EGUSPHERE-2026-1398 Response to RC1
Reviewer comments are in italics; author responses follow each point.

[Reviewer]
The authors use ERT, hydrological monitoring, and sediment analysis to show that fine-grained sediments in a low-energy Australian barrier estuary create a vertically stratified groundwater system, with shallow saline water overlying fresher deeper groundwater, controlling vegetation zonation across the wetland transect. Overall, the paper requires substantial revision. In my view, the main issues are: 1) insufficient engagement with the existing literature on this topic, several important contributions are missing; 2) some discrepancies between results obtained using different methods; 3) the central message of the paper is not well focused , I suggest the authors better highlight the strength of their data collection effort across the transect, which is genuinely valuable; 4) the Results section should expand the hydrological analysis and reduce the space dedicated to site setup and sediment characterization , part of this material would be better placed in the Methods, and I would recommend a dedicated section linking hydrology/hydraulics to sedimentation; 5) evapotranspiration is entirely absent from the Results; 6) the Methods section is occasionally too detailed and risks losing the reader's focus and I recommend trimming it. The paper sometimes reads more as a technical report than a research article, and I would encourage a full reorganization. However, I believe the dataset, even from a single transect, is sufficient to tell a compelling story on a topic that is highly relevant and increasingly discussed in the scientific community. I recommend major revisions.

[Author response] We thank the reviewer for their thorough and constructive assessment of our manuscript, and for acknowledging the value of our dataset and narrative we have to tell. To strengthen our framing and contextual expertise, we have invited Dr. Jeffrey Kelleway (University of Wollongong, Australia) to join the authorship, given his previous input to this research work at Bensville and his extensive knowledge of Australian coastal wetland ecosystems, particularly supratidal forests, to ensure this narrative is clear in its content and context. We also greatly appreciate the extensive literature provided throughout the review; this will be instrumental in ensuring our manuscript engages better with the global existing literature on coastal wetland hydrology and positions our findings within the broader scientific discussion on this topic.

Regarding the central message of the contribution of our study, we agree that this requires sharper focus. We will reframe our narrative to demonstrate the novelty of our integrated biophysical dataset across diverse vegetation communities - mangrove, saltmarsh, supratidal forest, and terrestrial forest - all observed from a single transect. This site setup is unique, particularly for Australian settings, where such comprehensive measurements of both surface and subsurface processes across a full estuarine vegetation gradient are lacking. This is why we are able to provide such a rich and full dataset from the single transect (as acknowledged from the reviewer). This is also why we provide a section in results and discussion for this site setup, as it is comprehensive for measuring vegetation and biophysical processes (both surface and subsurface) across a wetland gradient.

We will address the specific points raised by the reviewer in detail below. We will engage with the suggested literature to better contextualise our findings globally. We will closely examine the discrepancies between methods identified by the reviewer; and this is helped greatly by specific comments provided by the reviewer below in methods and results. We will streamline the Methods section to ensure brevity while being explicit about the uniqueness of the site setup in this setting. We will also ensure clarity around the influences on rainfall variability, primarily through climate related phenomena such as Phases of the El Niño Southern Oscillation, rather than a wet vs dry season as observed elsewhere in Australia and around the world. We will also address the contribution of ET in relation to our setting and our findings.

We appreciate the reviewer's caution regarding the manuscript reading as a technical report and will thoroughly revise the structure and narrative throughout to ensure the connection to our aim and objectives remains clear to the reader. We are confident these revisions will uplift the paper into a compelling research article that fully leverages the strength of our dataset to tell a compelling narrative about sediment-controlled groundwater and salinity stratification across an estuarine wetland transect in an Australian setting.

[Reviewer]
Abstract. *The abstract is well written. I would also recommend including quantitative values where possible, as numbers help catch the reader's attention. For example: "Results reveal a pronounced lateral and vertical salinity structure characterized by a shallow saline wedge extending inland* ***[how far?]*** *within fine-grained intertidal sediments, while deeper groundwater remains comparatively fresh."* The last sentence feels disconnected from the rest of the abstract.

