RC1 Comments addressed:

Kagawa et al. estimate the amount of particulate organic carbon (POC) export to the ocean due to coastal erosion and peat mass movement events on Bengkalis Island, Indonesia, using aerial photogrammetry and satellite imagery analysis. The topic of this study is interesting and important. Nonetheless, I have three major concerns on the current manuscript.

Q1. First, to my understanding, this study is more like a study of remote sensing or GIS, rather than a biogeochemical study. The major works involved in this study is about feature (e.g. vegetation, and topography) recognition based on UAV and satellite images. Few biogeochemical analysis has been involved or revealed in this study. Maybe a journal of remote sensing is more suitable to this manuscript.

A1.

We sincerely appreciate the time and effort you have dedicated to reviewing our manuscript. We are grateful for your insightful comments and suggestions.

As you have correctly pointed out, our study incorporates remote sensing analysis. However, it is important to emphasize that our research is not solely based on remote sensing; rather, we have conducted multiple field surveys and integrated both remote sensing and field survey data.

It appears that our research objective may not have been conveyed clearly in our manuscript. We understand that the reviewer perceives our study as primarily focusing on the recognition of features such as vegetation and topography derived from UAV and satellite imagery. However, the fundamental objective of our research is to elucidate the natural processes of coastal erosion and PMMs in tropical peatland coasts, as well as to estimate the amount of particulate organic carbon (POC) released due to these lateral degradations. While UAV and satellite image analysis is part of the methodological process leading to our results, it is not the primary focus of our study.

Furthermore, Biogeosciences has previously published studies that utilize remote sensing. Therefore, we believe that the use of remote sensing techniques alone should not preclude our manuscript from being suitable for this journal. To clarify this point, we will include references to past studies in Biogeosciences that have employed remote sensing methods. We recognize the potential risk of misinterpretation by readers. To address this concern, we will move less critical sections of the manuscript to the Appendix.

Q2. Second, I am a bit worrying about the novelty of this study. The findings in this study depends strongly on the specific conditions of topography, vegetation, climate, tide and coastal wave. I don't think the POC loss rates due to coastal erosion at the current study site can be used as a reference for estimating the coastal POC loss rates in other places. So I am wondering whether this study has provided a vital or reliable implication for understanding global land-ocean POC fluxes. By the way, the authors should give a better discussion on the implications of this study.

A2.

We greatly appreciate your valuable insights, which are extremely helpful in refining our manuscript. In response to your comments, we plan to make the necessary revisions to improve the clarity and comprehensiveness of our research.

Our findings suggest that the occurrence of coastal erosion and PMMs in the study area is influenced by specific factors, including topography, vegetation, climate, tides, and coastal waves.

Regarding PMMs, we intend to add results from cross-sectional land surveys using RTK-GNSS, aerial photogrammetry, and NDVI, as well as a time series of SAR images, to better identify the timing of PMM events. Furthermore, we will incorporate results that determine the collapse timing in greater detail by analysing variations in precipitation and water level fluctuations associated with the breaching of the drainage channel. Based on these results, we plan to add an explanation demonstrating that PMMs occur due to increased water levels following heavy rainfall.

For coastal erosion, we will include results on the cumulative long-term coastline retreat for different land-use types using SAR images. Additionally, we will present results analysing the relationship between significant wave heights and maximum wind speeds during periods of accelerated coastline retreat. Based on these findings, we plan to include results demonstrating that erosion intensifies during periods when monsoonal winds are predominant. Furthermore, we will summarize and incorporate wind direction and speed observations from the study area in the form of wind rose diagrams.

Given that progressive erosion and wave-induced coastal retreat have been studied in this region, we will add relevant references to strengthen our manuscript.

Finally, in response to the comment that our findings may not be applicable for estimating POC loss rates in other locations, we would like to emphasize that similar coastal erosion processes have been documented in peatlands worldwide. Boreal peatlands also contain extensive coastal peatland areas, suggesting that phenomena like those observed in our study may be occurring in other regions. To better contextualize our study, we will incorporate a global peatland distribution map and examples of coastal erosion and PMMs from different parts of the world into the introduction section.

