We thank Arnaud Héquette for reviewing our manuscript. The suggestions improved the dataset and accompanying manuscript. We address the specific comments one by one below. Original reviewer comments are shown in **black font**. Our responses and modifications affected in response to Reviewer comments are shown in **green font**. Modifications in the manuscript are shown in the **blue font**.

Specific comments

- line 13: The authors consider that "sheltered coastlines are traditionally defended by hard coastal structures made of concrete, asphalt or stones". This statement is a little surprising since sheltered coastlines are by definition protected from the action of high-energy waves that are responsible for coastal erosion. I would rather think that hard coastal structures would commonly be implemented along open coasts as a protection against high-energy waves.

We acknowledge that this wording was too strong and focussed on the field site we are studying. To make sure we address both this reviewer's and the other reviewer's concern about the introduction, we rewrote it slightly. In particular, we wrote an alternative opening paragraph of the manuscript:.

L13-16: Sheltered coastlines are protected from high wave impact and can be found in estuaries, coastal basins or inland lakes. Sandy sheltered coastlines typically undergo smaller rates of storm-driven erosion than exposed coasts and received less attention in research. Nevertheless, understanding the physics of these beaches is just as important, as they also protect vital coastal infrastructure and communities that rely on them as a defense against flooding

- lines 23-24: It is stated that "beaches in estuaries and on the lee-side of islands are not truly fetch-limited, as refracting ocean swell waves may still reach the shore…". Although it is true that some beaches in estuaries are not truly fetch-limited, other beaches located in an estuary may be fetch-limited where the mouth of the estuary is protected from ocean swells (by an island for example).

We acknowledge that our original wording here is too general. We have rephrased it to the following:

L20-21: Beaches in estuaries and on the lee-side of islands may be typically sheltered from long period swell, but under the right conditions some refracted ocean swell waves may still reach these shores (Cooper et al., 2007).

- lines 74-75: it is written that the data were collected "shortly after construction". After construction of what? Presumably, this refers to the sand nourishment that took place in 2019, but this is mentioned later in the paper.

Thanks for pointing this out. We have removed the reference to the construction of the sand dike here and explain about the timing of the campaign with respect to finalization of the construction in more detail in the next section:

L81-85: The campaign was undertaken at the Prins Hendrik Zanddijk (PHZD), a sandy coastal defense constructed in 2019 along the Wadden Sea coast of the island Texel (Figure 1a). This part of the coastline was originally protected by an asphalt dike (Figure 1b), but in light of anticipated sea level rise did not meet the Dutch safety standards any longer. Instead of heightening and widening the dike itself, a sandy foreshore including a sub-areal dune was constructed in front of the dike on the subtidal shoal Schanserwaard (Perk et al., 2019).

- lines 89-90: The authors indicate that “the campaign was undertaken at the Prins Hendrik Zanddijk (PHZD), a sandy coastal defense along the Wadden Sea coast of the island Texel constructed in 2019”. Maybe some elements of context could be useful here. What motivated the realization of a beach nourishment on a sheltered beach? Was the coast eroding even if it is partially protected from offshore waves from the North Sea? Was the dyke damaged which required further coastal protection?

This was indeed very minimally described. We incorporated some more background information in the field site section. The resulting paragraph is the same that is included in the reply to the previous comment (L81-85).

- lines 93-97: Some information is given here about waves and tides at the study site, stating that most waves reaching the site are locally generated short waves, but that in certain conditions swell waves can propagate into the basin and can refract towards the coastline, but with diminishing amplitude. Given the configuration of the site, one would expect that wave heights would be strongly lower when reaching the beach and would not have enough energy for causing significant erosion. Is there any information on this?

It is also stated that tidal velocities can reach 1 m/s along the PHZD (or even more under the influence of local winds). Could tidal currents be a major cause of beach erosion at this site instead of waves?

We added two sentences to clarify a bit more on the role the swell waves are deemed to have and the magnitude of the tidal current on the platform the PHZD is constructed upon”:

L100-101: On the subtidal shoal, current magnitude is strongly reduced by bottom friction and were observed up to 40 cm/s.

L104-105: These swell waves are not deemed an important cause for beach erosion by themselves, but can add to the overall impact when superimposing the locally generated wind sea

- lines 125-131 (and table 1): It is indicated that the different hydrodynamic instruments recorded data at different sampling frequencies, ranging from 4 to 16 Hz. Any reason why the instruments were programmed to make measurements at different sampling frequencies?

We targeted to measure wave related signals up or above 10Hz when possible, but instrument options varied. We worked with two type of acoustic doppler velocimeters (Nortek Vector and SONTEK ADV), 3 type of pressure sensors (Nortek Vector, OSSI wave gauges and RBR Solo’s) and one type of acoustic doppler current profiler (Nortek ADCP). All of these instruments have their own range of possible sampling frequencies. The Solo’s maximum sampling frequency was 8 Hz, the OSSI’s could measure at either 2,5,10, 20 or 30 Hz and both vectors could measure at 2,4,8,16,32,64 Hz. Current profilers could measure up to 4 Hz. We addressed this in the manuscript as follows:

L126-127: Sampling frequency between instruments varied because configuration possibilities differed between manufacturers. In general and when possible, we aimed to resolve wave processes with at least 10 Hz.