[Author response] Agreed. Important quantitative values will be included in abstract, as per example provided by reviewer. The last sentence will be reworked to ensure clear connection to the overview provided in the abstract and the outcome of this research.

[Reviewer]
Introduction. *The writing is clear, but the reference list needs revision since several key contributions to this field are missing and should be acknowledged. Some examples: Pennings & Bertness (2001); Cahoon et al. (2021); Mariotti & Carr (2014); Fagherazzi et al. (2012). At line 42, I recommend engaging with the work of Matthew Kirwan's group, whose research focuses on the links between organic matter, sedimentation, elevation, and sea-level rise. At line 50, I recommend engaging with the work of Alicia Wilson's group, which is very active on groundwater dynamics in salt marshes. At line 57, I suggest also citing Guimond et al. (2024), Adams et al. (2024), and Pratt et al. (2025). At line 71, Tackley et al. (2025) published an important study on the role of marine sediment in regulating saltwater intrusion during flooding events…I recommend reading and citing it. At line 71, I agree that surface–groundwater dynamics in coastal critical zones and their ecological consequences remain understudied, but interest in this topic is growing rapidly. Examples include LTER coastal sites in the United States and the Coastal Critical Zone Network. This is a timely and increasingly central topic in the scientific community, and the authors should frame their contribution accordingly.*

[Author response] This is such a helpful comment from the reviewer, with clear guidance on literature that we need to engage with and integrate into our manuscript to ensure connection to broader global literature. We will ensure these are included as relevant so that we can increase the relevance of our study to this increasingly important study area.

[Reviewer]
Pennings, S. C., & Bertness, M. D. (2001). Salt marsh communities. Marine community

ecology, 11, 289-316.Cahoon, D. R., McKee, K. L., & Morris, J. T. (2021). How plants influence resilience of salt marsh and mangrove wetlands to sea-level rise. Estuaries and Coasts, 44(4), 883-898.

Mariotti, G., & Carr, J. (2014). Dual role of salt marsh retreat: Long-term loss and short-term resilience. Water Resources Research, 50(4), 2963-2974.

Fagherazzi, S., Kirwan, M. L., Mudd, S. M., Guntenspergen, G. R., Temmerman, S., D'Alpaos, A., ... & Clough, J. (2012). Numerical models of salt marsh evolution: Ecological, geomorphic, and climatic factors. Reviews of Geophysics, 50(1).

Pratt, D., Guimond, J. A., Bacmeister, E. S., Fagherazzi, S., & Michael, H. A. (2025). Terrestrial groundwater drives coastal ecosystem shifts. Geophysical Research Letters, 52(14), e2025GL116251.

Guimond, J. A., Grande, E., Michael, H. A., Pratt, D., Herndon, E., Noyce, G. L., ... & Arora, B. (2025). The hidden influence of terrestrial groundwater on salt marsh function and resilience. Nature Water, 3(2), 157-166.

Adams, K. H., Reager, J. T., Buzzanga, B. A., David, C. H., Sawyer, A. H., & Hamlington, B. D. (2024). Climate-induced saltwater intrusion in 2100: Recharge-driven severity, sea level-driven prevalence. Geophysical Research Letters, 51(22), e2024GL110359.

Tackley, H. A., Lake, C. B., van Proosdij, D., Jamieson, R. C., & Kurylyk, B. L. (2025). Saline sediment deposition in estuarine floodplains exacerbates vertical saltwater intrusion. Journal of Hydrology, 657, 133116.)

[Reviewer]
Methodology. *Additional technical details are needed throughout.*

Line 96: Did the authors conduct fieldwork visits to identify and delineate the vegetation zones? If so, when, and in which season? Is the ecological zonation observed along the transect representative of nearby areas? The elevation range for each ecological zone should also be defined explicitly in the text, not only shown in Figure 1.

