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Supplement of

Geomorphologic controls and anthropogenic impacts on dissolved organic carbon from mountainous rivers: insights from optical properties and carbon isotopes

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Introduction

This document contains: Figure S1, distribution of (a) mean drainage elevation, (b) mean channel slope, and (c) urban and agricultural land uses in the Yinjiang (Y), Shiqian (S), and Yuqing (Q) catchments, and (d) percentage of urban and agricultural land uses versus the mean catchment slope; Figure S2, Spatial distribution of SOC content in the surface layer (0–5 cm); Figure S3, fluorescent components identified by the PARAFAC model for the three rivers. Fluorescence peaks are C1 (295/402), C2 (275/338), and C3 (325/440), with wavelengths (nm) for excitation and emission, respectively. In each box plot, the end of the box represents the 25th and 75th percentiles, the blue solid dot represents the mean, the horizontal red line represents the median, and whiskers represent 1.5 IQR. The magenta solid dot represents the outlier, which is outside of the 1.5 interquartile ranges. Letters above the boxes represent significant differences between the grouping of rivers based on statistical analysis with $p < 0.05$; Figure S4, the most parsimonious PLS-PM showing the direct and indirect effects of geomorphology and anthropogenic activities on fluorescent components. (a) Path coefficients are shown as arrows with blue and red to represent positive and negative effects, respectively. The solid and dotted lines indicate the direct and indirect influence pathways of environmental drivers on fluorescent components, respectively. The indicators (e.g., TN) of latent variables (e.g., nutrient) are shown at the beginning of the grey arrows. The numbers in the parentheses are the loading scores. GOF denotes the goodness of fit of the entire model. R^2 indicates the amount of variance in fluorescent components explained by its independent latent variables. The standardized path coefficients that are significantly different from zero are indicated by $*p =< 0.05$, $** p =< 0.01$, $*** p =< 0.001$. (b) Standardized direct and indirect mean effects of environmental drivers on fluorescent components derived from the PLS-PM analysis. C1 was initially included in the model but had to be removed to meet the requirements of the model analysis; Figure S5, the most parsimonious PLS-PM showing the direct and indirect effects of geomorphology and anthropogenic activities on DOM optical parameters. (a) Path coefficients are shown as arrows with blue and red to represent positive and negative effects, respectively. The solid and dotted lines indicate the direct and indirect influence pathways of environmental drivers on DOM optical parameters, respectively. The indicators (e.g., TN) of latent variables (e.g., nutrient) are shown at the beginning of the grey arrows. The numbers in the parentheses are the loading scores. GOF denotes the goodness of fit of the entire model. R^2 indicates the amount of variance in DOM optical parameters explained by its independent latent variables. The standardized path coefficients that are significantly different from zero are indicated by $*p =< 0.05$, $** p =< 0.01$, $*** p =< 0.001$. (b) Standardized direct and indirect mean effects of environmental drivers on DOM optical parameters derived from the PLS-PM analysis. FI was initially included in the model but had to be removed to meet the requirements of the model analysis; Figure S6, implications for water from deeper flow paths. (a) Relationship between EC and $\delta^{18}O$ for the river water and spring water. This relationship represents the mixing of the two reference waters: groundwater and upstream river water. (b) Variations of $\delta^{18}O$ for water in the mainstream of the Yinjiang River. The $\delta^{18}O$ value used in panel b for site Y12 is from the sample we collected before rainfall. The $\delta^{18}O$ value for site Y15 was influenced by rainfall. The statistical test used a significance level of 0.05.

