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Referee 1

I thank the authors for addressing my review comments so carefully. I believe this process greatly enhanced the clarity of the manuscript. However, I would like to come back to the point of increasing wave length, as I think your interpretation is either not correct or the chosen wording is misleading. Beudin et al. 2017 describe the increase of mean wave length within a spectrum which goes in line with an increase in mean wave period although the peak period stays the same. A possible, an in my eyes likely, interpretation is that the seagrass acts as a band pass filter which attenuates short, low period waves to (almost) zero while having little effect on the spectral peak and long waves. This would match the anecdotal observations described by Beudin et al 2017: The surface in the field will appear 'glassy' as the small waves overriding the larger ones are filtered out. And it agrees with findings from lab experiments (see Anderson and Smith 2014, doi: 10.1016/j.coastaleng.2013.10.004 for instance). And this will obviously have an effect on the mean value as stated by Beudin et al. 2017.

Giving that you are hinting at an effect on the mean value in Appendix B, I guess you are observing the same phenomenon, but then your wording in the main body of text is not precise enough. An increase in wavelength as you phrase it, suggests that the length of individual waves change and become longer. But that is not what is happening. Instead, short waves are removed from the spectrum, affecting the mean values, while the larger waves remain unaffected. Please rephrase this precisely. I also recommend to use Appendix B to elaborate this a bit more.

Dear Referee,

We thank you for your comment! As you correctly stated, our description lacks clarity and is misleading, suggesting various interpretations. We therefore change in the Introduction section and in the appendix the description of this phenomena to align with previous studies as below:

[line 17-21]: *"The process known as wave damping, as described by Dalrymple et al. (1984), effectively reduces wave height. Over the seagrass canopy, the mean wavelength increases due to the attenuation of shorter waves from the spectrum. This effect, combined with the reduction in wave height, leads to a decrease in wave steepness. Consequently, the reduction in wave height leads to a localized drop in sea surface elevation in the lee of the vegetation patch as demonstrated by Beudin et al. (2017)"*

[line 470 – Appendix B1]: *"The following Figure B1 illustrates the impact of vegetation on wave characteristics. Similar to the observations of Beudin et al.(2017), we note the reduction in wave steepness toward the shore as waves interact with seagrass patches. This reduction arises from a combination of wave height damping and a localized increase in the mean wavelength. The latter reflects a spectral shift resulting from seagrass preferentially attenuating shorter, high-frequency waves, rather than an elongation of individual wave components. Such frequency-dependent attenuation has been documented in previous* *studies, where submerged aquatic vegetation acts as a low-pass filter, selectively damping higher-frequency wave components and allowing longer-period waves to propagate more effectively (Nowacki et al. (2017); Bradley and Houser (2009))"*

Please note that Figure B1(a) was updated to only represent vegetation nodes instead of the SCI 2 site region.

Referee 2

The authors have addressed satisfactorily most of my previous comments. However, my major methodological concern has not been resolved.

As clearly explained in Luhar & Nepf (2016), the scaling of the effective length varies depending on the length ratio: L=l/A_w, namely, the ratio of the blade length to the wave excursion. Eq. 2.4 in the present manuscript is only valid for cases where the blades experience large excursion, which include steady flows and oscillatory flows that meet the condition L< <1. Therefore, unless such condition is met in all simulated scenarios (and throughout the whole domain), the methodology employed here is not rigorous.

The authors do not provide the range of values of L. Assuming that L< <1 is not always valid, there are two ways this can be addressed:

1. A rigorous way whereby the simulations are repeated using the correct formulas for the effective length depending on the 'local' conditions. That is, Le/l~{Ca}^{-1/3} for L<<1, and L_e/l~{(CaL)} ^{-1/4} for L>>1 (see Lei & Nepf (2019) for the exact formula);
2. An approximate way whereby the authors somehow justify the use of the formula developed for steady flows (i.e. eq. 2.4). For example, when a current is superimposed to the waves the Le/l~{Ca}^{-1/3} scaling is still valid (see Schaefer and Nepf, 2022). I wonder if the presence of currents (also in the field study used for model validation) may play some role here?

Assuming that both Ca and CaL are much larger than unity, for small blade excursions I expect the effective length and, consequently, the wave attenuation to be larger than what currently estimated, particularly in intermediate-deep waters - it remains to be seen if such difference is significant though.