[Author response] We did visit the site twice prior to undertaking fieldwork to understand the vegetation and broader landscape. This was completed on 15th December 2023 and 18th January 2024 (Australian summer). The seasonality implication here is not as important as the reviewer may identify due to temperate climate of southeast NSW where this study was conducted (i.e. little phenological difference for this ecosystem for different seasons). More importantly is likely the influence of Phases of the El Niño Southern Oscillation (Allen 1988; Verdon et al. 2004) exert strong influences on the timing and duration of periods of drought and flood across southeast Australia, including temporal variability in sea level and salinity conditions relevant to coastal wetlands (Saintilan et al. 2022). In addition, the zonation here is very representative of the surrounding bays, the broader estuary and similar estuaries found in southeast NSW; which is in part why it was identified as a suitable location. We will include these clarifications in text as well as elevation ranges in text in section 2.1

Allan, R.J., 1988. El Niño southern oscillation influences in the Australasian region. Progress in Physical Geography, 12(3), pp.313-348.

Verdon, D.C., Wyatt, A.M., Kiem, A.S. and Franks, S.W., 2004. Multidecadal variability of rainfall and streamflow: Eastern Australia. Water Resources Research, 40(10).

Saintilan, N., Kovalenko, K.E., Guntenspergen, G., Rogers, K., Lynch, J.C., Cahoon, D.R., Lovelock, C.E., Friess, D.A., Ashe, E., Krauss, K.W. and Cormier, N., 2022. Constraints on the adjustment of tidal marshes to accelerating sea level rise. Science, 377(6605), pp.523-527.

[Reviewer]
Line 113: The rationale for site selection only appears at the end of this section, it should be moved to the beginning. Figure 1: Please add panel labels (a, b, c).

[Author response] Noted. We will implement this change.

[Reviewer]
Lines 118–119: Were preliminary ecological surveys conducted, or was plot selection based solely on the ERT results?

[Author response] Preliminary site visits were undertaken to understand the ecological setting and then the transect for groundwater installations was selected based on this knowledge in connection with the ERT surveys. We will clarify this in text in section 2.1 as above.

[Reviewer]
Lines 127–134: The ERT surveys are well executed. However, it is important to clarify how the authors distinguished between the effects of salinity, water content, and soil properties on the ERT signal, particularly in the unsaturated zone, where this interpretation can be ambiguous.

[Author response] We agree that distinguishing between salinity, water content, and lithology (particularly clay surface conduction) is critical. As detailed in our response to Reviewer 2, we have invited a geophysicist (Dr. Brady Flinchum) to join the authorship to lead a formal petrophysical revision. We will incorporate an Archie's law framework with a clay correction (e.g., Waxman-Smits) to explicitly bound the contribution of clay surface conduction. We will calibrate this model using our measured pore-water EC, grain size, and water EC data. Furthermore, we will apply Depth of Investigation (DOI) masking to all inverted sections to objectively constrain our interpretations to high-sensitivity regions, and we will revise the interpretive language to present bulk electrical conductivity as a combined fluid-salinity and lithology proxy.

[Reviewer]
Line 146: The ecotone is referred to as "MSE" here but as "ET" in Figure 1, please be consistent throughout.

[Author response] Thank you for this pick up, will be changed to ET for consistency.

[Reviewer]

Lines 147–149: Is the PVC pipe fully screened over the 0.5 m interval? If so, please provide screen dimensions and explain whether the screen design was informed by the sediment analysis.

[Author response] We will clarify in the Methods that the 0.5 m interval consists of a laser-slotted PVC screen (specifying exact slot dimensions) wrapped in geotextile. We will add details explaining that the screen design and geotextile wrap were specifically selected to prevent the ingress of the fine silts and clays characteristic of the intertidal and supratidal study site, while maintaining hydraulic connectivity.

[Reviewer]
Lines 149–: Please clarify the screen position … is it located at the bottom of the pipe?

