Response to Anonymous Referee #3

General Comments:

This study characterizes the geomorphological controls and anthropogenic effects on DOM dynamics in small mountainous rivers. There are some interesting results and discussion that would make this manuscript a good contribution to the literature. However, there are important methodological details that need to be included or rectified before publication. Further, the discussion is lacking a clear structure, and I think the manuscript would be much improved by the removal of tangential and speculative discussion.

Allochthonous and autochthonous are incorrectly defined here. Autochthonous does not mean "microbial," but rather, produced within the river (e.g., from primary producers within the aquatic system). Allochthonous means organic C produced outside the river, but can also be "microbial" in composition (for example, if the DOM is derived from soils that have undergone significant microbial degradation).
Our response: We appreciate the reviewer for the time and effort spent reviewing our paper. We also thank to the reviewer for the affirmation of results and discussion. We have modified the manuscript as you suggested (see details on our response in specific comments). After revision, we believe the manuscript was much improved.

Specific Comments:

Methods: There are many important details missing in the methodology, particularly in the laboratory analysis section. This makes it challenging to assess whether the methodology in this study is sound. See specific comments below.

Please include methodology on how land-use and slope are calculated.
Our response: Thanks. We have added details on how land-use and slope are calculated in the manuscript as: "*Catchment characteristics (e.g., mean drainage elevation, annual air temperature, mean channel slope, and proportion of urban and agricultural land uses) for the sub-catchments were determined using ArcGIS (version 10.2)*." (P4 Line 101-102).

Ln 100: What were samples collected with? Acid-washed or baked equipment?
Our response: Thanks. Details on sample collection have been added in the manuscript as follow: "*The filtered water was stored in a Milli-Q water pre-washed low-density polyethylene container at low temperature (4℃) in the dark before optical properties analysis and acidified by phosphoric acid to pH=2 for DOC analysis.*" (P5 Line 133-135).

Ln 106: How long were samples stored before optical measurement? 0.7 μm pore size allows microbes into filtrate, so long storage times (even at 4°C) can be problematic.
Our response: Thanks. Refrigerated water samples for determine DOM absorbance and fluorescence were analyzed within one week, which is a suggested period for DOM optical measurement (Coble et al., 2014). We have included the information in the manuscript as: "*Refrigerated water samples for DOM absorbance and fluorescence were analyzed within one week after sampling.*" (P6 Line 166-167).
Reference: *Coble P. G., Lead, J., Baker, A., Reynolds, D. M. and Spencer, R. G.: Aquatic organic matter fluorescence, Cambridge University Press, 2014.*

Ln 117-123: Did the authors measure blanks or standards for radiocarbon measurement to test and correct for contamination in the radiocarbon processing setup? Please describe whether these checks and corrections were performed, and if so, what the amount of error from contamination was, as contamination can be quite significant when processing samples for radiocarbon.
Our response: Thanks. We did have measured blanks and standards for radiocarbon measurement. The $^{14}C/^{12}C$ background ratio was better than 2×10^{-15}. Detailed information for the radiocarbon processing is available at Dong et al. (2018).
Reference: *Dong K., Lang, Y., Hu, N., Zhong, J., Xu, S., Hauser, T.-M. and Gan, R.: The new AMS facility at Tianjin University, Radiation Detection Technology and Methods, 2, doi:10.1007/s41605-018-0064-0, 2018.*

Ln 124: Were blanks measured between absorption analyses and were the blanks subtracted from the measured samples? How did the authors calculate the absorption coefficient (which is needed to calculate SUVA), or are the values presented here raw absorbance values? The SUVA values presented in Figure 4a are much too high for the typical range of surface waters, so maybe SUVA was miscalculated by using the raw absorbance value rather than the decadic absorption coefficient as in Weishaar et al. 2003 (doi: 10.1021/es030360x)?
Our response: Thanks. Blanks have been measured and subtracted (please see the revised manuscript: "*The UV-visible spectrophotometer was blanked with Milli-Q water prior to data collection*"; P6 Line 158-159). Our previous SUVA

values were calculated from naperian values and thus why they are so high. We have re-calculated them from decadic absorbance. The related information has been added in the manuscript as follows: "*Decadic absorbance values were used to calculate absorption coefficients as below (Poulin et al., 2014): a_{254} = Abs_{254}/L. Where, a_{254} is the absorption coefficients (cm^{-1}), Abs_{254} is the absorbance at 254 nm, and L is the path length (cm). Specific UV absorbance at 254 nm ($SUVA_{254}$) was determined according to Weishaar et al. (2003; Table 1): $SUVA_{254}$ = a_{254}/DOC.*" (P6 Line 159-164).

