Public justification (visible to the public if the article is accepted and published): The paper has now been re-reviewed by one of the original reviewers, who felt that the manuscript has improved substantially. They did, however, raise one remaining concern that I also share. Specifically, the reviewer suggested adding a short paragraph in the discussion that addresses the study's limitations. While the authors expressed concern that such a paragraph might detract from the paper, I want to emphasize that acknowledging limitations is a hallmark of strong scientific writing. Including this section would not weaken the manuscript—it would enhance its transparency, credibility, and overall impact by helping readers understand the scope and context of the findings.

We would like to thank the reviewer and the editor for another very thorough revision of the manuscript. We have adjusted the manuscript according to the comments.

Reponses to each comment are added in blue and the changed blocks of text are added, with removed text crossed out in ~~red~~ and added text just in red.

The main changes we made are:

1) *Added a paragraph on the limitations of the current study*
2) *Changed figure 1, 3 and 5*
3) *Checked the text for additional spelling and lay-out errors*

Additional private note (visible to authors and reviewers only):
In addition to adding a paragraph on limitations, the reviewer also requested the following minor edits.

Major:

1. Add a paragraph addressing the limitations of your study.

We have added a separate section within the discussion to address the limitations. We therefor moved some blocks of text from the previous discussion into this section. In this response we only show the finished limitations section.

Line 415-455:
4.1 Limitations of the study
A first limitation of our study is the use of a space-for-time substitution, assuming that a spatial gradient in increasing marsh inundation and increasing pond area can be considered representative for the temporal development of increasing pond surface area within a marsh, as a result of increasing marsh inundation in response to relative sea level rise. Because of this space-for-time approach, there could be differences between sites, other than differences in inundation and pond surface area, that could influence the vegetation belowground biomass production that we have not considered. However, given the qualitative agreement of our results with previous findings who don't use this space-for-time substitution (as discussed above), we believe that this effect is limited.

Further, the use of shear vane devices is not recommended for direct comparison between different studies, as measurements are influenced by the present roots, but also the person who takes the measurements. We therefore recommend on the one hand that shear vane devices are used in combination with other methods for evaluating soil strength, such as a penetrologger (used in our study) or a Cohesive Strength Meter (Brooks et al., 2023). On the other hand, we recommend to only compare patterns and not absolute values between

studies. We argue however that when measurements are performed by the same person, shear vane measurements are valid for comparison of relative differences in sediment bed strength within a given study site, as done in our study.

Finally, we recognise that other environmental variables, which are not considered in our study, could influence vertical variations in soil strength. For instance, higher water content has been shown to decrease the soil penetration resistance (Gillen et al., 2021; Stoorvogel, de Smit, et al., 2025). As soil water content may be higher in deeper soil layers, this may also contribute to lower soil strength deeper in the profile. Yet, we expect this plays a minor role in our study sites as field observations typically indicate water saturated soils over the whole soil profile. Additionally, variations in soil strength along the spatial marsh degradation gradient may be related to factors we did not account for. For instance, higher nutrient loading decreases the soil organic matter content and belowground vegetation biomass and has been reported to be related to reduced soil strength (Turner et al., 2020). Bioturbation, especially burrowing by crabs, can increase the oxygenation of the sediment and facilitate the breakdown of belowground biomass (Wilson et al., 2012). Yet we have no data to test whether such factors varied along the spatial marsh degradation gradient and if they contributed to the observed spatial pattern of decreasing soil strength with increasing marsh degradation.

Minor:

1. Formatting of the introduction is off. Why do two of the paragraphs start with references?

R1. Something seems to have gone wrong with the references in the previous version, thank you for noticing. The references have been removed.

2. Figure 1c, the image is quite pixelated so it doesn't really add anything to the figure. Also, the symbols in 1b are still too small to read and an upward facing arrow still doesn't necessarily tell you the direction it is oriented towards.

R2. We have removed panel C and increased the size of panel B to improve the readability. The arrow is a north arrow, we have added this to the caption.