[Author response] We will clarify the exact vertical position of the screened interval relative to the ground surface (metres below ground level) and the bottom of the pipe in the Methods section. We will also update Table 1 to report these screen depths in metres below ground level (m bgl) alongside the AHD elevations, and ensure this is clearly depicted in the transect diagram (Figure 2).

[Reviewer]
Lines 158–160: Elevations referenced here should be reported in a Table or shown on a map.

[Author response] These are reported in Table 1 - Elevation (m AHD)

[Reviewer]
Line 165–166: Please specify where the barometric sensor was installed …which plot, and at what height above ground?

[Author response] We will specify the exact location (plot ID) and the installation height above the ground surface for the barometric pressure sensor in the Methods section.

[Reviewer]
Line 162: The pressure sensors should be referred to as "CTD sensors" (measuring conductivity, temperature, and pressure). Please also provide the exact model for both the Levelogger and HOBO instruments.

[Author response] Noted. This will be clarified in text to ensure audience knows exactly with devices were used for data observations.

[Reviewer]
Line 192: Please state explicitly the distance between the study site and both the tide gauge and rain gauge.

[Author response] Noted. This information can be inferred from Figure 1, however we will be explicit in text about distances of each.

[Reviewer]
Line 219: "Results were presented as grain size distributions" …if these data are not shown here, this sentence should be removed. If they are presented in the Results, please remove this statement from the Methods.

[Author response] Noted. These are presented in Figure 2 in results (as well as in supplementary data). Statement will be removed.

[Reviewer]
Line 222: Please refer to hydraulic conductivity as "saturated hydraulic conductivity (K)" for precision.

[Author response] Noted. This will be clarified in text.

[Reviewer]
Lines 244–247: This content belongs in the Methods section.

[Author response] We appreciate the reviewers indication here that typically this content is provided in a methods section. However, the site setup in this study is unique and comprehensive (see response to next comment from reviewer) for a setting in Australia, and we believe it is important to recognise that this undertaking is a key outcome for this study.

[Reviewer]
Results

Section 3.1: *From my point of view, this material does not constitute Results in the strict sense …it describes the physical setting and data collected to characterize the study area. I would recommend moving it to the Methods, as it serves primarily to contextualize the hydrological analysis rather than present new findings.*

[Author response] We appreciate the reviewer perspective on the content of section 3.1 in results. However, we respectfully maintain that the site characterisation presented in Section 3.1 constitutes a substantive undertaking and finding that warrants placement in the results. Our rationale is as follows:

- This is clearly identified in our objectives of this study 'establish a long-term hydrological and salinity monitoring framework across the vegetation gradient'
- The uniqueness of this geographic setting in comparison to other studies globally, however representative of an expansive coastline across eastern Australia
- The novelty of this study lay in the diversity of vegetation communities and structures (mangrove, saltmarsh, supratidal forest, terrestrial forests) present in our setting, and how processes vary across these communities
- Our site setup is key to enabling us to examine biophysical processes across multiple vegetation types simultaneously over a relatively small transect (i.e. < 400m)
- Understanding how hydrological processes vary across these distinct communities is a primary contribution of this work, and presenting the characterisation of these communities in the Results allows us to establish this context before examining the processes that operate within and across them

To address the reviewers concern, we will ensure greater clarity around section 3.1 and its link to objective (a), framing this section to explicitly demonstrate that this is a foundational result and successfully implementation provides confidence in observations presenting in sections 3.3 and 3.4.

[Reviewer]

Lines 287–292: Please refer to figure panels using letters (a, b, c). Also…is Casuarina glauca in the supratidal zone a moderately salt-tolerant species? If so, what is its known salinity tolerance threshold, and is it expected to remain in good condition at 10 mS/cm?

