between over-bank deposits and lacustrine deposits in the Bra core. (B) Transition between paleochannel deposits and lacustrine deposits in the LS core. (C) Transition between organic-rich deposits and lacustrine deposits in the Jij core. Depth scales are indicated in centimeters.

10. The use of depth distribution in the upper 1 m to assess anthropogenic impacts is not warranted as sedimentation rates are presumably different in time for each core and certainly different between cores. A detailed age model is needed, such as based on radiogenic isotopes with appropriately short half-lives. The discussion at the end of the paper on the recent period is unwarranted without such data.

Thank you for pointing this out. It appears that the rationale for this comparison was not sufficiently explained in the manuscript. As mentioned in our response to comment 6, we selected the upper metre of the cores to highlight the effect of ploughing during the last decades on carbon stored in the shallowest part of the sediments deposited in the LDF. We acknowledge that the age of this interval is not uniform among the cores: according to the age–depth models, the upper 50 cm may correspond to approximately 900 BP in one core and to approximately 100 BP in others, reflecting the considerable spatial heterogeneity in sedimentation rates across the floodplain. Therefore, we do not interpret the upper metre as a time-equivalent recent sedimentary interval. Rather, our comparison focuses on the present-day distribution of organic carbon within the shallow subsurface and on the effects of agricultural disturbance on this sedimentary layer. In the artificially drained and cultivated sectors, repeated ploughing during the last decades has disturbed the shallow sediment and promoted exposure and oxidation of organic matter, resulting in lower organic carbon contents in the uppermost sediments. We also agree that, without short-lived radionuclide chronologies (^{210}Pb , ^{137}Cs), which are not available for these cores, sedimentation rates for the last century cannot be resolved. We will state this as a limitation and restrict the discussion of the recent period to the TOC depletion in the plough layer, without inferring recent accumulation rates.

11. The OC budget for LDF as 1.7 Gt is confusing. What area was used for computation? How is the average depth that was used supported? Is this the whole LDF as stated in the paper or just a part of it?

We thank the reviewer for this question, which points to a real ambiguity in the text. The value of 58 Gt of sediment and 1.7 Gt of organic carbon was an attempt at a budget for the whole Lower Danube Floodplain: the core data were extrapolated over $\sim 7000 \text{ km}^2$, including the Danube Delta and the far-reaching lower Danube floodplain, where carbon accumulation is not constrained by our cores, and the area was not stated. We agree that this extrapolation is not supported by the data, and we will restrict the estimate to the $\sim 900 \text{ km}^2$ study area described in Section 2 (from Turcoaia to the Danube Delta apex, i.e. the $\sim 780 \text{ km}^2$ embanked sector and the $\sim 120 \text{ km}^2$ natural sector), from which all cores were recovered, stating the area explicitly. The $\sim 9.1 \text{ m}$ is the mean thickness of the sediment deposited over the last 7000 years in the cores. For the 900 km^2 study area this gives $\sim 7.1 \text{ Gt}$ of sediment and $\sim 0.19 \text{ Gt}$ of organic carbon (95 % interval 0.16–0.23 Gt), computed from the mean bulk density and the mass-weighted mean TOC of the upper 9.1 m of the cores; scaled to $\sim 7000 \text{ km}^2$, the same column gives $\sim 55 \text{ Gt}$ of sediment, consistent with the submitted value. The partition of the sediment mass between periods (60.8 % before 5000 cal BP, 22.2 % in the last 2000 years) is a ratio and is not affected. We will also state that extrapolating eight cores

to the study area is the main source of uncertainty in these values, with the area and thickness as its largest components.

