Response to Editor

Dear Professor Shen,

Thank you for the thoughtful review of our manuscript (No. bg-2022-217) and the chance to submit a revised version. We sincerely appreciate your valuable suggestions and generous assistance. We have incorporated the changes you recommended into the revised manuscript.

All changes have also been highlighted in yellow in the revised version of the manuscript and the Supplementary Information. We hope the revised version of the manuscript will be acceptable for publication in the journal Biogeosciences. We look forward to hearing from you.

Thank you very much for your kind consideration.

Sincerely,
Lishan Ran
On behalf of all the authors

Response to editor

Regarding the computation of SUVA254, it is accurate to utilize the decadic term of absorbance (i.e., absorbance normalized to path length, measured in m-1) for SUVA254 calculations, following the method outlined in Weishaar et al. 2003. However, in this context, the symbol representing the decadic absorption coefficient is italicized alpha (α), not the letter a. The letter a (or more often in its italic form) is typically employed to denote the Napierian absorption coefficient, where a is equal to α times ln10. To align with the correct notation, the authors can simply substitute the term "a254" with "α254" (alpha α in its italicized form) in equation (1) and add "decadic" before "absorption coefficient" in the subsequent line.

Our response: Thanks for your clarification on definition on SUVA254 calculations. We have substituted the term "a254" with "*α*254" throughout the manuscript and added “decadic” before “absorption coefficient” in the revised manuscript: “

Decadic absorbance values were used to calculate decadic absorption coefficients as below (Poulin et al., 2014):

$$\alpha_{254} = Abs_{254}/L, \quad (1)$$

Where, α_{254} is the decadic absorption coefficient (m^{-1}), Abs_{254} is the absorbance at 254 nm, and L represents the path length (m). Specific UV absorbance at 254 nm ($SUVA_{254}$; reported in units of L mg C^{-1} m^{-1}) was determined according to Weishaar et al. (2003; Table 1):

$$SUVA_{254} = \alpha_{254}/DOC. \quad (2)$$

” (P7 Line 180-186)

line 237: remove “were” in the title of Table 2.

Our response: Thanks. We have remove “were” in the title of Table 2: “DOM optical parameters used in this study.” (P9 Line 235)

line 272: define “SD”. I assume it stands for Standard Deviation.

Our response: Thanks. We have added the definition of SD in “2.4. Statistical analysis” as: “*Values are presented as the mean ± standard deviation (SD)*.” (P8 Line 210)

lines 298-324: Section 3.3, I think it would be more informative to report r values in addition to p values. The r values help evaluate the strength and direction of the correction described in the text.

Our response: Thanks. We have added r values in “section 3.3” to strength our results. “Section 3.3” was shown below: “Significant pairwise interdependencies between DOC and catchment characteristics were identified in the three study rivers (Fig. 4). There is a strong negative correlation between DOC and SOC ($p < 0.001$, $r = -0.73$; Fig. 4), as well as average catchment slope ($p < 0.001$, $r = -0.67$). Conversely, DOC displayed a positive correlation with the proportion of urban and agricultural land uses ($p < 0.001$, $r = 0.62$), Cl^{-}_{anthro} ($p < 0.01$, $r = 0.58$), and NH_4^+-N ($p < 0.01$, $r = 0.51$). Stepwise MLR models revealed that topsoil SOC and POC were the most effective predictors for explaining the spatial variation in DOC concentrations (Table 4), while catchment slope and NH_4^+-N exhibited the highest explanatory power for DOC concentrations when SOC was excluded from the models. Unlike DOC, a significant positive correlation with mean catchment slope was found for $\delta^{13}C_{DOC}$ ($p < 0.001$, $r = 0.76$; Fig. 4). In addition, there was a significant negative correlation between $\delta^{13}C_{DOC}$ and NO_3^--N ($p < 0.001$, $r = -0.75$). Moreover, $\delta^{13}C_{DOC}$ was negatively correlated with DOC concentrations ($p < 0.01$, $r = -0.57$; Fig. 4), but positively correlated with $\delta^{13}C_{POC}$ in these three rivers ($p < 0.05$, $r = 0.51$). Similar to $\delta^{13}C_{DOC}$, $\Delta^{14}C_{DOC}$ was positively related to mean catchment slope ($p < 0.01$, $r = 0.91$) and $\Delta^{14}C_{POC}$ ($p < 0.05$, $r = 0.79$). Additionally, there was a positive correlation between $\Delta^{14}C_{POC}$ and catchment slope ($p < 0.05$, $r = 0.79$), and no significant correlations were detected between $\Delta^{14}C_{POC}$ and the proportion of urban and agricultural land uses or ions that reflect human disturbances (e.g., Cl^{-}_{anthro}, NH_4^+-N, and NO_3^--N; $p > 0.05$; Fig. 4).

$SUVA_{254}$ showed an increasing trend with increasing mean catchment slope ($p < 0.001$, $r = 0.77$; Fig. 4). Furthermore, there was a significant negative correlation between $SUVA_{254}$ and the proportion of urban and agricultural land uses ($p < 0.001$, $r = -0.83$; Fig. 4). This is consistent with the constructed stepwise MLR models that urban and agricultural land uses and catchment slope were the best predictors of $SUVA_{254}$ (Table 4). Although no significant correlation was observed between the fluorescence indexes and catchment slope, they (except for FI) were found to be closely related to land use patterns (Fig. 4). For example, HIX had a positive correlation with urban and agricultural land uses ($p < 0.001$, $r = 0.61$; Fig. 4), while β/α had a negative correlation with urban and agricultural land uses ($p < 0.01$, $r = -0.52$) and water pH ($p < 0.001$, $r = -0.66$). In addition, the fluorescence components did not exhibit significant variations with changing catchment slope ($p > 0.05$; Fig. 4), but the percentage of C1 and C2 were positively ($p < 0.05$, $r = 0.47$) or negatively ($p < 0.01$, $r = -0.55$) related to the proportion of urban and agricultural land uses. Urban and agricultural land uses were also identified as predictors for DOM optical indexes (i.e., HIX; Table 4) and fluorescent components (i.e., C1 and C2). However, unlike C1 and C2, C3 was not significantly correlated with urban and agricultural land uses ($p > 0.05$; Fig. 4), but its variation can be partially explained by NO_3^--N concentrations and POC (Table 4)."

line 348: Figure 6 is of low resolution; the text appears blurry.
Our response: Thanks. We have replaced it with a high resolution.

line 383: 2014 should be 2015.
Our response: Thanks. We have replaced "2014" to "2015".

line 465: Suggestion: insert "compiled and" before "shown"
Our response: Thanks. We have inserted "compiled and" before "shown" as you suggested: "*To provide a deeper insight into the DOC characteristics of the study rivers, DOC concentrations and the carbon isotopes of DOC in global mountainous rivers are compiled and shown in Table 5*." (P20 Line 466-467)

line 499: Regarding the statement on the availability of data, please refer to our data policy (https://www.biogeosciences.net/policies/data_policy.html). Authors are required to provide a statement on how their underlying research data can be accessed. If the data are not publicly accessible, a detailed explanation of why this is the case is required. The best way to provide access to data is by depositing them (as well as related metadata) in FAIR-aligned reliable public data repositories, assigning digital object identifiers, and properly citing data sets as individual contributions.
Our response: Thanks. We have make most of the data used in this study availability to the public. We'd like to add the statement on the availability of data in the revised manuscript: "*Data availability*. Water chemistry, isotopes, and DOM properties data used in this study are available online at https://doi.org/10.25442/hku.24433354. Other data are available from the corresponding author Lishan Ran upon request at lsran@hku.hk."