[Author response] Noted, we will refer to figure panels using labelled letters. In addition, we will modify text in the discussion to address this salinity tolerance threshold

Modified text in discussion (L471-476) to address this:
"The shift to supratidal forests and terrestrial vegetation signals access to less saline conditions, potentially mediated by deep root penetration to the freshwater horizon and/or exploitation of transient rainfall dilution at the surface. Shallow rainfall dilution is the more likely explanation for *Casuarina* and *Melaleuca* in the supratidal forest, which typically have shallow rooting depths (as evidenced by surficial organic profiles; Kelleway et al. 2025), and for which isotopic analyses have demonstrated selective use of rainwater use across both wet and dry periods (Wei et al. 2013). This phenomenon would explain the persistence of these taxa in settings where mesohaline to marine conditions may persist for several months (Figure 7b, c; Kelleway et al. 2025). Little is known about rooting depth and water use characteristics of our terrestrial community species, for which direct investigation of root distribution, water sourcing (e.g., isotopic analysis), and the hydraulic properties governing vertical versus lateral water uptake is recommended."

Wei, L, Lockington, DA, Poh, S-C, Gasparon, M & Lovelock, CE 2013, 'Water use patterns of estuarine vegetation in a tidal creek system', Oecologia, vol. 172, no. 2, pp. 485-94.

Kelleway, JJ, Gorham, C, Trevathan-Tackett, SM, Palacios, M, Serrano, O, Lavery, P, Nagel-Tynan, Z, Conroy, B, Bendall-Pease, G, Rigney, S, Deutscher, N, Hughes, M, Carvalho, R, Owers, C, Jones, AR, Russell, SK, Planque, C, Saintilan, N & Rogers, K 2025, 'Inundation and salinity regimes support blue carbon conditions in temperate supratidal forests', Ecological Applications, vol. Accepted July 2025.

[Reviewer]
Figure 4: At approximately 180 m from ET, there appears to be an elevated salinity anomaly (~16 mS/cm). Can the authors explain this feature? Is there a topographic depression at this location that might account for it? ERT-2 was acquired shortly after a storm surge event. Yet this anomaly is not evident here since the storm surge signal does not reach this point? Please clarify. In the following section, where hydraulic heads are presented, the authors should address this observation and cross-reference it with the ERT results.

[Author response] We have identified that this anomaly originates from ERT measurement protocol error having mistaken two electrodes as one. We have re-inverted our results and this anomaly has disappeared. Please see our response to Reviewer #2 on this observation.

[Reviewer]
Line 292: This appears to be a well-known pattern in estuarine and coastal forested environments. The shallow saline plume broadens with increasing inundation frequency and is particularly pronounced in silty-clay soils due to reduced flushing efficiency.

[Author response] Agree. This is very helpful reflection that we will integrate into the discussion with respect to discussion section 3.3 to broader literature.

[Reviewer]
Line 304: Rainfall should be expressed as cumulative rainfall, please revise.

[Author response] Noted. This will be adjusted.

[Reviewer]
Section 3.4: *Please refer explicitly to figure panels throughout. The use of "correlation" throughout this section requires clarification…what type of correlation was computed (Pearson? Spearman?)? What significance criterion was applied? This should be described in the Methods.*

[Author response] We agree that figure panels must be explicitly referenced and will update the text accordingly (e.g., Figure 6a, 6b). However, we respectfully push back on the need to introduce formal statistical correlation analyses (e.g., Pearson or Spearman coefficients) for these hydrological time series. In the original manuscript, the term "correlation" was used in a general, descriptive sense (e.g., stating that water levels "correlate" with tidal forcing or across adjacent zones) rather than as a formal statistical metric.

Because coastal hydrological time series are highly non-stationary, strongly autocorrelated, and driven by shared external forcings (such as the regional estuary tide and episodic rainfall), computing simple linear correlation coefficients between piezometers would largely just quantify their shared response to these dominant drivers. This would not provide meaningful insights into actual subsurface hydraulic connectivity. The core hydrological findings of this study - namely hydraulic decoupling, signal attenuation with depth, and vertical stratification - are instead derived from event-based analysis (e.g., amplitude damping, tidal phase lags, and the attenuation of salinity responses to specific storm surge and rainfall events) and inundation frequency metrics. These physical observations are far more robust and relevant to our conceptual model than bulk correlation coefficients.