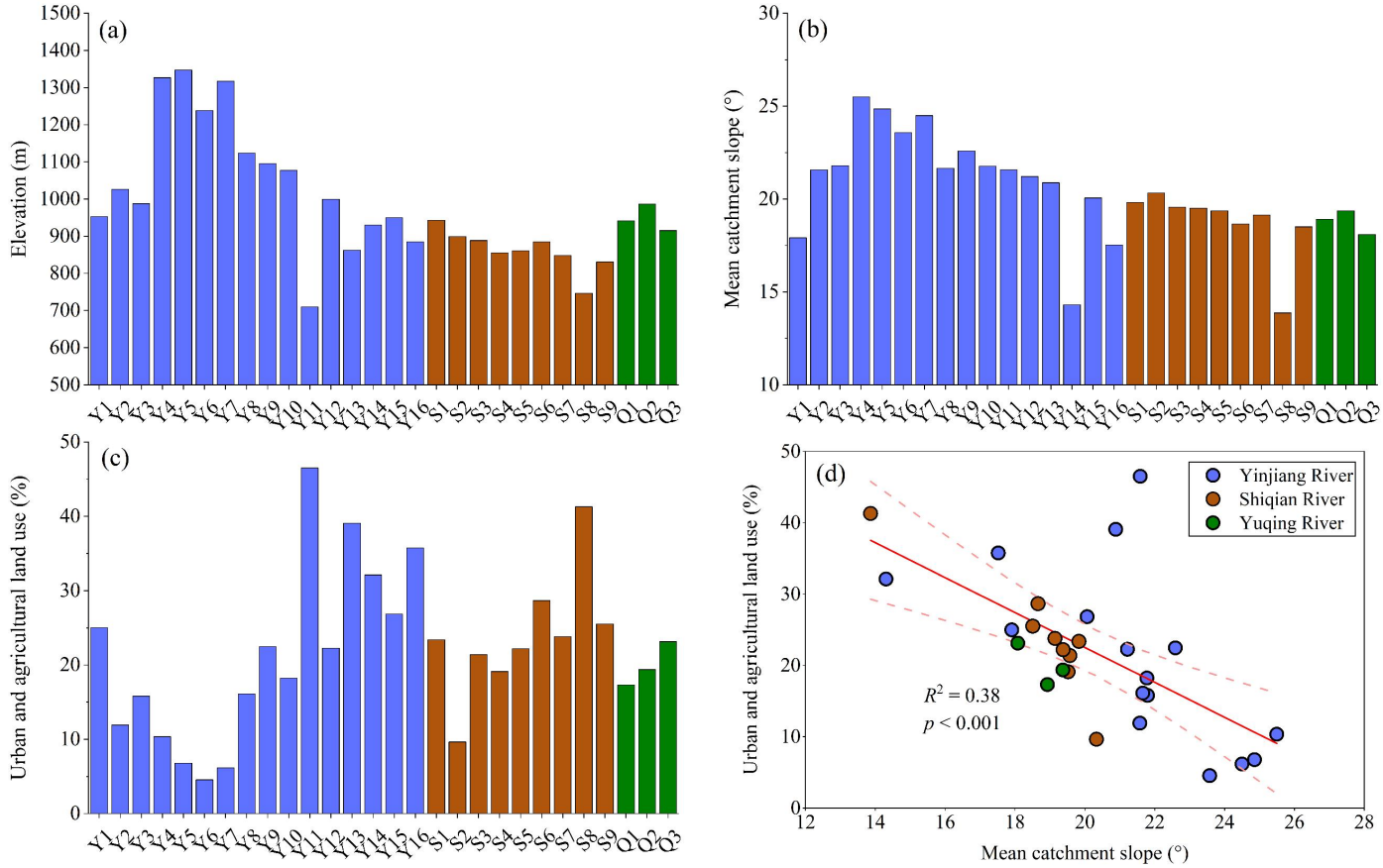

Figure S1 Distribution of (a) mean drainage elevation, (b) mean channel slope, (c) urban and agricultural land uses in the Yinjiang (Y), Shiqian (S), and Yuqing (Q) catchments, and (d) percentage of urban and agricultural land uses versus the mean catchment slope.