Ln 126: Absorbance and therefore SUVA are highly affected by the presence of iron in filtrate (see Poulin et al. 2014, doi: 1021/es502670r). Do you happen to know the iron concentrations or the iron:DOC ratio in this system? Iron interference could explain why the SUVA values are much higher than typical surface water values (typically < 5.0 L mg^{-1} m^{-1}, see Poulin et al. (2014) and references therein), though the SUVA values presented here seem too high for just an iron interference issue.
Our response: Thanks. We have recalculated the SUVA. The reason why SUVA values are much higher than typical surface water values was because previous SUVA values were calculated from naperian values. The new SUVA values are not much high now. In addition, there are no available references to show that the iron concentrations were high.

Ln 130: How often were blanks measured? Was inner-filter correction performed (see Kothawala et al. 2013, doi: 10.4319/lom.2013.11.616)? Inner-filter correction is essential when working with fluorescence data. Additionally, PARAFAC results should be compared previous work (for example, using OpenFluor) for context.
Our response: Thanks. We measured three blanks (before, during and after the sample measurement). We have added the information in the manuscript as: "*Blanks were measured daily with the same settings to correct excitation-emission matrices (EEMs)*." (P7 Line 171). Inner-filter correction was not performed, this is because the inner filter effects could be ignored as the absorbance at 254 nm was lower than 0.1 m^{-1}(Kothawala et al., 2013). Additionally, all the absorbance at 254 nm of the water samples in this study was lower than 0.1 m^{-1}.
Reference: *Kothawala D. N., Murphy, K. R., Stedmon, C. A., Weyhenmeyer, G. A. and Tranvik, L. J.: Inner filter correction of dissolved organic matter fluorescence, Limnol. Oceanogr. Methods, 11, 616-630, doi:10.4319/lom.2013.11.616, 2013.*

Discussion: Many results are presented in the discussion that are not first presented in the results. I suggest the authors move Figures 3-7 to the Results and add text describing these findings. Further, I think the number of figures can be greatly reduced and the discussion streamlined.
Our response: Thanks for your suggestions. We have moved these figures to the "Results" and added related description in the "Results". Also, the discussion has been modified accordingly. Please see details in the manuscript throughout the "Results" and "Discussion".

Figure 3: Unclear what the purpose of this figure or PARAFAC analysis is as these results are never discussed. This figure can be removed or discussion of PARAFAC results (after contextualizing the components based on OpenFluor, for example) should be added.
Our response: Thanks. We have added discussion of PARAFAC results after contextualizing the components based on OpenFluor in the manuscript: "*Two humic-like fluorescence components (C1 and C3) and one protein-like fluorescence component (C2) were identified by PARAFAC model in these three rivers (Fig. 7; Table S1). Component C1 is similar to traditionally defined peak M and sourced form microbial processes or autochthonous production (Kim et al., 2022; Li et al., 2016; Walker et al., 2009). Component C2 was previously related to recent biological production (DeFrancesco and Guéguen, 2021; Du et al., 2019; Lambert et al., 2017). C3 was the most widely found component in previous research among three fluorescence components, and was identified as traditional fulvic-like peaks A and C, representing terrestrial delivered OM or authochthonous microbial sourced OM (Amaral et al., 2016; Ryan et al., 2022; Shutova et al., 2014). Although C1 and C2 varied more widely in the Yinjiang River compared with the Shiqian and Yuqing rivers, the two fluorescence components did not show a statistical difference among the three rivers (Figs. 7a and b). However, a greater proportion of C3 was found in the Shiqian and Yuqing rivers, exhibiting a distinctive signature comprred with the Yinjiang River (Fig. 7c). The fluorescence components did not exhibit any significant variations with changing channel slope (Fig. S3), but C1 and C2 were positively or negatively related to proportion of urban and agricultural land uses (Figs. 6b and c).*" (P13 Line 277-288).

Table S1 Description of the three components identified by PARAFAC and comparison with previous studies from the OpenFluor database with a minimum similarity score of 0.95 (Murphy et al., 2014).