12. What do the authors mean by “geomorphic stability” in Table 2? How was this assessed?

Thank you for pointing this out. By “geomorphic stability” we refer to the relative persistence of floodplain geomorphic and depositional environments. This terminology follows our previous interpretation of the formation and evolution of wetlands and lakes on the Lower Danube Floodplain, where we distinguished a dynamic floodplain stage (8000–5500 BP) from a meta-stable floodplain stage (5500 BP–present; Țuțuianu et al., 2021). This interpretation is based primarily on sedimentary and chronological evidence. During the 8000–5500 BP interval, rapid relative sea-level rise resulted in repeated transitions between wetland/lacustrine and relatively dry floodplain conditions, expressed by alternating coarse- and fine-grained sedimentary units. In contrast, after ca. 5500 BP, the marked deceleration of sea-level rise was accompanied by lower aggradation rates and the development and persistence of wetlands and lakes, represented predominantly by fine-grained sediments and peat. Thus, “geomorphic stability” refers to the persistence of floodplain environments and the reduced frequency of major environmental transitions, rather than to the absence of geomorphic change. We note that the exact phase boundaries presented in Table 2 of the current manuscript (7000–5000, 5000–2000 and 2000 cal BP–present) differ slightly from those of our earlier study, reflecting the refined, higher-resolution chronology developed here from 64 dated horizons across eight cores; the underlying concept of relative geomorphic stability, however, remains the same, and we will add a clarifying sentence to this effect in the revised Table 2 caption.

13. The fact that TOC is not correlated with depth is not a new finding in a heterogeneous floodplain deposit. Any long-term record of OC in such an environment shows that.

We agree that this pattern has precedent in the floodplain/alluvial literature and already cite comparable studies (Brevik and Homburg, 2004; Heger et al., 2021; Hoffmann et al., 2013). We will reframe this result in the revised text as confirmation of a general floodplain behaviour rather than a stand-alone novel finding, while retaining it because it underpins our facies-based interpretive framework (Section 5.1) and directly motivates the discussion on sampling-depth bias in floodplain carbon inventories (Bennett and Chambers, 2023; D’Elia et al., 2017).

14. Authors say: “Areas subject to frequent or prolonged inundation – such as topographic depressions, abandoned channels, or infilled lake basins – consistently exhibit TOC values of 7–10 % higher than those of rarely flooded or well-drained environments.” Where do they present such data systematically? Peats and organic rich sediment are presented in Fig. 5. The CAR data in the same figure is more interesting but needs to be documented better in terms of facies detection – see above.

We thank the reviewer for this comment, which raises the same concern as Reviewer 2 (Line 364ff) regarding the empirical support for this statement. Having reconsidered both comments together, we revised our analysis and the underlying paragraph, replacing it with a version explicitly grounded in core-by-core data. Using historical topographic maps from the first half of the 20th century to characterize the hydrological connectivity of each site, and comparing this against measured TOC in equivalent facies, we found that well-connected lacustrine cores (Brateș, mean TOC 2.4%, and Sireasa, 4.1%) show consistently higher TOC than more isolated lacustrine cores

(Șerban and Jijila, 1.3% each). A comparable contrast holds among organic-rich facies: the well-connected Popina Swamp (7.7%) exhibits markedly higher TOC than the more distal Crapina Lake (2.9%). This directly documents the systematic connectivity–TOC relationship the reviewer asks about, rather than relying on the qualitative statement alone. Regarding the CAR/facies-detection documentation raised in the same comment, this is addressed together with our response to comment 9 (core photographs and explicit facies-assignment criteria to be added as supplementary material).

Revised paragraph: “Another critical control is local hydrological connectivity, which strongly shapes spatial TOC distribution across the LDF by modulating oxygen exposure and redox conditions, sedimentation rates, and organic matter inputs. Well-connected settings typically sustain higher sedimentation rates, promoting more rapid burial of organic matter and earlier onset of anoxic/sub-oxic conditions within the sediment column, thereby limiting microbial oxidation and enhancing long-term carbon preservation. This pattern is supported by our core-based dataset: using historical topographic maps from the first half of the XX century to characterize the connectivity of each site, and comparing the mean TOC of the uppermost facies of each core (the deposits formed under these connectivity conditions), cores from well-connected lacustrine settings – Brateș (BRA, mean TOC 2.4%), periodically inundated during high-water stages, and Sireasa (SIR, 4.1%), linked to the Danube via a network of small distributary channels – show consistently higher TOC than cores from more isolated lacustrine settings – Șerban (LS, 1.3%), situated within the interior of Insula Mare a Brăilei, and Jijila (JIJ, 1.3%), located in the distal floodplain more than 5 km from the main Danube channel. A comparable contrast is observed among organic-rich facies: Popina Swamp (BP, 7.7%), well connected via several small channels to the main Danube channel, exhibits higher TOC than the more distal Crapina Lake (LC, 2.9%). These site-specific differences are consistent with observations from the Elbe floodplain (Heger et al., 2021) and the Austrian Danube floodplain (Tockner et al., 1999), where connectivity gradients exert a primary control on SOC stocks and the efficiency of organic matter retention.”