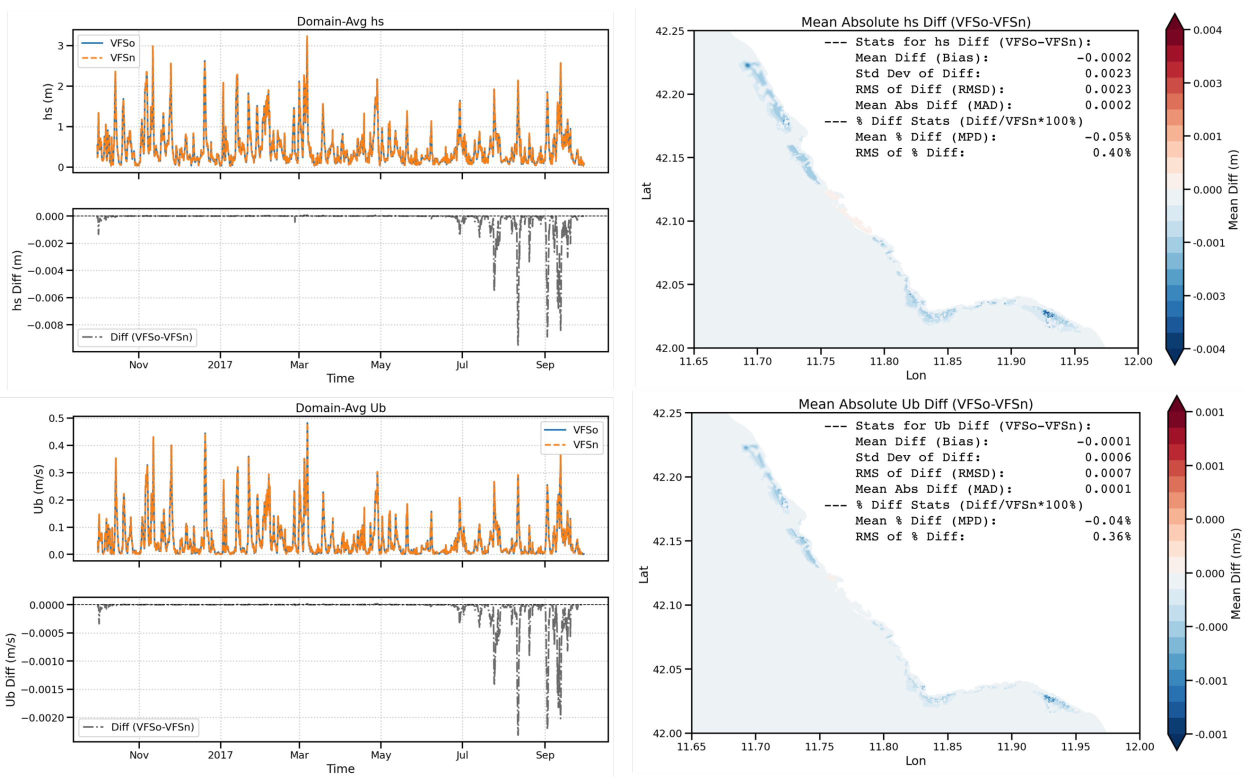
Dear Referee,

Thank you again for your detailed review of the methodology employed in our study. In our previous response, we addressed your concern regarding the use of Eq. 2.4 by justifying the substitution of the unidirectional flow component with the near-bed orbital velocity, following the approach of Luhar & Nepf (2016), and consistent with Lei & Nepf (2019) and Schaefer & Nepf (2022).

However, as you have correctly pointed out above, the blade length ratio L was not considered in our original work. Given that the formulation in Eq. 2.4 may underestimate the wave damping effect due to reduced effective leaf length, assuming a large wave excursion, the implementation of the conditional term L is necessary, and hence, we have adopted it in the model as follows: for $L \ll 1$, where $L = l_v/A_w$ the effective length scales as $l_e/l_v \sim Ca^{-1/3}$, and for $L \gg 1$, the alternative is considered: $l_e/l_v \sim (CaL)^{-1/4}$, as described in Luhar & Nepf (2016) and Lei & Nepf (2019).

