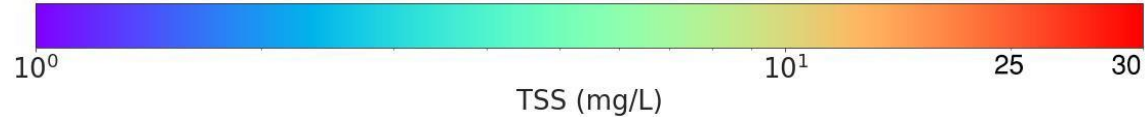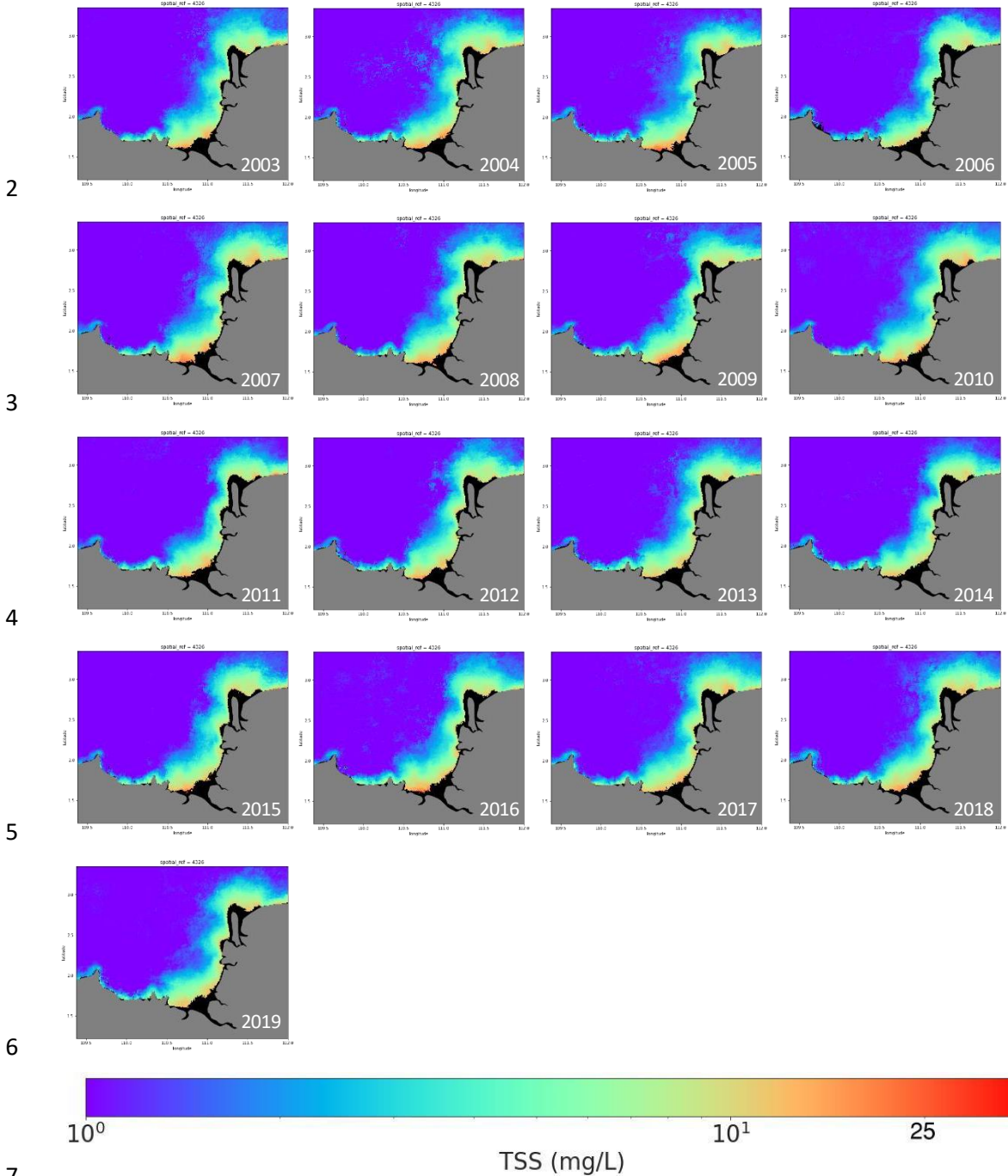Biogeosciences