15. The sea level driven TOC, CAR scenario is the same as any similar environment – too many references to cite but the authors should integrate this finding in a larger knowledge context than the one or two cases they cited, and discuss what makes the Danube different, if anything.

We agree that the transition from burial-dominated to preservation-dominated carbon accumulation under a rising and then stabilising base level is a generic pattern, documented in many lowland floodplains and deltas, and we will expand the comparative discussion in Section 5.2 accordingly, comparing our phase values with published Holocene carbon-accumulation and sedimentation-rate records from other base-level-controlled systems (e.g. the Rhine–Meuse; Hijma et al., 2009) rather than with one or two cases. Within this common framework, three aspects make the Danube case specific, and the revised Discussion will state them explicitly. (i) The base level of the LDF is the Black Sea, a semi-enclosed basin whose Holocene level history differs from the global eustatic curve; the timing of the transition we observe (~5000 cal BP) therefore reflects the regional base-level history rather than global sea level alone. (ii) The LDF lies immediately upstream of a large, prograding delta, within the reach where the Danube’s water level is controlled by base level; base-level change is therefore transmitted to the floodplain through the delta plain, and floodplain accommodation continued to depend on delta growth after sea-level rise slowed. (iii) The Danube is a large, sediment-rich river whose sediment supply has since been strongly reduced by damming (from ~57 to ~19 Mt yr⁻¹), so that the same archive records both the natural

base-level control and its recent anthropogenic override. We see the contribution of the LDF record in quantifying these controls for a large, sediment-rich and now heavily regulated river, rather than in the base-level mechanism itself.

16. Bottom line: What is the added value of this study beyond the set of new data?

We appreciate the directness of this question and will address it explicitly in the revised Introduction and Conclusions. Beyond the dataset itself, we consider the added value of this study to be:

(1) one of the few multi-core, chronologically-resolved reconstructions (eight cores, 64 radiocarbon dates, 7 kyr) of Holocene carbon burial for a large European floodplain situated downstream of a heavily dammed river system (the Danube), addressing a documented gap in fluvial floodplain carbon budgets;

(2) a demonstration, within a single well-dated record, that base-level change and catchment-scale anthropogenic forcing act as sequential, temporally separable controls on carbon burial efficiency, a process-based framework transferable to other base-level-sensitive floodplain and deltaic systems;

(3) within the same record, an explicit demonstration of how the more recent anthropogenic chain, dam construction, embankment, and subsequent conversion of the floodplain to agricultural land, has reduced the organic carbon content of the shallow, now-cultivated floodplain sediments (by up to 2.5-fold in the plough layer). This provides a quantitative, pre-disturbance baseline against which this ongoing degradation can be benchmarked, directly relevant to floodplain restoration planning under the EU Nature Restoration framework.

(4) a management-relevant result: carbon burial in the LDF is controlled by sediment supply and accommodation space rather than by organic carbon concentration; the phase with the highest TOC (Phase II) has the lowest CAR, and vice versa. Carbon inventories based on TOC concentration, or on the uppermost metre only, therefore misjudge floodplain carbon storage, and restoration aimed at carbon sequestration must restore sediment delivery and hydrological connectivity rather than rely on rewetting alone (see also our response to Reviewer 2's general comment).