- lines 179-180: the authors indicate that "shells or their fragments were not removed…, so the analysed samples are composed of both biogenic and non-biogenic minerals". What is the justification for not removing the shells or shell fragments? Although, some scientists prefer to carry out grain-size analysis on the total sediment samples without removing biogenic sediments (because the biogenic material is also a part of the sediment transported by waves and currents), some researchers prefer to remove the biogenic fraction from samples when measuring sediment grain-size. The authors mention that the non-biogenic sand fractions were much more abundant than the biogenic sediments, but it would have been better to carry out grain-size analyses on samples including both biogenic and non-biogenic sediments and on non-biogenic sand and provide the results of both analyses.

As mentioned by the reviewer, the choice to analyse the total samples of mixed sediments, without first separating the biogenic and non-biogenic components, was motivated by the goal of representing in-situ conditions as accurately as possible. Keeping shell and sand fractions combined in our sediment analysis allows us to examine the sediment sorting in relation to the morphological change in a holistic manner. We acknowledge that some researchers prefer to separate the biogenic and non-biogenic material for specific analyses. The densities of the most abundant types of shells (calcium carbonates) at our study site (e.g., of the species Cerastoderma edule and Spisula solida) are similar to that of quartz grains (i.e., ~2650 kg/m3), whereas their shapes are respectively flat (i.e., larger length to thickness ratio) and spherical. Although this discrepancy in particle properties may result in an overestimation of particle diameters from mechanical sieve analysis, we assumed this effect to be marginal in our case with underrepresentation (estimated typically <5 wt.%) of shell material (predominantly fragments, with small length to thickness ratios) in the bulk of most samples. Therefore, the added value of separating the carbonate from the siliciclastic material, by pre-treating the samples with hydrochloric acid, was not considered substantial for our study.

As a matter of fact, the current data set of sediment samples has made us question the role of shells and shell fragments, even in smaller quantities, in total sediment transport, incipient motion and sediment sorting by waves and currents.

L176-182: The reason for doing so was to capture representative in-situ samples of the sediment that is transported by waves and currents. The generally flatter-shaped shell particles tend to end up in a sieve with an aperture close to the size of their second longest dimension, which is often substantially longer than their nominal length (i.e., as if they were spherical). As the mineral density of many calcium-carbonate shell types is similar to that of quartz sand (i.e., ~2650 g/L), this could result in an inaccurate size-by-weight distribution of the whole sample. However, in our samples, the non-biogenic sand fractions were generally much more abundant and, moreover, the biogenic fractions consisted predominantly of broken shell fragments, which typically have substantially smaller length to thickness ratios than intact shells.

- lines 289-290: It is stated that "alongshore (tidal) velocities first decrease with water depth, but then the wave-driven alongshore component increases the total alongshore velocity again in even shallower water (Figure 8f)". Although Figure 8f actually shows an increase in alongshore current velocity with decreasing water depths on the beach face (from approximately 200 to 210 m), which is presumably related to a wave-driven alongshore component, the figure does not show a decrease in current velocity with water depth over the rest of the beach, but rather similar current velocities.

From both reviewer's feedback, we realized that there was a mistake in the computation of the significant wave height in the SOLO instruments as the sampling frequency was wrongly set to 10Hz instead of the correct 8 Hz in the processing. Correcting this has modified the wave height transformation of Figure 8. This makes the interpretation more logical, there is now no longer a wave height increase with decreasing water depth. The alongshore velocity in Figure 8 shows a small reduction from L2C10VEC through L2C5SONTEK1 to L2C4VEC (with decreasing water depth), after which it slightly increases again at L2C3VEC and L2C2VEC. We have updated Figure 8.

- Figure 2: It could be useful to add the number of the beach profile on each transect shown in the figure. This would be helpful for quickly locating the position of the profile along the beach when using the beach profile data.

Thanks for this suggestion. We have indeed included the profile numbers in the figure.

- Figure 8: The graph 8f shows mean current speeds in the cross shore and alongshore directions with positive and negative values. It could be useful to indicate if positive (negative) values of cross shore currents are onshore-directed (or offshore-directed); this could be mentioned in the figure caption or directly in the graph. The same for alongshore currents: do positive or negative values indicate eastward- or westward-flowing currents?

Thanks for this suggestion. We have modified the caption as follows:

Figure 8. Snapshot of the observed cross-shore wave and current transformation along the cross-shore transect on September-19 08:30: a) significant wave height Hm0, b) mean wave period $T_{m-1,0}$, c) wave angle of incidence, d) near-bed velocity skewness, e) near-bed orbital velocity, f) burst mean currents in the cross-shore and alongshore direction (cross-shore positive is shoreward, alongshore positive is south-west ward), g) position of instruments on the profile with the burst mean water level for reference.