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# Spatial and temporal dynamics of suspended sediment concentrations in coastal waters of the South China Sea, off Sarawak, Borneo: ocean colour remote sensing observations and analysis
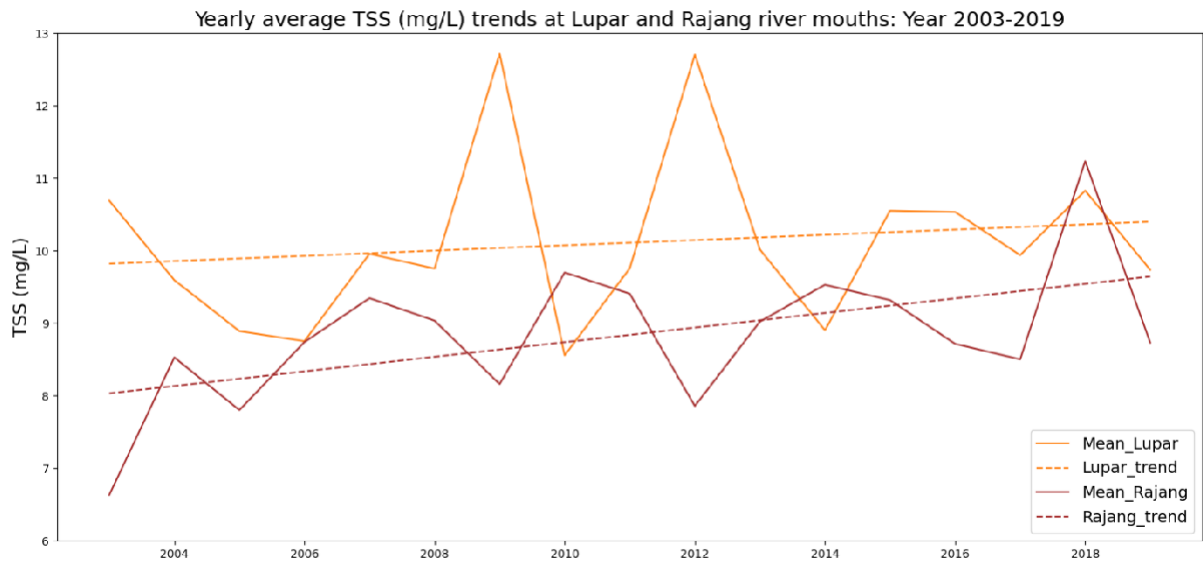
**Jenny Choo et al.**