Therefore, rather than adding a statistical correlation framework to the Methods, we will revise the text to remove the ambiguous use of the word "correlation". We will replace it with precise, physically descriptive terminology (e.g., "tracks", "covaries with", "exhibits a synchronous response to", or "attenuates relative to") to accurately reflect our event-based time-series analysis without implying formal statistical testing.

[Reviewer]
Figure 6: Please define the dashed line in the caption.

[Author response] Good pick up, thank you. This is in reference to MSL, however 0 m has been used, whereas it should be 0.118 m. This figure will be updated to the correct dotted line and clarified in text caption to its purpose.

[Reviewer]
Lines 308–313: This paragraph is unclear. It is not evident which data the authors are referring to, and the relationship between the described values and Figure 6 is difficult to follow. Please revise this section thoroughly.

[Author response] We will thoroughly rewrite this paragraph to improve clarity. We will explicitly link the described water level ranges and fluctuations to specific panels in Figure 6 and ensure the narrative logically guides the reader through the hydrological dynamics observed across the different vegetation zones.

[Reviewer]
Lines 314–315: Is there a supplementary figure showing these correlations?

[Author response] No. Please refer to our earlier response about correlation.

[Reviewer]
Lines 334–341: Please add figure references. Figure 7 caption is also incomplete: the dashed red line and continuous red line are not defined. Here I would add a comparison with the bulk EC shown in ERT profiles. It is also notable that salinity peaks during compound events (combined flooding and rainfall) appear lower than during flooding-only events …this is worth highlighting.

[Author response] Agree. We will add figure references and refresh figure 7 to include labels on HAT, MSL, LAT and EC of seawater (dotted line); as well as complete figure caption. This is a helpful point about the salinity peaks, we will highlight this in the results section.

[Reviewer]
Figure 7: Compound flooding events also merit closer examination. In these events, rainfall and saltwater intrusion simultaneously fill soil pores, producing more complex hydrological dynamics within the soil.

[Author response] We will expand the analysis of compound flooding events in the Results and Discussion sections. We will examine specific time windows where high tides or storm surges coincide with heavy rainfall, and discuss the resulting complex hydrological dynamics, such as the suppression of infiltration, surface pooling, and the subsequent flushing or dilution signals.

[Reviewer]
Line 327: This is a good observation that merits discussion. The saltmarsh elevation is higher than both the mangrove and ecotone, making elevation a primary control on its inundation frequency. In the mangrove, despite proximity to the coast, efficient tidal drainage limits waterlogging. In the ecotone, however, water is effectively trapped after inundation, promoting persistent waterlogging.

[Author response] Agree. Very helpful comment. We will include this in the discussion section when we talk about surface water inundation and position in the landscape of vegetation communities.

[Reviewer]
Section 3.4 (general): *This section needs to be substantially expanded. The hydrological results are the most important part of the paper and deserve more thorough treatment, including hydraulic gradients, the response to individual rainfall and flooding events, the combined role of tidal forcing and storm surges, and the seasonal patterns in the water level data. In particular, the dry season (roughly September to April in Australia) shows systematically lower water levels — this seasonal signal is important for understanding surface–groundwater dynamics. Additionally, evapotranspiration is entirely absent from the analysis — do the authors have ET data, or at minimum an estimate of potential*

evapotranspiration?. Moreover, in my view, this section describes the hydrological results in terms of means and ranges rather than exploring the underlying processes. Again, I think an analysis of selected temporal windows would be useful.

[Author response] We thank the reviewer for this constructive comment and agree that Section 3.4 requires substantial expansion to more thoroughly explore the hydrological processes underlying our observations. We will revise the section to move beyond descriptive means and ranges, incorporating analysis of hydraulic gradients and, where relevant, selected temporal windows that capture the response to individual storm surge and rainfall events during our study period.