Line 89-97:

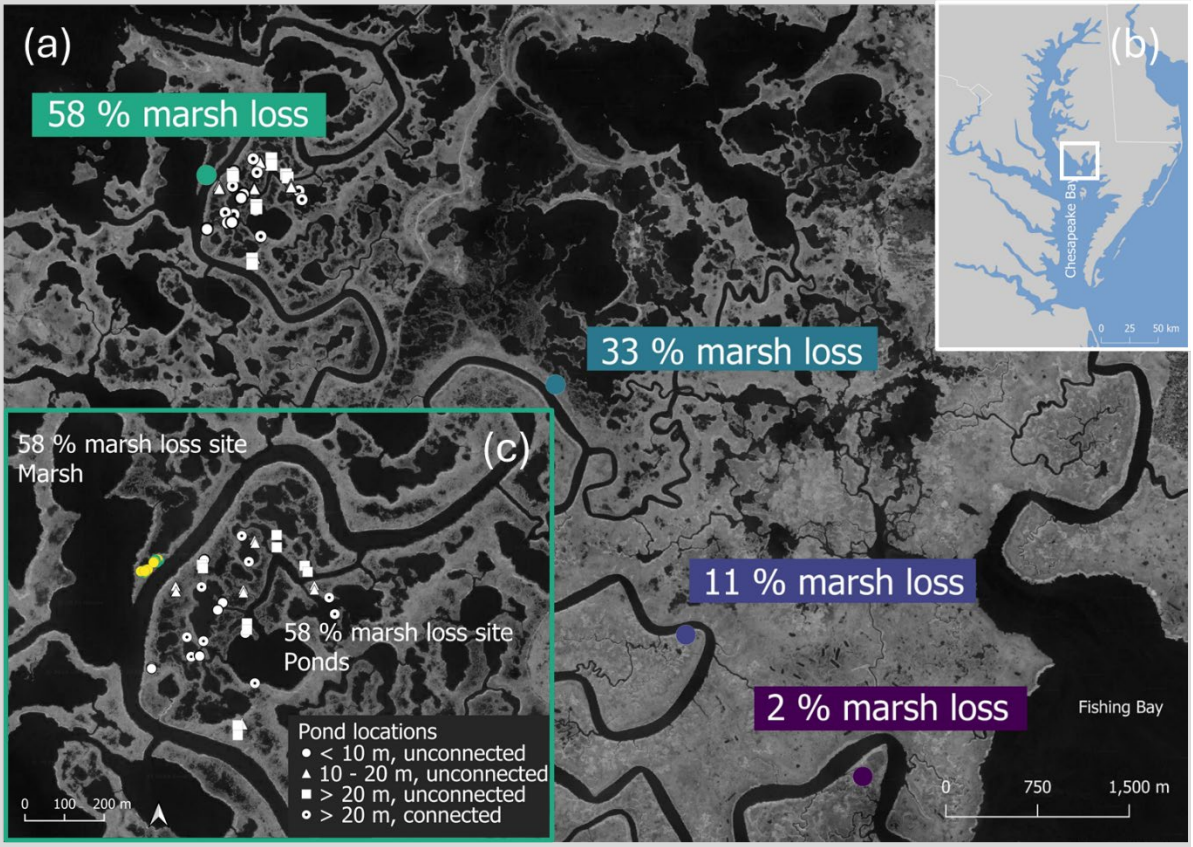

Figure 1: (a): Aerial images of the Blackwater marshes (black: water, light grey: marsh) with sampling locations (Copernicus – Sentinel data [2025]. Retrieved from Google Earth Engine, processed by ESA). The marsh loss (i.e. proportion of shallow open water ponds to total marsh area) is quantified for each site based on Schepers et al. (2017). (b) Inset map showing the location of the Blackwater marshes in the Chesapeake Bay. The green box is the extent of panel ~~b~~ c. ~~B~~ (c): pond locations (white) sampled at site 4. Values in the legend of (~~b~~c) refer to the average pond diameter in each category. The arrow on the bottom is a North arrow. ~~The yellow box is the extent of figure C. C: marsh locations at site 4 with (green) and without (yellow) vegetation.~~

3. Paragraph starting in line 110 - the authors didn't really answer my question on the changing rates of SLR at the site. The overall rate they show is 4.06 mm/yr but this encompasses a rate from 1940 to 2025. I would assume the rate of SLR is actually increasing so the timescale of the SLR rate that you state would matter to knowing whether these sites can keep up with SLR. Also, since the sedimentation study cited here is from 1985, is there any indication that sedimentation has changed over time at this site?