*Correspondence to:* Jenny Choo (jccy89@gmail.com, jchoo@swinburne.edu.my)
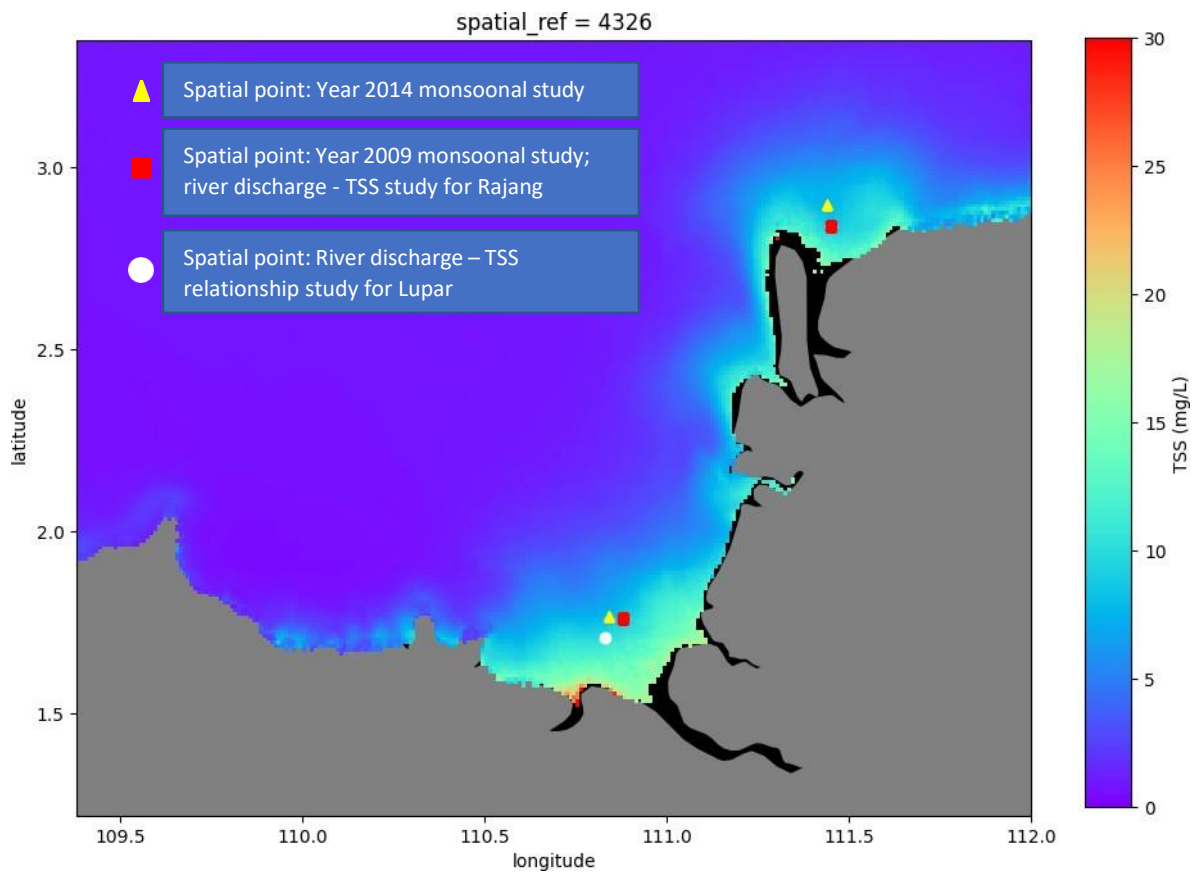
1    Supplementary Materials



S1: Annual spatial maps of TSS distribution in Sarawak's southwest coastal region calculated by means of the proposed TSS remote sensing algorithm.