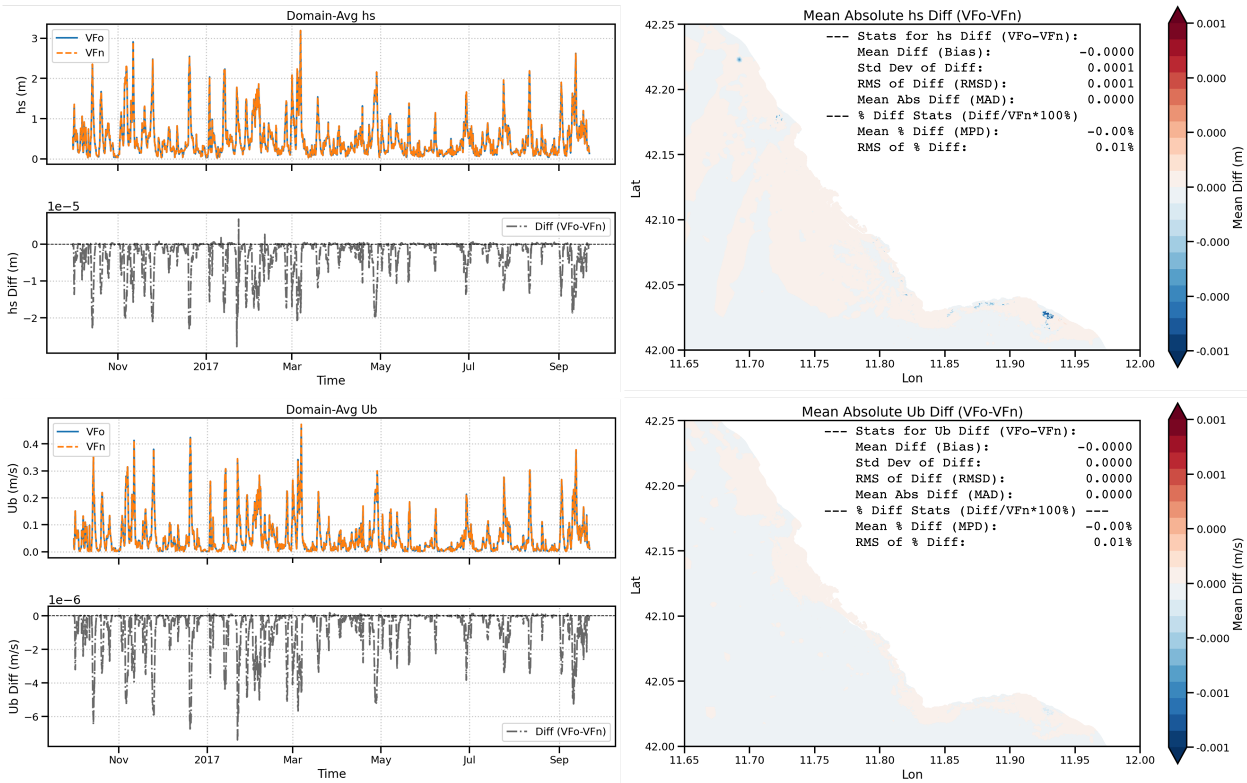
We re-executed the simulations with the new effective length formulation, both for seasonal (VFS) and flexible (VF) experiments. Below we provide the analysis of the differences between the previous results (with subscript ‘**o**’: VFSo and VFo) and the new results (subscript ‘**n**’: VFSn, VFn) adapting the L ratio dependency. The A_w maps with L-ratios are appended to the Appendix C (referenced in Section 4.3, line 330) of the manuscript. Accordingly, the following figures (having minor changes) were re-generated in the manuscript: **Figure 9**, **10** alongside **Table 5**. However, the analysis of the figures and conclusions from the previous version of the manuscript hold true due to negligible difference between the results as shown below.

Comparisons of seasonal experiments (VFSo vs. VFSn). Considering the senescence and juvenile phases of leaf development during spring and autumn (Figure 5 in the manuscript), the differences between the two model runs are minimal, with the largest mean difference observed in August being −0.009 m. The statistics presented in the color map reveal an overall negligible variation, with a mean difference of −0.05%. A similar trend is observed for the wave orbital velocity, where the maximum difference does not exceed −0.0025 m/s.