R3. It does indeed seem that the sea level rise rate has been increasing since the 1970's (https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?plot=50yr&id=8571892). From the late '90s onwards, the sea level rise rate has exceeded the sediment accretion rates reported in the 1985 study. This is further specified in the revised text below:

Line 110-115: In particular, sediment accretion rates (on average 1.7-3.6 mm yr^{-1} (Stevenson et al., 1985)) are less than the ~~relatively constant~~ long-term rate of relative sea-level rise of 4.06 mm yr^{-1} in Cambridge, MD, calculated over the period of 1943-2025 (NOAA station 8571892, http://tidesandcurrents.noaa.gov/sltrends, 2025-04-10)), ~~and more sediment is exported from the system than imported into it (Ganju et al., 2013)~~. The historical sea level rise rate has been increasing since the 1970's, and it has exceeded the sediment accretion rate since the 1990's (NOAA station 8571892, http://tidesandcurrents.noaa.gov/sltrends, 2025-04-10). Moreover, more sediment is exported from the system than imported into it (Ganju et al., 2013).

We did a more recent study in that area where we measured sediment accretion rates (the paper containing this data is currently under review) and the sedimentation rates are still around 3.6 mm/y on average in the inner marsh locations.

4. line 155 and thereafter - the authors need to be consistent with either spelling out the number of sites or using digits.

R4. This was corrected. We aimed to consistently spell out numbers below 10 as is the convention in scientific writing.

5. With the addition of linear models, while they are applicable for analyzing patterns, why not also look at using non-linear models? Only the results from below ground biomass are shown and the authors mention the other variables did not have a significant influence. But perhaps they could still be important to overall shear strength?

R5. We did in fact also test non-linear models (generalised additive models), but the results did not change, so we decided to only report on the linear models.

We compared a model with all variables to the model with only the belowground biomass and the Akaike Information Criterion is lower for the simple model than for the more extensive model. Therefor we believe that the additional variables included in the more extensive model (i.e. water content, organic matter content, bulk density) are not important in our case. We do acknowledge that previous studies have shown these variables to be important (see paragraph starting on line 344-352 in the discussion), but we also emphasize that these studies are mainly performed in minerogenic marshes, while ours is an organogenic one. In our study system, the amount of belowground biomass is the most important driver.

6. Need to fix the formatting of table 1 and some typos.
R6. We have fixed the errors in table 1.

7. table 2 caption is misplaced.

R7. Indeed, something seems to have gone wrong in the layout. It is fixed now.

8. Figure 3 caption says there are significance letters but they are missing from the actual figure. Is there enough of a sample size to make inferences of significant differences?

R8. Thank you for noticing, we seem to have looked over this error. We have changed the figure (see also comment 9) and have included error bars to indicate that every dot is the average of 5 replicate measurements. For each point we thus have 25 values, which we do believe is a big enough sample size. We have made this clearer in the caption as well.

Line 240-249:

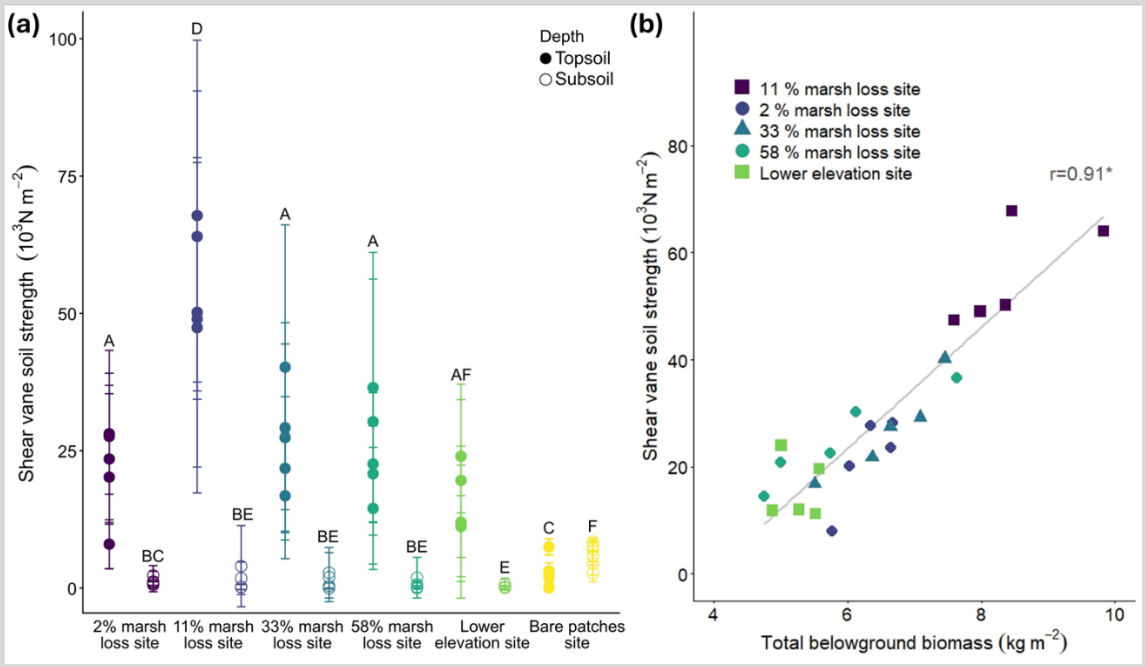

Figure 2: a) Comparison of shear soil strength (10^3 N m^{-2}~~, for 0-10 cm soil depth~~) in the different field locations and between the topsoil (0-10 cm, full circle) and subsoil (30-40 cm, open circle). Letters at the top show the results of the pairwise Wilcoxon rank sum test with Bonferroni correction (n=25 for each site and depth combination), with different letters indicating significant differences between sites and depths. Error bars indicate the standard deviation of each measurement (n=5 for every point) b) Total belowground biomass (kg m^{-2}) versus shear vane soil strength (10^3 N m^{-2}, for 0-10 cm soil depth) for all vegetated marsh sampling locations (no bare or pond locations), demonstrating a strong correlation (r = 0.91, p<0.05).

9. Figure 5: You mention this in your comment to me but you can be more clear in the text for why you are comparing the ponds to the 30cm marsh depth. There is no point in the text that I can find where you directly compare the marsh pond data to the marsh 30cm data. Isn't this why you tested these for significance in the figure?

R9. You are indeed correct that in the remaining manuscript we don't compare these two. We have therefor decided to change figure 5 to only show the pond data and have added the subsoil measurements to figure 3a (see also R8). This is the new figure 5:

Line 271-276:

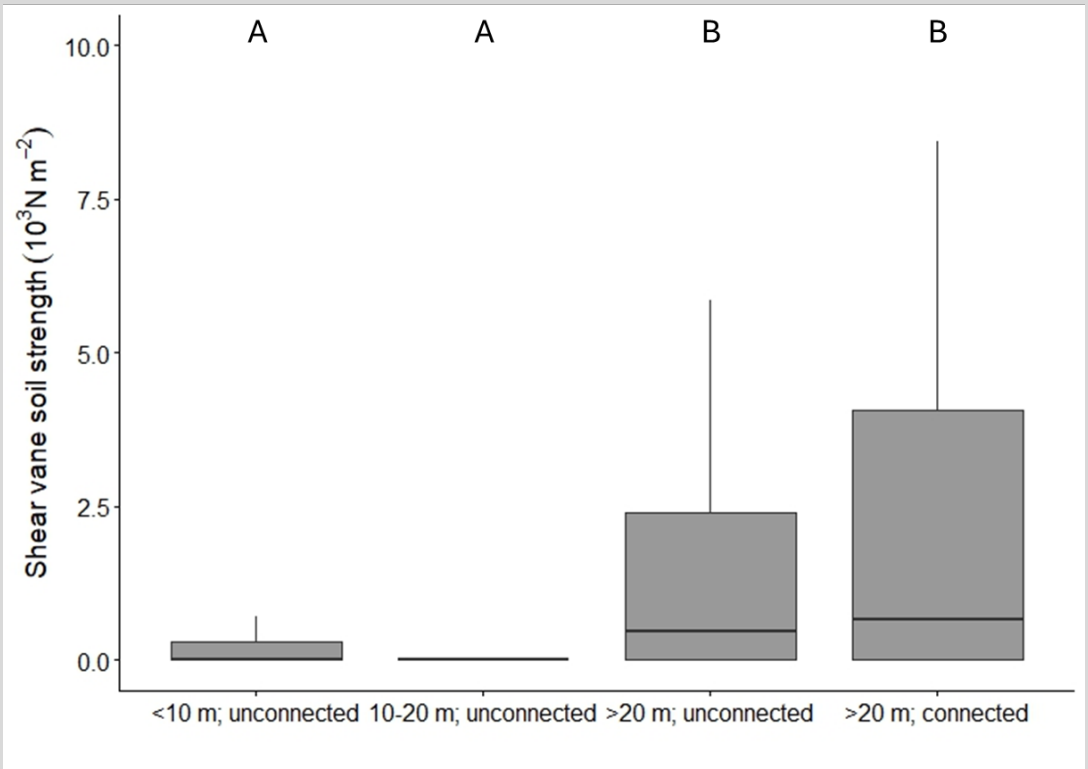

Figure 3: Shear vane soil strength (10^3 N m^{-2}) measurements of pond topsoils (n=50 for each boxplot). ~~and marsh soils at 30 cm depths (n=25 for each boxplot).~~ Significant differences between pond types ~~or marsh locations~~ have different letters above each boxplot, differences between groups have different letters at the very top of the figure (pairwise Wilcoxon rank sum test with Bonferroni correction, α= 0.05).

10. Line 291 - only partly? Based on my comment from V1, why couldn't this be completely explained by roots impacting the shear vane measurement? Just because there is a similar relationship to biomass and penetration resistance does not mean the shear vane measurement was only partly impacted by roots.

R10. We have removed the word partly. We wanted to say that we argue there still is a causal relationship between shear strength and belowground biomass, even though the shear vane method is directly affected by roots.

Line 305-307: This can ~~partly~~ be explained by the methodological choice of using a shear vane for soil strength measurements, since roots can be expected to directly affect the shear vane measurements (Brooks et al., 2023).

We have also added an additional paragraph in the discussion on the limitations of using shear vane measurements.

Line 421-426:
Further, the use of shear vane devices is not recommended for direct comparison between different studies, as measurements are influenced by the present roots, but also the person who takes the measurements. We therefore recommend on the one hand that shear vane devices are used in combination with other methods for evaluating soil strength, such as a

penetrologger (used in our study) or a Cohesive Strength Meter (Brooks et al., 2023). On the other hand, we recommend to only compare patterns and not absolute values between studies. We argue however that when measurements are performed by the same person, shear vane measurements are valid for comparison of relative differences in sediment bed strength within a given study site, as done in our study.

11. Line 318 - if salinity and tidal range could influence below ground biomass production, couldn't you test for this since you have biomass data and you can get salinity/tidal range data?

R11. We didn't test the effect of salinity because this is outside the scope of our study. We mention it here because we want to be complete in acknowledging that space-for-time substitutions have limitations. Therefor we mention that other factors, which we did not account for but that could differ between sites, could potentially influence the differences between sites.

Line 416-420: A first limitation of our study is the use of a space-for-time substitution, assuming that a spatial gradient in increasing marsh inundation and increasing pond area can be considered representative for the temporal development of increasing pond surface area within a marsh, as a result of increasing marsh inundation in response to relative sea level rise. Because of this space-for-time approach, there could be differences between sites, other than differences in inundation and pond surface area, that could influence the vegetation belowground biomass production that we have not considered. However, given the qualitative agreement of our results with previous findings who don't use this space-for-time substitution (as discussed above), we believe that this effect is limited.