

Re: Address comments from reviewer #2

Dear Editor,

Thanks for the opportunity to review the manuscript titled “Spatial and temporal dynamics of suspended sediment concentrations in coastal waters of South China Sea, off Sarawak, Borneo: Ocean colour remote sensing observations and analysis”, authored by Jenny Choo et al. My general observation is that the manuscript does not contain any significant flaw in terms of the scientific methodology. The approach is sound, the analysis is clearly explained, and the inferences are supported by the results. The manuscript, as a whole, is written well and is easy to follow.

Inasmuch as the manuscript is scientifically solid with regard to the methodology and analysis, the results and inferences are not anything new. The manuscript does not present any new information that is not previously known. It is generally understood that sediment concentrations tend to follow precipitation and river discharge amounts, though there may be some lags and discrepancies in the patterns due to a number of factors. The authors mention the possible factors causing the lags and discrepancies but do not go on to investigate and ascertain the factors – perhaps that is beyond the scope of this manuscript. Nevertheless, the manuscript does present a fairly substantial analysis of spatial and temporal variations in sediment concentrations in the study area over a long period of time and could be potentially useful for natural resource managers and environmental policy makers in the region.

My overall assessment is that this manuscript is worth publishing, though the methodology and the results are neither innovative nor new, provided the authors address the following comments.

The following are some specific comments, which are few because the manuscript does not focus on the methodology but on the discussion of spatial and temporal patterns of sediment concentrations:

Comment #1:

The approach undertaken for retrieving sediment concentrations is not new. Empirically parameterized spectral band ratio algorithms have been around for a long time. Nevertheless, this, in and of itself, is not a disqualifying factor because if the band ratio algorithm gives the best results then it does not matter that the algorithm or its basic approach is not new. However, it would have been better to see a comparative analysis

of a few different algorithms. Are the same spatial and temporal patterns captured by more than one algorithm? Are there differences in the spatio-temporal patterns across various algorithms? I believe that these are important questions and, if addressed, would add significant value to the manuscript. The authors have mentioned – on page 9, above Eqn. (2) – that they tried a variety of models; however, no results are shown. It would be helpful to see results of this analysis, showing what other models were tried and how each performed.

Reply: Received with thanks for your comments to strengthen my manuscript. I agree that it will be helpful to show the results of various model functions being tested, which will give a better insight into the performance of each model and how we come about selecting the best model. As such, the performance error metric of the various model functions (power, linear, exponential, logarithmic) has been added in Table 2 (lines 250 – 254). As a result, the content of section 2.3.2 has been slightly rearranged to fit the changes made. Thank you.

Comment #2:

In general, the description is a bit too long. There is a lot of discussion about the spatial and temporal variations in sediment concentration, with observations made regarding discrepancies from expected patterns. However, the reasons attributed to the discrepancies are presented more as reasonable conjectures rather than confirmed facts. It might very well be the case that there is not enough data to make anything more than a reasonable conjecture, and that is understandable. In this case, it would be helpful to tighten up the discussion, focusing on what is important. Do the results indicate anything new or surprising? If not, focus on the main inferences that might be of value to regional environmental managers and decision makers, and shorten the discussion.

Reply: Thank you for your further comment and suggestion to tighten up the discussion.

As this study presents the application of ocean colour remote sensing technologies in studying large spatial and long-term temporal changes of TSS within Sarawak's coastal areas, new observations were uncovered in how TSS distribution varies (spatially and temporally) within this region across large spatial extent since year 2003. These observations were not available previously due to limited spatial and field coverage by conventional field campaigns. As such, we would like to highlight new observations that have been gathered from our study:

- Study on potential TSS hotspots revealed that Lupar and Rajang coastal areas have received sustained levels of TSS input over a period of 17 years.
- Spatial map of TSS coefficient of variation (CV) showed that large TSS variability was identified within the Samunsan-Sematan coastal areas (CV > 90%), which could potentially impact nearby coral reefs and socio-economic activities in this region.
- While it is generally understood that monsoonal influence is one of the main drivers of TSS changes, this study presents spatial maps of large coverage which exhibited substantial differences of TSS plumes between northeast (wet) and southwest (dry) monsoon periods within these coastal areas.
- Our temporal maps of TSS anomalies with respect to long-term TSS mean enable detection and study on TSS distribution changes annually, which provide visualization insights into the potential effects of extreme rainfall events in intensifying TSS release into coastal and open ocean waters.

