Referee 3

General Comments

Comments	Responses
This manuscript examines how urbanization affects soil organic carbon stocks, source composition, and stability in natural mangroves, restored mangroves, and tidal flats across three Guangdong cities classified at low, moderate, and high urbanization levels. The topic is timely, and the three-habitat comparison is useful.	We sincerely thank you for your positive evaluation and kind recognition of our study.

Specific Comments

Comments	Responses
The study attributes observed differences in SOC stocks, sources, and stability to urbanization, but the Methods do not specify how the urbanization effect is identified or tested.	Thank you very much for this important comment. We agree that the original Methods did not state sufficiently clearly how urbanization was operationalized as an explanatory variable or how its association with soil-carbon properties was statistically evaluated. We have therefore revised the Methods to distinguish explicitly between the construction of the urbanization gradient and the statistical tests used to assess responses along that gradient. Urbanization intensity was quantified using four socioeconomic indicators, including the proportion of the urban population, the proportion of the non-agricultural population, per capita disposable income of urban residents, and built-up area. These indicators consistently ranked Zhanjiang, Shantou, and Huizhou as representing low, moderate, and high urbanization contexts, respectively. Urbanization level was then included in the analyses as a three-level categorical explanatory variable. Because habitat type and urbanization represent distinct dimensions of the study design, urbanization-related differences were evaluated within each habitat type rather than inferred from pooled comparisons among habitats. Differences in soil organic carbon stocks and stability among urbanization levels were tested using

	linear mixed-effects models (LMMs), followed by post-hoc multiple comparisons. Differences in source composition were evaluated using MixSIAR. We have now added the corresponding model structures, response variables, fixed effects, random effects where applicable, and post hoc comparisons to the Methods. We also clarify that each urbanization level is represented by one coastal region. The analyses therefore identify associations between soil-carbon characteristics and contrasting urbanization contexts, but they do not isolate a causal urbanization effect independently of all regional environmental variation. We have revised both the Methods and Discussion to make this inferential scope explicit.
The MixSIAR model considers only mangrove leaf tissue and marine phytoplankton but overlooks terrestrial inputs (see the terrestrial end-member from https://doi.org/10.1021/acs.est.3c00012).	Thank you very much for your valuable comment. We fully agree that allochthonous organic matter may represent an important source of soil organic carbon in some coastal ecosystems. In the revised manuscript, the selection of end-members for the MixSIAR model was primarily based on previous studies Huang et al. (2025), Zhang et al. (2024) and Zhang et al. (2022), which consistently highlight the key contributions of mangrove-derived and marine-derived organic matter in blue carbon ecosystems. We do not exclude the potential contribution of terrestrial organic matter; however, because no terrestrial end-member samples were collected in this study, site-specific isotopic signatures for terrestrial inputs were not available. Thank you for raising this important issue. We agree that terrestrial organic matter may contribute to soil organic carbon in coastal wetlands and should not be assumed to be absent from mangrove sediments. However, we do not consider terrestrial organic matter to be a statistically identifiable third end-member in the present MixSIAR model. Mangroves and most terrestrial woody vegetation both use the C3

	photosynthetic pathway and therefore show strongly overlapping carbon isotope signatures, commonly centred near minus 28 per mille (Kohn, 2010; Kristensen et al., 2008). Their nitrogen isotope values are also highly variable and may overlap because they are influenced by nitrogen sources, nutrient conditions, and post-depositional processing. Consequently, adding a literature-derived terrestrial end-member to our dual-isotope model would introduce substantial end-member overlap and would not allow reliable separation of terrestrial C3 material from mangrove-derived material. Under such conditions, estimated contributions may become strongly dependent on the specified priors rather than being resolved by the isotope data. Combining isotopically indistinguishable and ecologically related sources is an established approach in stable-isotope mixing models. Previous studies of mangrove sediments have therefore frequently used two broad source groups, namely mangrove or vascular-plant material and estuarine or marine suspended organic matter, to distinguish locally produced plant carbon from externally supplied aquatic carbon (Bouillon et al., 2003; Kristensen et al., 2008; Suello et al., 2022). The terrestrial end-member used by Li et al. (2023) is informative for demonstrating the potential importance of allochthonous inputs, but its isotopic values are site dependent and cannot be transferred directly to our study sites as an independently resolvable source. We have therefore retained the two-source model but revised the interpretation of the plant end-member. It is now defined as C3 vascular plant-derived carbon, represented by locally collected mangrove tissues, rather than as carbon that can be attributed exclusively to mangroves. Accordingly, references to mangrove-derived carbon in the Methods, Results, and Discussion have been revised to mangrove-dominated C3 vascular plant-derived carbon where appropriate. We also clarify that the model