11

12    S2: Time series and trend lines of average TSS release (mg/L) at the Lupar and Rajang river mouths from 2003 until 2019.
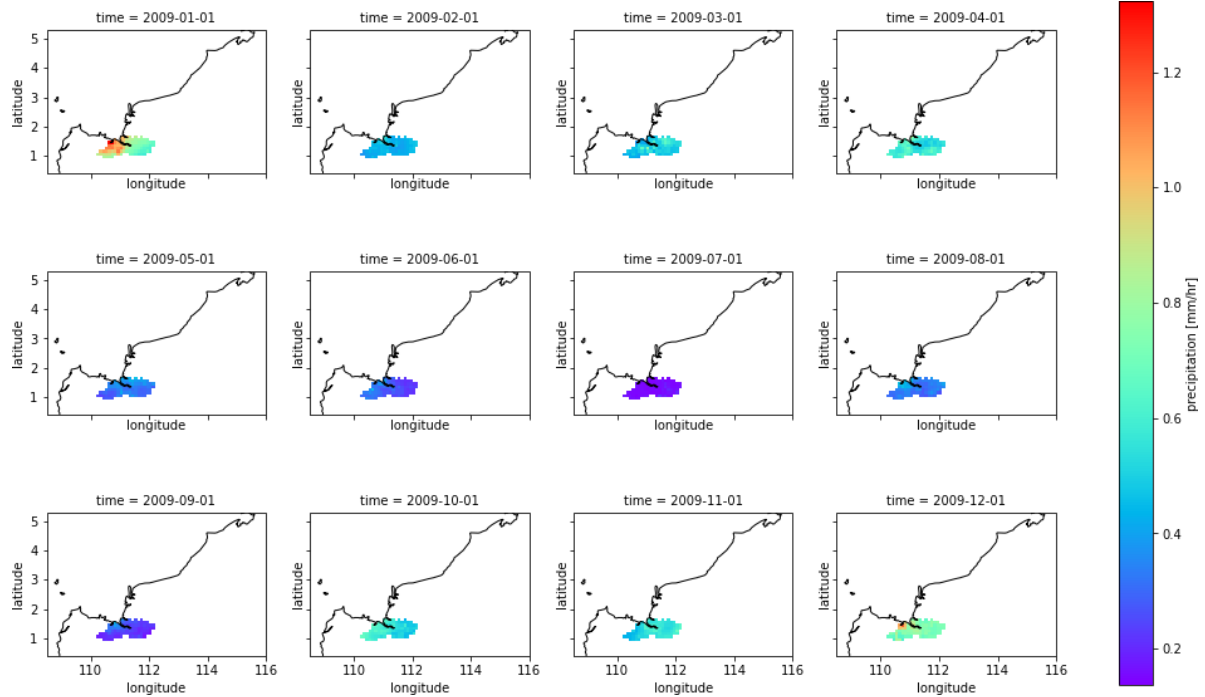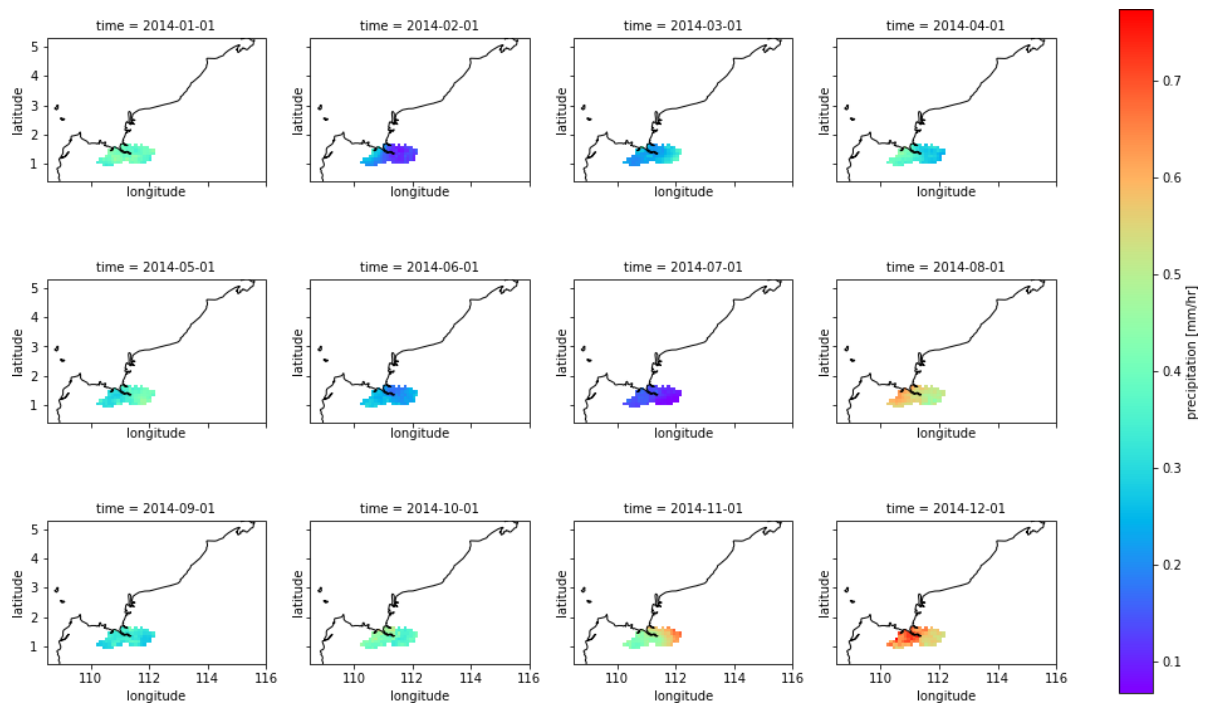
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15    S3: Spatial map of TSS distribution with indicators for the Lupar and Rajang coastal river points (coloured markers) to
16    assess the variation of TSS values in relation to monsoonal and river discharge, as discussed in Section 3.2 and 3.3.