These new observations, coupled with the study on river discharge influence and TSS variability across coastal waters, present important findings to relevant authorities and regional environmental managers in enhancing coastal management and conservation strategies.

While this study presents the first observation of TSS distributions at Sarawak coastal regions, it is agreed that there is room for refinement to further tighten up the discussion. As such, changes have been made and are as follows:

1. In Section 3.2, a paragraph from lines 435-438 has been removed and added into Section 2.0 Methodologies section, under Section 2.5 "Precipitation data and computation of river discharge", as the paragraph outlines on how the precipitation data was retrieved. Hence, it is more fitting to be included under the methodologies section.
2. Paragraphs from lines 458-466 in Section 3.2 has been trimmed off to strengthen the focus on the discussions of flood and drought events in driving TSS distribution.
3. Discussions from lines 493-519 are important observations which may have been overshadowed from the previous discussions in Section 3.2. As such, these discussions (lines 493-519) have been inserted into a new sub-section - in "Section 3.2.1 Temporal TSS anomalies", to further highlight these observations in a new extension.

4. In Section 3.4, paragraphs from lines 620-630 have been removed as these may carry redundancy to the Conclusion section.
5. In Section 4.0 Conclusion, line starting from lines 717-721 has been edited as follows: "Overall, these coastal areas of Sarawak are dominantly categorised as Class I quality, which remain within local quality standards to support various marine and socio-economic activities in this region. Our findings in the southwest coastal areas (Sematan and Stamin-Sampadi) showed that the coral reefs there can be well-maintained with negligible impacts from TSS loadings.", to highlight on these important observations which may be of value to regional environmental managers, authorities, and decision makers.

A Few Minor Comments:

The manuscript is written well, in general. However, there are a few instances of minor issues with the grammar and sentence structure that need to be corrected:

1. **In the Abstract, for the sentence starting towards the end of line 21, consider something like the following: "The average TSS concentration in these coastal waters was in the range of 15 - 20 mg/L".**

Reply: Received with thanks on the suggestion made. The sentence has been edited accordingly and can be found in line 21.

2. **In the Abstract, on line 27, "Map of relative..." => "A map of relative..."**

Reply: Noted with thanks. It has been edited and can be found in line 28.

3. **In page 7, Section 2.2, line 169, the phrase "TSS measurements data" sounds a bit awkward. Consider rephrasing it as either "TSS measurements were taken from..." or "Data of TSS concentrations were taken from..."**

Reply: Received with thanks for the rephrasing suggestion. The phrase has been edited to "TSS measurements were taken from..." (line 183).

4. **On page 8, line 182, consider replacing "high-sun elevation angle condition" with "high solar elevation angles".**

Reply: Thank you for your suggestion. The phrase has been edited accordingly in line 196.

- 5. On page 8, line 192, “apply regional” => “apply a regional”.**

Reply: Received with thanks on the addition of the article ‘a’ ([line 207](#)).

- 6. On page 8, lines 192 and 193, it might be better to replace “a total number of 35 TSS datasets” with “a total of 35 different datasets of TSS concentrations” in order to make it clear that you mean 35 different datasets and not one dataset with 35 data points.**

Reply: Noted with thanks on the suggestion made. The sentence has been edited ([line 208](#)).

- 7. On page 10, line 231, “Equation (3), (4), and (5)” => “Equations (3), (4), and (5)” (add an “s” to make equations plural).**

Reply: Thank you for pointing out this mistake. The correction has been made in [line 246](#).

- 8. On page 11, line 250, the sentence is rather awkwardly phrased. Please consider rephrasing it to something like the following: “...waters of this type do not have the same spectral characteristics as phytoplankton-rich waters” or “this type of waters is not spectrally similar to phytoplankton-rich waters”.**

Reply: Received with thanks for your suggestions. The phrase has been edited ([line 275](#)).

- 9. On page 14, line 310, the word “part” or “region” should be added in between “northeast” and “of the study area”.**

Reply: Noted with thanks for your suggestions. The word “region” has been added in [line 335](#).

- 10. On Page 14, line 312, “temporally average” => “temporally averaged”**

Reply: Thank you for correcting this grammatical mistake ([line 337](#)).

- 11. On page 16, line 348, it’s not clear what the authors mean by “6192 time steps” - are these 6192 images taken of the same area at different times?**

Reply: Yes, these 6192 images were taken at different times of the same area.