We note, however, that the seasonal signal the reviewer anticipates does not characterise our study region or period. In southeastern Australia, rainfall seasonality is weak and highly variable, with the dominant wet–dry driver being the El Niño–Southern Oscillation (ENSO; Allan, 1988; Verdon et al., 2004), which exerts strong interannual controls on drought and flood periods rather than predictable seasonal patterns. As we will clarify in Section 2.1, our study period captured an anomalously wet phase associated with ENSO-driven conditions, with above-average rainfall distributed throughout the year and no distinct seasonal dry signal. Rather than imposing a seasonal framework that does not apply to our data, we will focus on the event-driven dynamics - storm surge and rainfall responses - that characterised the study period. We will also include the suggested ET estimates based on existing literature and data sources to provide context for understanding shallow salinity dynamics and vegetation response. We do not directly estimate ET in this study.

[Reviewer]
Lines 347–350: I recommend reading and citing Boufadel (2022), Geng & Boufadel (2015), and Geng & Boufadel (2017), whose work specifically addresses the role of evapotranspiration in driving salinity increases in supratidal zones following storm surge events.

[Author response] Thank you this is great, we will integrate these references to give context to the discussion of our results.

[Reviewer]
Boufadel, M. C. (2022). Collaborative Research: Impact of evaporation and waves on groundwater dynamics in tidally influenced beaches. NSF Award Number 2130595. Directorate for Geosciences, 21(2130595), 30595.

Geng, X., & Boufadel, M. C. (2015). Impacts of evaporation on subsurface flow and salt accumulation in a tidally influenced beach. Water Resources Research, 51(7), 5547-5565.Geng, X., & Boufadel, M. C. (2017). The influence of evaporation and rainfall on supratidal groundwater dynamics and salinity structure in a sandy beach. Water Resources Research, 53(7), 6218-6238.

[Reviewer]
Line 365: "Which estimates?". Please clarify what is being referred to here.

[Author response] We will clarify the text to explicitly state which estimates are being referred to (e.g., saturated hydraulic conductivity estimates derived from grain-size analysis using the Kozeny-Carman equation) to ensure precision.

[Reviewer]
Lines 363–367: This explanation is too brief for a Discussion section. The flushing dynamics during rainfall events and the dilution signal in the porewater deserve a more thorough treatment, ideally with supporting data shown in the Results.

[Author response] We will expand the Discussion to provide a more thorough treatment of flushing dynamics and porewater dilution. We will also move supporting data (e.g., specific EC responses in shallow piezometers during selected rainfall events) into the Results section to properly ground the subsequent discussion.

[Reviewer]
Lines 369–370 and 406–408: The fine-grained surface layer functions as a "pillow layer" — a concept discussed by Nordio et al. (2024a, b). It is worth noting that this layer also plays a protective role: while fine-grained sediments are difficult to flush of saltwater (leading to longer recovery times), they simultaneously prevent rapid downward contamination of deeper groundwater. This is a counterbalancing effect worth discussing explicitly.

[Author response] Thank you, we will integrate the concept of the "pillow layer" (citing Nordio et al., 2024a, b) into the Discussion. We will explicitly discuss this counterbalancing effect, highlighting how the low-permeability fine-grained surface layer retains salt and prolongs recovery times in the shallow zone, while simultaneously acting as an aquitard that protects the deeper groundwater from rapid downward salinization. This aligns with our broader revisions regarding hydraulic anisotropy and DOI-constrained ERT interpretations (see response to Reviewer #2).

Nordio, G., Pratt, D., Michael, H. A., & Fagherazzi, S. (2024). Initial soil moisture and soil texture control the impact of storm surges in coastal forests. Science of The Total Environment, 953, 175911.