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19    S4: Monthly precipitation values (mm/hr) extracted from GPM datasets at the Lupar river basin in year 2009.
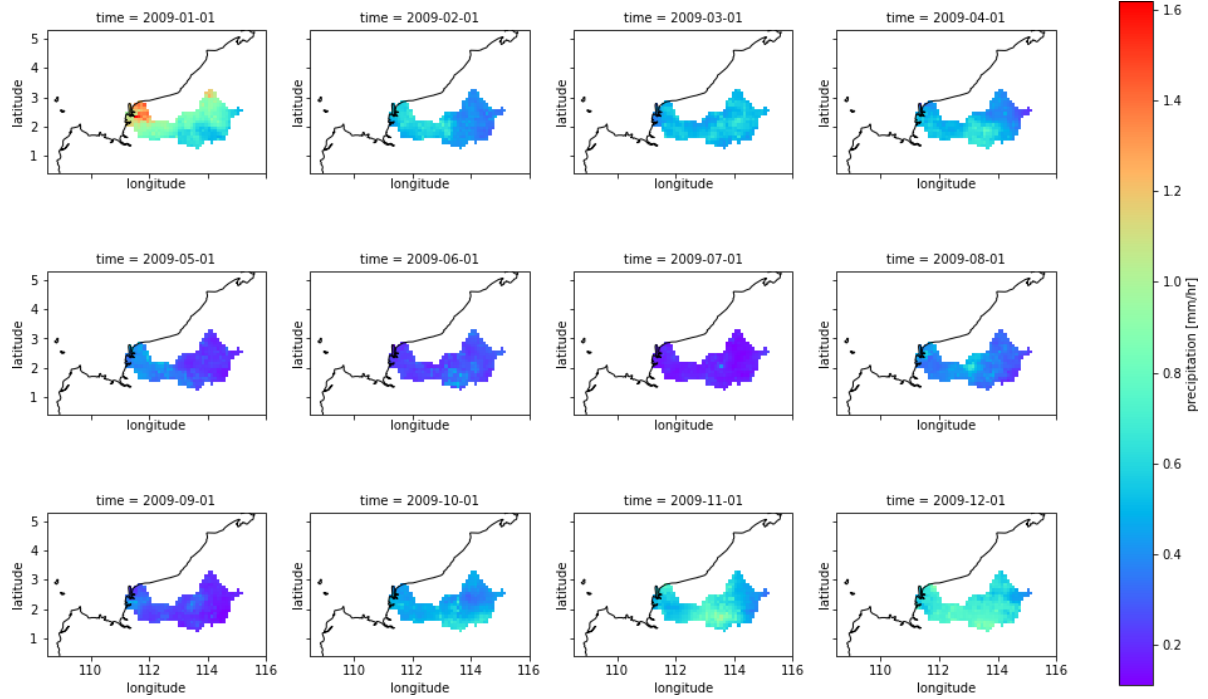


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21    S5: Monthly precipitation values (mm/hr) extracted from GPM datasets at the Lupar river basin in year 2014.
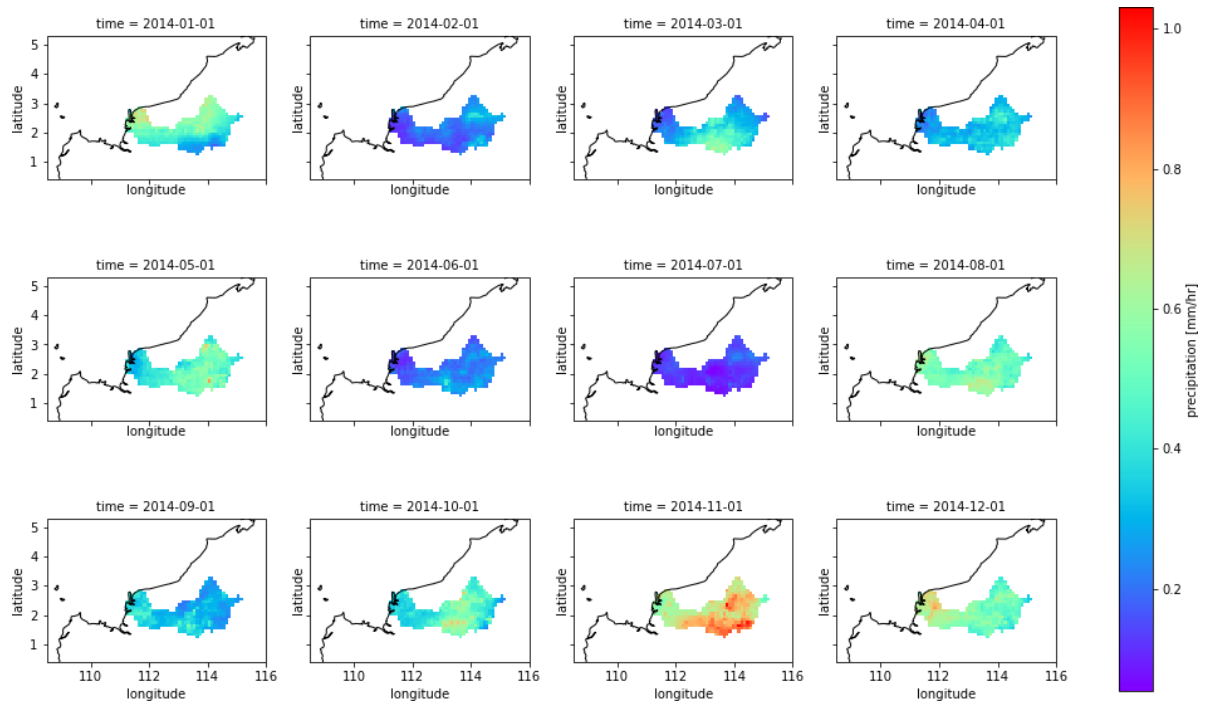
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25    S6: Monthly precipitation values (mm/hr) extracted from GPM datasets at the Rajang river basin in year 2009.