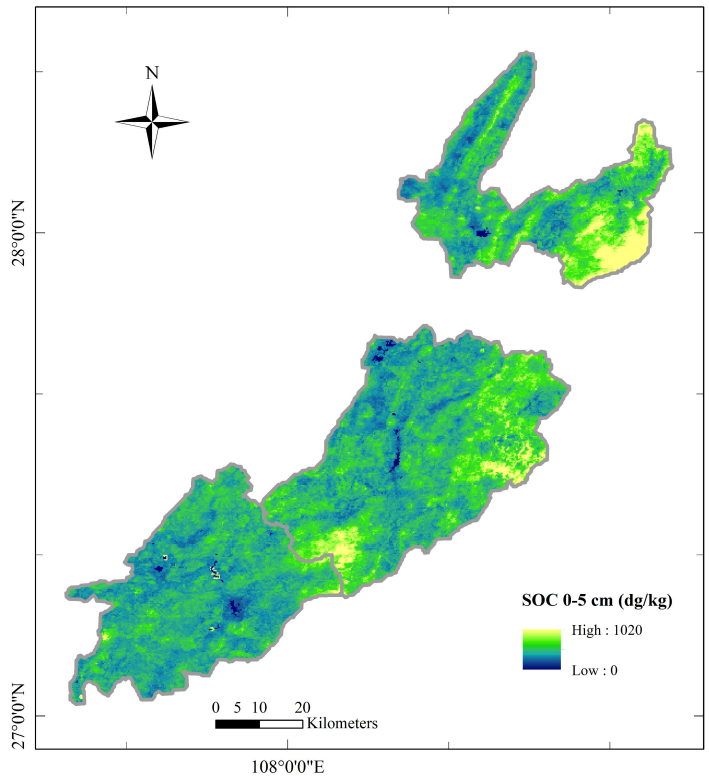

Figure S2 Spatial distribution of SOC content in the surface layer (0–5 cm).

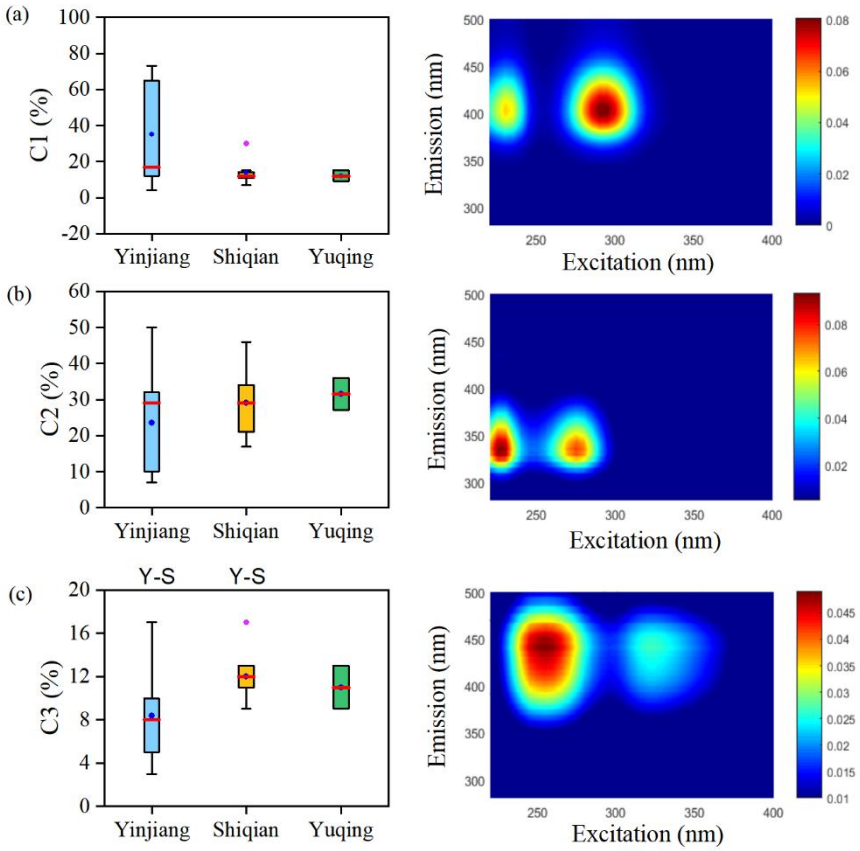

Figure S3 Fluorescent components identified by the PARAFAC model for the three rivers. Fluorescence peaks are C1 (295/402), C2 (275/338), and C3 (325/440), with wavelengths (nm) for excitation and emission, respectively. In each box plot, the end of the box represents the 25th and 75th percentiles, the blue solid dot represents the mean, the horizontal red line represents the median, and whiskers represent 1.5 IQR. The magenta solid dot represents the outlier, which is outside of the 1.5 interquartile ranges. Letters above the boxes represent significant differences between the grouping of rivers based on statistical analysis with $p < 0.05$.