Nordio, G., & Fagherazzi, S. (2024). Evapotranspiration and rainfall effects on post-storm salinization of coastal forests: Soil characteristics as important factor for salt-intolerant tree survival. Water Resources Research, 60(10), e2024WR037907.

[Reviewer]
Discussion

Section 4.2: *The analysis of rainfall impacts on water levels and electrical conductivity needs to be developed further in the Results section before being interpreted here. Evapotranspiration is again entirely absent …what happens during the dry season? What are the consequences if saltwater flooding occurs when antecedent water levels are already low? Lines 398–401 are interesting but need to be better contextualized and explained in a dedicated section.*

[Author response] We thank the reviewer for this comment and agree that the rainfall impacts on water levels and electrical conductivity warrant further clarity in the results section, which we will address as outlined in our response to Section 3.4 from previous comment. Regarding the dry season suggestion, we reiterate that there is a lack of dry vs wet seasonality in SE NSW Australia, where the dominant wet–dry driver is the El Niño–Southern Oscillation (ENSO; Allan, 1988; Verdon et al., 2004). This study was undertaken entirely within a wet phase of ENSO, on the back of multiple La Niña years, with above-average rainfall distributed throughout the study period and no distinct seasonal dry signal. As such, our data do not capture dry-phase conditions. However, the current wet-phase study offers an important baseline for comparison with future dry-phase investigations, for which no comparable biophysical data currently exist in this region. Importantly, the persistence of forested vegetation along this transect - communities that establish and persist over decadal timescales well beyond individual ENSO phases - suggests resilience to temporal variations in biophysical conditions.

Furthermore, we will expand on the mechanism of rainwater use through both wet and dry periods (as outlined in our response to the reviewer's query on Casuarina glauca salinity tolerance) to contextualise this response of vegetation. In addition, we will incorporate publicly available potential evapotranspiration data and integrate the suggested literature (Boufadel, 2022; Geng & Boufadel, 2015, 2017; Nordio & Fagherazzi, 2024) to contextualise the potential role of ET influencing shallow salinity dynamics.

[Reviewer]
Lines 420–421: This type of salinity configuration — shallow saline plume overlying fresher deeper groundwater — is well documented in coastal systems. I strongly recommend engaging with the work of (for instance) Julia Guimond, Holly Michael, Anner Paldor, Barrett Kurylyk, Alicia Wilson, whose research directly addresses this topic.

[Author response] Thank you this is great, we will examine and integrate these groups for references to give context to the discussion of our results based on the saltwater-freshwater interface.

[Reviewer]
Lines 464–476: Please refer to Nordio et al. (2024), who have already discussed the points raised here regarding vegetation water access and root-zone salinity dynamics.

[Author response] Noted. Will examine based on previous comment.

[Reviewer]
Lines 445–451: I think the paper's main contribution is not a novel conceptual model but rather a well-designed and carefully executed observational study that corroborates and extends findings reported by others. I would encourage the authors to reframe their contribution accordingly, focusing on the quality and comprehensiveness of the dataset collected along the transect, and on what it confirms and adds to the existing understanding of surface–groundwater–salinity dynamics in low-energy estuarine wetlands. The stratification and hydraulic anisotropy described here are not new findings, as the literature I have suggested demonstrates. The real value of this paper lies in the richness of the data and the ecological context in which they are interpreted.

[Author response] We appreciate the reviewer's perspective on the broader global literature. While we agree that hydraulic stratification is well-documented in other regions (e.g., North American coastal systems), we will reframe our contribution to emphasize that this is the first study to comprehensively demonstrate these sediment-controlled stratification processes across such a diverse and complex vegetation gradient (mangrove, saltmarsh, supratidal forest, terrestrial forest) in a microtidal, wave-dominated barrier estuary in southeastern Australia. We will revise the Introduction and Discussion to clearly highlight the unique biophysical and geographic context of this dataset, positioning the conceptual model as a region-specific refinement that corroborates and extends global paradigms to understudied Australian settings.