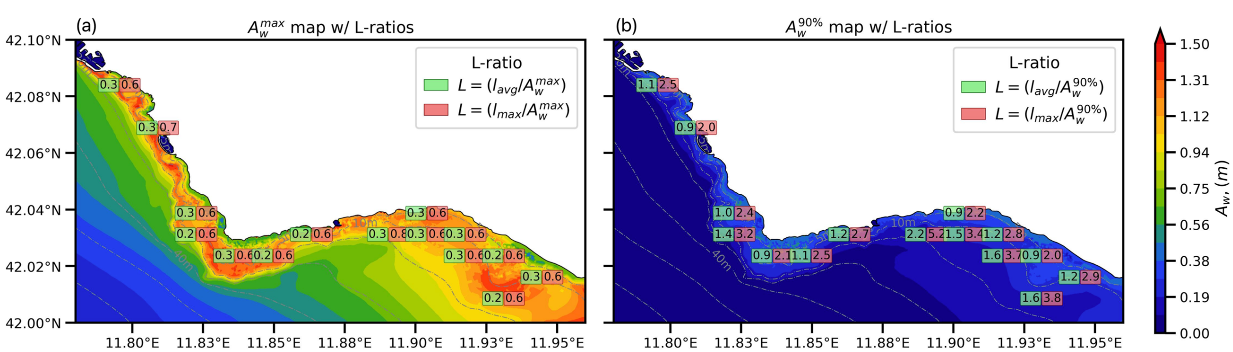


Our results with the updated formulation indicate reduced wave attenuation, evidenced by the consistently negative differences in wave dissipation shown in the figures, reflecting lower damping efficiency. This differs from the Referee’s expectation of increased effective leaf length and wave attenuation under conditions where L≫1. The reason behind this is that the original Eq. 2.4 yielded inflated estimates of effective length (on the order of 10^{-3}) under conditions of small wave excursion, whereas with the new formulation, the length is mediated by L ratio in $l_e/l_v \sim (CaL)^{-1/4}$, reaching at most the actual leaf length l_v. As a result, this scaling improves the model’s physical consistency and reliability.

Comparisons of non-seasonal experiments (VFo vs. VFn). We observe smaller discrepancy between the results w/ and w/o *L-ratio* condition, in the order of 10^{-5}, although with the similar tendency (negative differences).

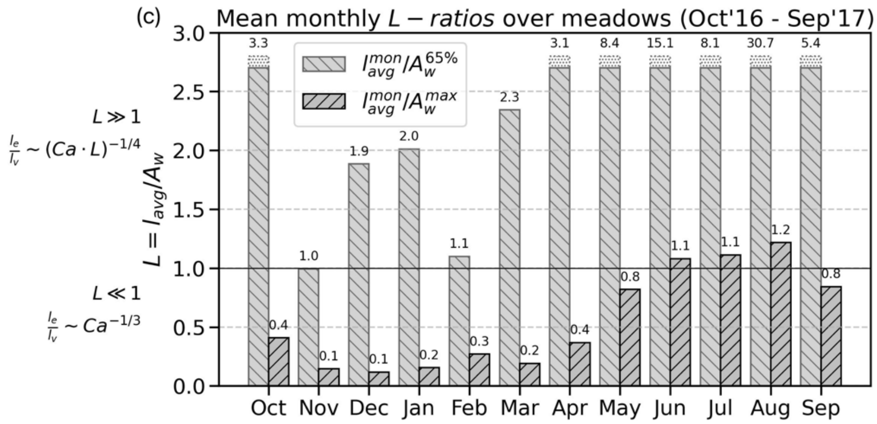


Below, we present maps for VFS experiment of wave orbital excursion (A_w) with the *L*-ratios over the vegetated areas. These maps are constructed using the annual mean and maximum leaf length values, in relation to the maximum and 90th percentile of the wave orbital excursion. The results indicate that the condition $L \ll 1$ is primarily associated with high-energy wave events characterized by peak near-bed orbital excursions. In contrast, the $L \gg 1$ regime is more commonly encountered under typical wave conditions.



The following figure of the domain-averaged (over vegetation only) monthly mean *L-ratios* illustrates that at least 65% of wave conditions fall within the $L \gg 1$ regime, scaling effective leaf length as

$l_e/l_v \sim (CaL)^{-1/4}$. Notably, this regime dominates during the summer months (June–August), a period characterized by both reduced wave orbital excursions and peak leaf lengths.



The **Appendix C** was added to manuscript to reflect these conditions as described above.