26

27    S7: Monthly precipitation values (mm/hr) extracted from GPM datasets at the Rajang river basin in year 201.
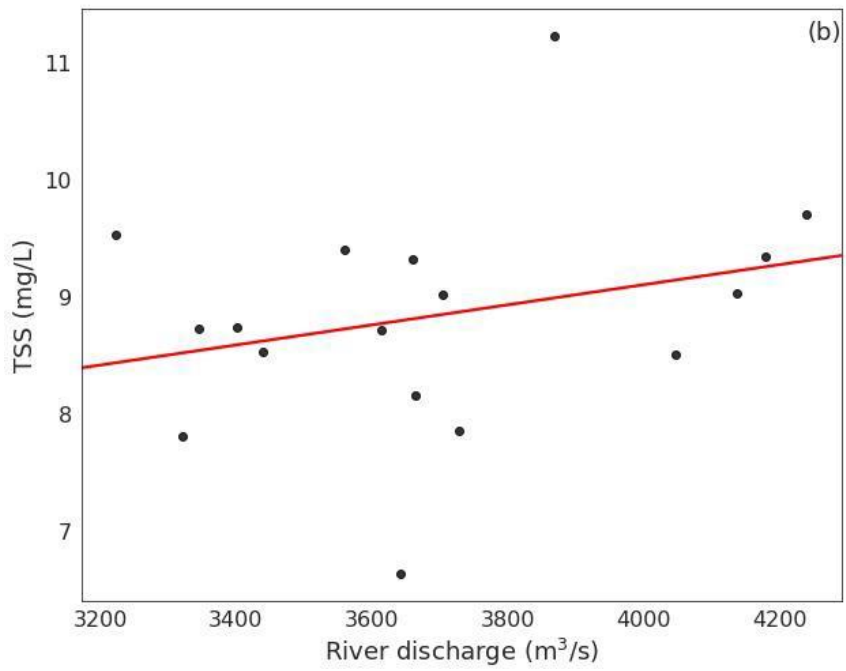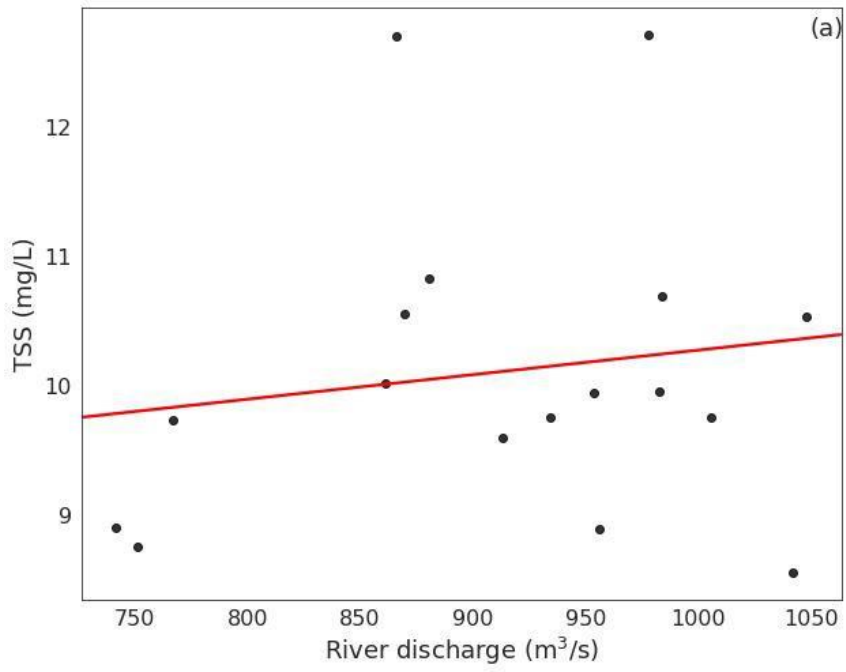
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S8: Scatter plots of TSS concentration (mg/L) vs. river discharge ($m^3/s$) for the Lupar (a) and Rajang (b) basins.