Q3. Third, an analysis on the environmental controls (land use change, climate change, see level rise?) of the interannual variation of peat mass movement and the POC export from land to the ocean is important to improve the novelty of this study, and will make this study better fit the scope of Biogeosciences. Unfortunately, I have not seen any analysis on the drivers of the peat mass movement and the POC loss.

A3.

We greatly appreciate your valuable insights, which will be extremely helpful in improving our manuscript. In response to your comments, we plan to make the necessary revisions accordingly.

As stated in Q2, we intend to add results that clarify the characteristics of meteorological and water level fluctuations associated with PMMs in tropical peatlands. These findings will be obtained through a combination of field surveys and remote sensing techniques, allowing us to identify the timing of PMMs and analyse the conditions under which they occur.

RC1 Specific comments addressed:

Q1. The Introduction section has not been organized well. The authors using a lot words to describe the importance and formation of peatland, however, the introduction on coastal erosion, in particular the coastal erosion of peat, is very weak. Moreover, the specific aims of this study should be provided in the last paragraph of the Introduction section.

A1.

Thank you for your valuable feedback. As you have correctly pointed out, while our current manuscript explains the importance and formation of peatlands, it lacks a sufficient introduction to coastal erosion and PMMs. Your comments have helped us recognize this weakness, and we will revise the introduction accordingly.

To address this, we will first present the global distribution of peatlands as of 2023. Following this, we will introduce cases of coastal erosion affecting peatlands in Siberia, Canada, Alaska, and the Baltic Sea coast of northern Germany. In addition, we will review peatland degradation processes, including gully erosion commonly studied in boreal peatlands, as well as a collapse example from Florida.

Furthermore, we will highlight the potential for similar phenomena to occur beyond our study area. Reports on PMMs in tropical peatlands are limited, except for a documented case in 1966 along the Tutoh River in Malaysia. However, studies on wave-induced coastal erosion and collapse mechanisms have been conducted in Bengkalis Island, our study area, and we will include a discussion of these findings.

In the Riau Province, Indonesia, including Bengkalis Island, coastal erosion and PMMs have jointly contributed to coastline retreat, resulting in the loss of approximately 160 ha of land over a 25-year period from 1988 to 2013.

Finally, we will revise the introduction to clearly articulate the aims of our study.

Q2. Fig. 5: The current figure caption is lengthy. A figure caption should be like "Flowchart used in this study to ***"**

A2.

Thank you for your valuable feedback. We will revise the figure captions to make them more concise and clearer. Additionally, we will ensure that the section glossary and abbreviations is clearly aligned with the corresponding content for better clarity.

In response to the reviewer's comments, we also plan to enhance our manuscript by incorporating additional analyses on the actual conditions of coastal erosion, as well as the relationships between coastal erosion, PMMs, meteorological factors, land characteristics, and geomorphological changes. To improve the clarity of these analyses, we will include a flowchart illustrating the analytical process.

Q3. L140-144: Why not include more satellite in different times? Is there any Google Earth image or satellite images for recent years after 2018?

A3.

In estimating the particulate organic carbon (POC) flux resulting from coastal erosion and PMMs in this study, it was necessary to use not only optical satellite imagery but also a Digital Terrain Model (DTM). However, the most reliable DTM data available was limited to 2018. Therefore, our analysis was constrained to data up to that year.

Q4. Fig. 12: What are the P01-P04 represent? Are they soil cores from different locations of the study area? Please provide a map of the soil collection sites.

A4.

The sampling locations in our study area are indicated in Fig. 4 of the manuscript. Additionally, a detailed explanation can be found in Section 3.1.8, Sampling and analysis of peat soils. We kindly ask you to refer to this section for further details.

Q5. Fig. 16: Why the unit of POC export rate per unit length is tC m^{-1}, rather than tC m^{-1} yr^{-1}?

A5.

As stated in Section 3.2.7, Estimation of POC mass by PMM Event and estimation of POC Flux due to coastal erosions, from Line 345 onward, "The POC from the displacement of peat mass caused by PMMs was not measured by fluxes, as PMMs are a sudden disaster. Instead, it was calculated based on the areas that had already collapsed by each date." For this reason, the unit is expressed as tC m^{-1}.