12. On page 31, line 593, the authors probably mean figure “13d”, not “15d”.

Reply: Thank you for correcting the mistake (line 619).

13. On page 34, line 644, “impede” => “impedes”

Reply: Thank you for correcting this grammatical error (line 670).

14. On page 35, line 677, “reported a low” => “reported low”

Reply: Received with thanks on the suggested correction (line 703).

Re: Address comments from reviewer #3

Dear reviewer,

Thank you for your comments and suggestions. These are addressed as follows:

1. In abstract, 'our findings' is not suitable use in writing abstract.

Reply: Received with thanks for the comment. The phrase 'our findings' is replaced as follows:

Line 25: **Study** on temporal TSS variation...

Line 30: Furthermore, **study** on the contribution of river discharge to the TSS distribution showed...

Line 34: **Results** showed a progressively decreasing pattern...

2. Line 113: Suggested to change the phrase 'this paper' to 'this study'.

Reply: Received with thanks for the suggestion. The phrase has been edited to 'this study' which can be found in [line 114](#).

3. Line 160: Avoid the use of first person pronouns in the manuscript

Reply: Noted with thanks on the suggestion. The sentence is edited and rephrased to as follows from [lines 161-162](#):

'In this study, the southwestern part of Sarawak's coastal regions (Fig. 2), (between 1.9° N, 109.65° E and 2.8° N, 111.5° E) was studied, which comprise...'

4. Line 268: Check format of writing

Reply: Noted with thanks on the suggestion. The format of writing has been edited accordingly ([lines 294-295](#)).

5. Line 294-296: Please provide some information about this study area. What is the land use and current situation in this basin.

Reply: Thank you for the suggestion. Additional information about the study area is added under 'Section 2.1 Area of study', from lines 163-176, which reads as follows:

“Rajang river basin consists in tidally influenced river channel which splits into a northwest (Igan, Lassa and Paloh) and a southwest (Rajang, Belawai) Rajang river delta (Staub et al., 2000). The Rajang river basin drains a dominant area (>50,000km²) of sedimentary rocks (Milliman and Farnsworth, 2013; Staub et al., 2000) extending from Belaga to Sibuh, with major peatland areas converted into oil palm plantations (Gaveau et al., 2016) as its river flows into the South China Sea (Milliman and Farnsworth, 2013). Major settlements along the Rajang river comprise of Kapit and Kanowit town areas, as well as Sibuh city, with a total population size of about 388,000 inhabitants (Department of Statistics, 2020). Lupar and Saribas rivers, respectively, comprise a catchment area size of approximately 6500 and 1900 km² (Lehner et al., 2006). Situated at the southwest side of the Rajang catchment, Lupar and Saribas rivers surround the Maludam National Park, which is Sarawak’s remaining biggest single patch of peat swamp forest (Sarawak Forestry Corporation, 2022). Adjacent to Lupar river mouth is the Sadong river, with an approximate catchment area size of 3500 km² (Kuok et al., 2018). Sadong river runs about 150 km and flows through oil palm plantations (Staub and Esterle, 1993).”

6. Line 425: Is there any data for the rainfall event related to monsoon season? With reference to the highlighted sentence, “This observation may potentially be caused by the lag between the time of rainfall events occurring during NE monsoon periods and TSS release entering the coastal river regions.”

Reply: Noted with thanks on the comment. The rainfall events are generally reported in an annual basis. Reference to the annual trends of rainfall in Sarawak can be found in Sa’adi et al. (2019). As such, the Global Precipitation Measurement (GPM) satellite datasets (<https://gpm.nasa.gov/data/imerg>) were retrieved to extract the monthly precipitation values (mm). In this study, the monthly precipitation values for each Lupar and Rajang river basins were extracted to evaluate the effect of precipitation in relation to TSS concentrations at the corresponding river mouths. Hence, the discussion on rainfall events occurring during the NE monsoon periods is drawn from the GPM estimates, as plotted in Figure 8a

for the case of Lupar river basin, where NE monsoon periods are highlighted in blue background in the plot.

- 7. Line 508: 'From our findings, discrepancies between TSS estimates and river discharge were identified in...'. The phrase 'our findings' was highlighted.**

Reply: The phrase 'our findings' is omitted, and the sentence is restructured to as follows (line 534): "Discrepancies between TSS estimates and river discharge were identified in... '.