Component	Description and likely structure	Number of matches in Openfluor	Previous studies
C1	Similar to traditionally defined peak M, marine humic-like component, the products from microbial processes or autochthonous production.	6	C6 (Walker et al., 2009); C4 (Kim et al., 2022); C4 (Li et al., 2016)
C2	Protein-like (Tryptophan-like) components, commonly found in anthropogenically affected rivers, associated with recent biological production and breakdown products of lignin.	30	C3 (DeFrancesco and Guéguen, 2021); C7 (Lambert et al., 2017); C2 (Du et al., 2019)
C3	Traditional fulvic-like peaks A and C, humic-like and terrestrial delivered OM, authochthonous, or microbial source	70	C1 (Amaral et al., 2016); C1 (Ryan et al., 2022); C1 (Shutova et al., 2014)

Figure 4a: SUVA values are uncharacteristically high (see comment above in the methods). Additionally, this figure (once the high SUVA values are addressed or corrected) would be more effective if is discussed in the section below when discussing geomorphology controls on DOM. Why not include it in Figure 6 when trends with slope are shown?

Our response: Thanks. We have added it into the figure as shown below:

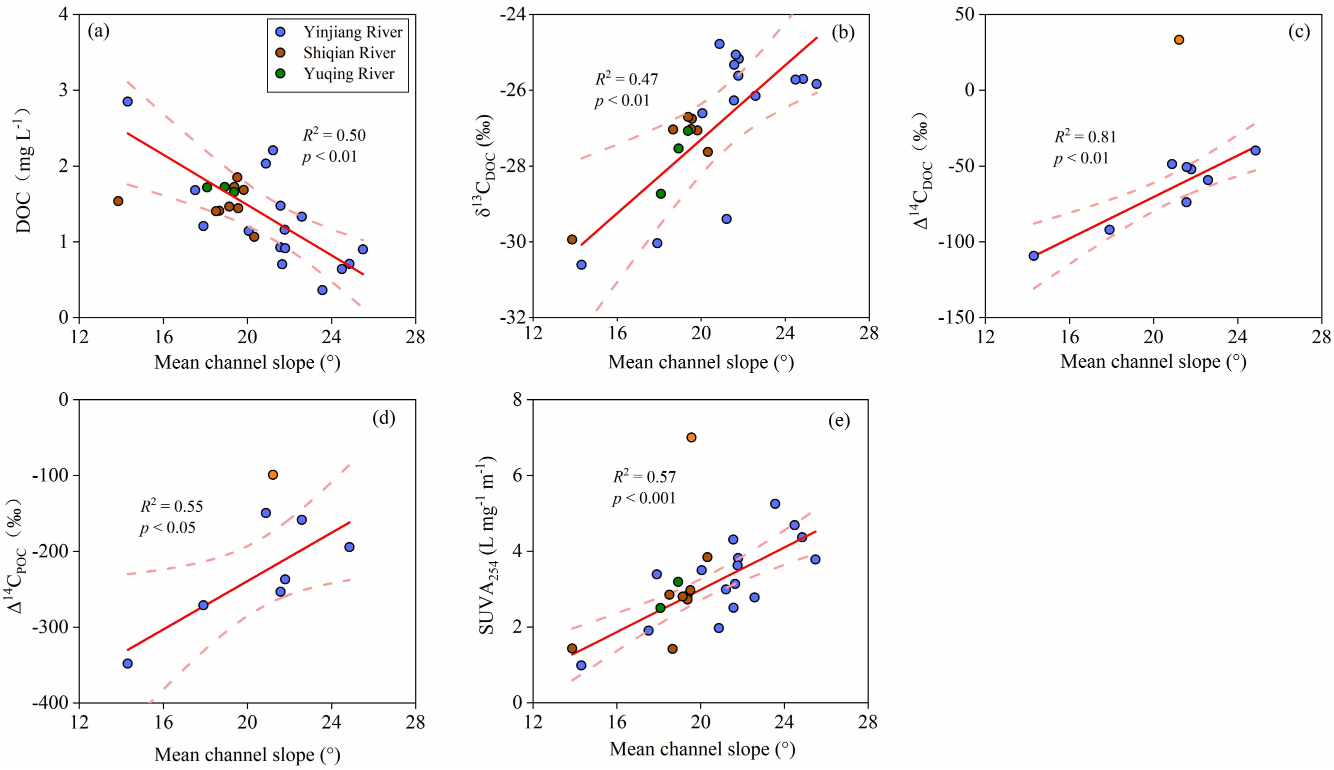

Figure 3. Mean channel slope (°) controls on (**a**) DOC concentrations, (**b**) stable carbon isotopes of DOC ($\delta^{13}C_{DOC}$), (**c**) radiocarbon isotope of DOC ($\Delta^{14}C_{DOC}$), (**d**) radiocarbon isotope of POC ($\Delta^{14}C_{POC}$), and (**e**) $SUVA_{254}$. The $\Delta^{14}C_{DOC}$ and $\Delta^{14}C_{POC}$ are only available for the Yinjiang River. Outliers in orange were excluded from analyses as they were samples at site Y12 collected after a rainfall event in panels (**c**) and (**d**) and sample collected at site S3 due to the high influence by road construction, which was evidenced by high POC and TSM concentration (Chen et al., 2021). The statistical test used a significance level of 0.05.