	primarily distinguishes C3 vascular plant inputs from phytoplankton-derived inputs and cannot exclude a contribution from isotopically similar terrestrial C3 vegetation.
The phrasing "composition of organic-carbon sources" (H2, line 75) is awkward. The intended meaning is the relative contribution of different sources to soil organic carbon, not the composition of the sources themselves. Consider replacing with "source composition of soil organic carbon" or simply "organic carbon source contributions," and apply the revised phrasing consistently across the abstract, hypotheses, and Discussion.	Thank you for this helpful comment. We agree that "composition of organic-carbon sources" could be misinterpreted as referring to the properties of the source materials rather than their relative contributions to soil organic carbon. We have therefore replaced this phrase with "organic carbon source contributions" throughout the Abstract, hypotheses, Results, and Discussion. This revision more accurately describes the quantity estimated by the mixing model and ensures consistent terminology throughout the manuscript.
The Introduction and Discussion invoke mineral-associated organic matter fractions, Fe/Al-bound carbon, thermal indices, and radiocarbon ages as relevant stability metrics, yet none were measured (see the stabilization mechanisms documented in https://doi.org/10.1111/gcb.70763). The Discussion should more clearly separate what was measured from what is inferred by analogy with the cited literature.	Thank you for this important comment. We agree that the original manuscript did not sufficiently distinguish the stability indicator evaluated in this study from stabilization mechanisms documented in the literature. In the present study, soil-carbon stability was assessed only from the fitted β parameter, which we use as a relative proxy for apparent SOC turnover. We did not measure mineral-associated organic matter, Fe- or Al-bound carbon, thermal stability indices, molecular recalcitrance, or radiocarbon ages. We have therefore revised the Introduction, Discussion, and Conclusions to state this distinction explicitly. We have also removed or qualified statements that could be interpreted as direct evidence for changes in mineral protection, thermal recalcitrance, or carbon age. The revised Discussion now interprets declining β values as evidence of faster apparent SOC turnover under increasing urbanization. Mineral association, Fe and Al binding, molecular composition, and microbial processing are discussed only as potential mechanisms identified by previous

	studies, including Li et al. (2026), rather than as processes demonstrated by our data. We further clarify that the available measurements cannot determine which stabilization mechanism caused the observed turnover patterns.
The linear mixed-effects model structure is unreported. The Methods state that LMMs were used but do not specify the fixed-effect structure, the random-effect structure, or the grouping variable	Thank you very much for your valuable comment. In response, we have revised the Methods section of the manuscript to include a complete description of the linear mixed-effects model (LMM) structure, explicitly specifying the fixed and random effects.
The phytoplankton sampling (five 500 mL samples per site, line 116) is described, but the processing steps (filtration, drying, isotope measurement) are not. What organism-level end-member values were used in MixSIAR? Were they site-specific or pooled?	Thank you for this important comment. We agree that the original Methods did not provide sufficient information on phytoplankton processing or on how the source end-members were parameterized in MixSIAR. We have now added the complete phytoplankton processing procedure. At each site, five 500 mL water samples were processed separately and treated as analytical replicates. Samples were filtered through glass microfiber filters, and the retained material was rinsed to remove dissolved salts. Filters were dried using a freeze dryer for 3–5 days, homogenized, and analysed for carbon and nitrogen stable isotopes using DELTA V Advantage isotope ratio mass spectrometer. We have also clarified the quality-control procedures and isotope-reference standards used during analysis. For MixSIAR, the phytoplankton and plant end-members were not represented by single organism-level measurements. Instead, isotope measurements from multiple samples were used to estimate the mean and standard deviation of each source group. The phytoplankton end-member was $\delta^{13}C$ = [-18.46 ± 5.27]‰ and $\delta^{15}N$ = [10.66 ± 2.06]‰ based on 39 samples, whereas the C3 vascular plant end-member represented by locally collected mangrove leaves was $\delta^{13}C$ = [-28.57 ± 1.37]‰ and $\delta^{15}N$ = [7.66 ± 1.38]‰ based on 72 samples. These values and their associated variation are now

	reported explicitly in the Methods and Supplementary Information. The end-members were pooled across sampling locations rather than specified separately for each site. We adopted this regional parameterization because the regional-scale objective of the study. Importantly, the among-site variation was retained through the source standard deviations entered into MixSIAR, rather than reducing each source to a single fixed value. We have clarified that this approach assumes that the broad isotopic characteristics of the two source groups are regionally comparable and may not capture all local variation in end-member signatures. This limitation has now been acknowledged in the Discussion.