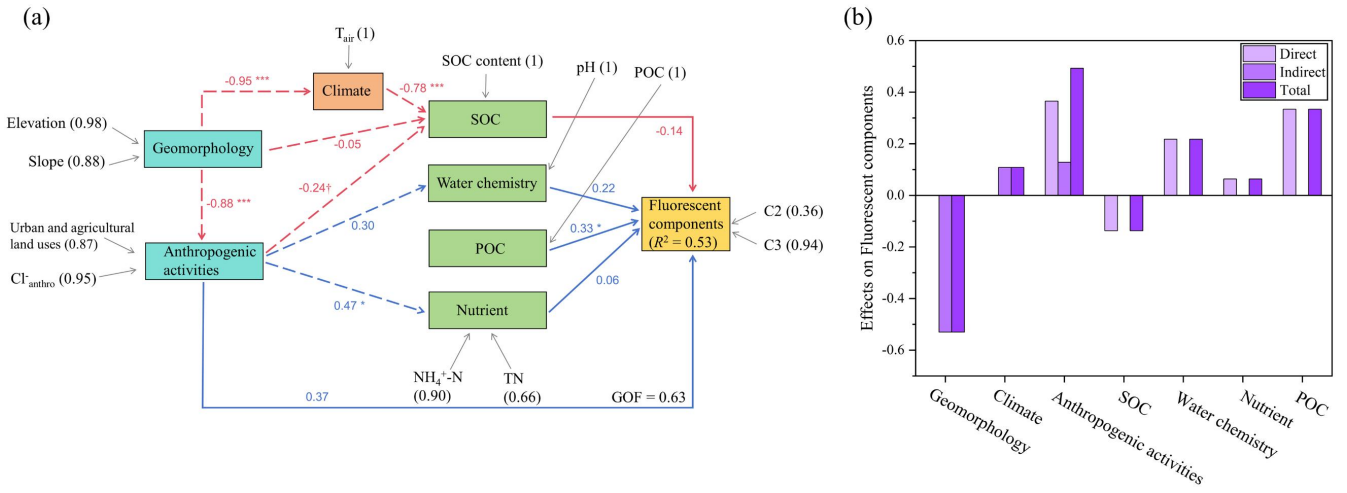

Figure S4 The most parsimonious PLS-PM showing the direct and indirect effects of geomorphology and anthropogenic activities on fluorescent components. (a) Path coefficients are shown as arrows with blue and red to represent positive and negative effects, respectively. The solid and dotted lines indicate the direct and indirect influence pathways of environmental drivers on fluorescent components, respectively. The indicators (e.g., TN) of latent variables (e.g., nutrient) are shown at the beginning of the grey arrows. The numbers in the parentheses are the loading scores. GOF denotes the goodness of fit of the entire model. R^2 indicates the amount of variance in fluorescent components explained by its independent latent variables. The standardized path coefficients that are significantly different from zero are indicated by *p = < 0.05, ** p = < 0.01, *** p = < 0.001. (b) Standardized direct and indirect mean effects of environmental drivers on fluorescent components derived from the PLS-PM analysis. C1 was initially included in the model but had to be removed to meet the requirements of the model analysis.