Table S1: Comparison of calibration and accuracy assessment between published MODIS(Aqua)-derived models, and proposed MODIS(Aqua) model for TSS retrieval. Calculation for bias and MAE are in log-transformed structure as adapted from Seegers et al. (2018) and Balasubramanian et al. (2020).

| Parameter | Publication | Bands (nm) | Model | Bias | MAE | RMSE | adjusted R2 | MRE (%) | CV |
|---|---|---|---|---|---|---|---|---|---|
| TSS | Jiang & Lu (2011) | Rrs(470), Rrs(555) | TSS = 1365.5[Rrs(470) + Rrs(555)]^2 - 369.08[Rrs(470)+Rrs(555)] + 27.216 | 5.7448 | 6.1579 | 18.5426 | 0.3476 | 1014.18 | 1.2745 |
| | Zhang et al. (2010) | Rrs(488), Rrs(555), Rrs (645) | Log10(TSS) = 0.6311 + 22.2158[Rrs(555) + Rrs(645)] - 0.5239[Rrs(488)/Rrs(555)] | 0.7049 | 1.9774 | 9.048 | 0.7243 | -8.7216 | -7.5375 |
| | Kim et al. (2017) | Rrs(490), Rrs(555), Rrs(670) | Log(TSS) = 0.649 + 25.623*[Rrs(555) + Rrs(670)] - 0.646*[Rrs(490)/Rrs(555)] | 0.6443 | 1.9227 | 8.9264 | 0.7218 | -19.5701 | -2.7432 |
| | *This study* | Rrs(530), Rrs(666) | TSS = 21.238[(Rrs530/Rrs666)]^-1.272 | 0.9999 | 1.4732 | 5.1116 | 0.8182 | 13.8355 | 4.74 |

Table S2: Malaysian Marine Water Quality Standards for Total Suspended Solids (mg/L) taken from the Department of Environment (https://www.doe.gov.my/wp-content/uploads/2021/10/BOOKLET-BI-SKAMM.pdf).

| Parameter | Classification | | | | | |
|---|---|---|---|---|---|---|
| | Class 1 | Class 2 | Class 3 | Interim Class E1 | Interim Class E2 | Interim Class E3 |
| | Sensitive marine habitats | Fisheries (including Mariculture) | Industry, Commercial Activities & Coastal Settlements | Coastal plain | Estuaries Lagoon | Complex Distributary Network |
| Total Suspended Solids (mg/L) | 25.0 | 50.0 | 100.0 | 30.0 | 30.0 | 30.0 |

Table S3: Malaysian National Water Quality Standards for Total Suspended Solids (mg/L) taken from Department of Environment (https://www.doe.gov.my/wp-content/uploads/2021/11/Standard-Kualiti-Air-Kebangsaan.pdf).

| Parameter | Unit | Class | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | IIA | IIB | III | IV | V |
| Total Suspended Solids | mg/L | 25 | 50 | 50 | 150 | 300 | 300 |