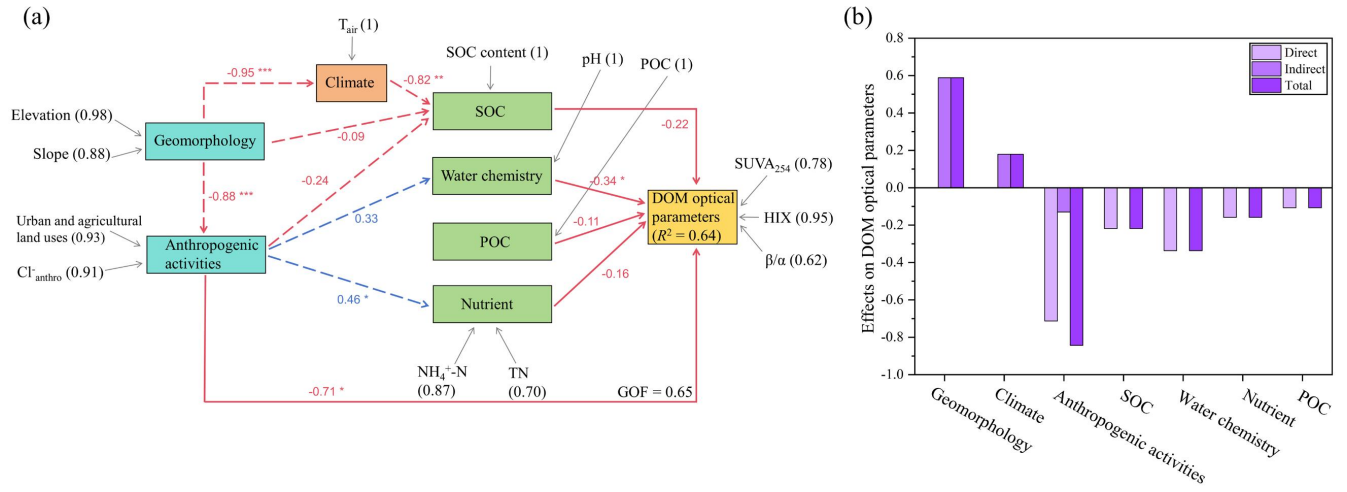

Figure S5 The most parsimonious PLS-PM showing the direct and indirect effects of geomorphology and anthropogenic activities on DOM optical parameters. (a) Path coefficients are shown as arrows with blue and red to represent positive and negative effects, respectively. The solid and dotted lines indicate the direct and indirect influence pathways of environmental drivers on DOM optical parameters, respectively. The indicators (e.g., TN) of latent variables (e.g., nutrient) are shown at the beginning of the grey arrows. The numbers in the parentheses are the loading scores. GOF denotes the goodness of fit of the entire model. R^2 indicates the amount of variance in DOM optical parameters explained by its independent latent variables. The standardized path coefficients that are significantly different from zero are indicated by *p = < 0.05, ** p = < 0.01, *** p = < 0.001. (b) Standardized direct and indirect mean effects of environmental drivers on DOM optical parameters derived from the PLS-PM analysis. FI was initially included in the model but had to be removed to meet the requirements of the model analysis.

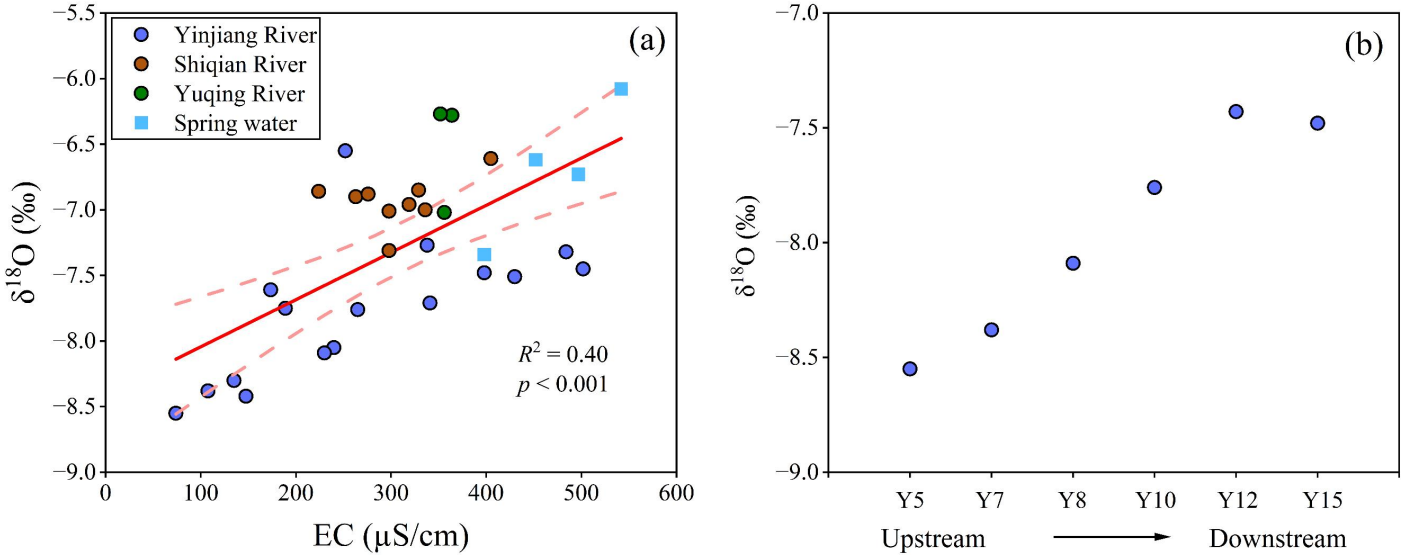

Figure S6 Implications for water from deeper flow paths. (a) Relationship between EC and $\delta^{18}O$ for the river water and spring water. This relationship represents the mixing of the two reference waters: groundwater and upstream river water. (b) Variations of $\delta^{18}O$ for water in the mainstream of the Yinjiang River. The $\delta^{18}O$ value used in panel b for site Y12 is from the sample we collected before rainfall. The $\delta^{18}O$ value for site Y15 was influenced by rainfall. The statistical test used a significance level of 0.05.