Figure 4b: This figure is confusing as we do not know much about the site numbers. I suggest the authors present this with changing slope or land-use instead. Additionally, I think this figure would be more effective if the three indices were split into three different plots. The small changes in each parameter are minimized by the large scale of the plot, and the indices shouldn't be compared directly, so there is no need to include them all on the same axis.

Our response: Thanks. We have added these indexes into the Figure 3, 6, S3 and S4 (please see above or below) or modified the figures as you suggested.

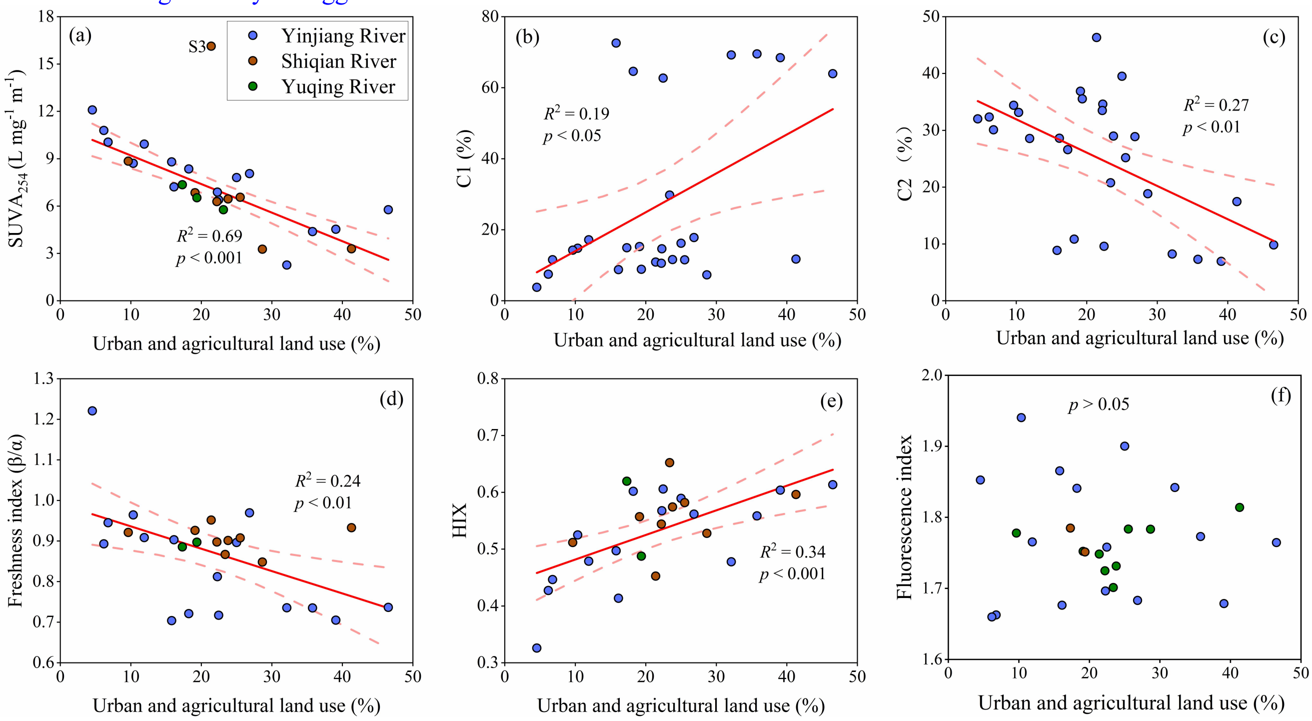

Figure 6. Land use pattern impacts on DOM character. (**a**) $SUVA_{254}$, (**c**) C2, and (**d**) freshness index (β/α) decreased with the increasing proportion of urban and agricultural land uses. Outlier (site S3) was excluded from analysis in panel (a) as the sample was strongly influenced by road construction, which was evidenced by high POC and TSM concentration (Chen et al., 2021). (**b**) C1 and (**e**) humification index (HIX) were positively related to the increasing proportion of urban and agricultural land use areas. However, there was no significant correlation between (**f**) fluorescence index and the proportion of urban and agricultural land uses.

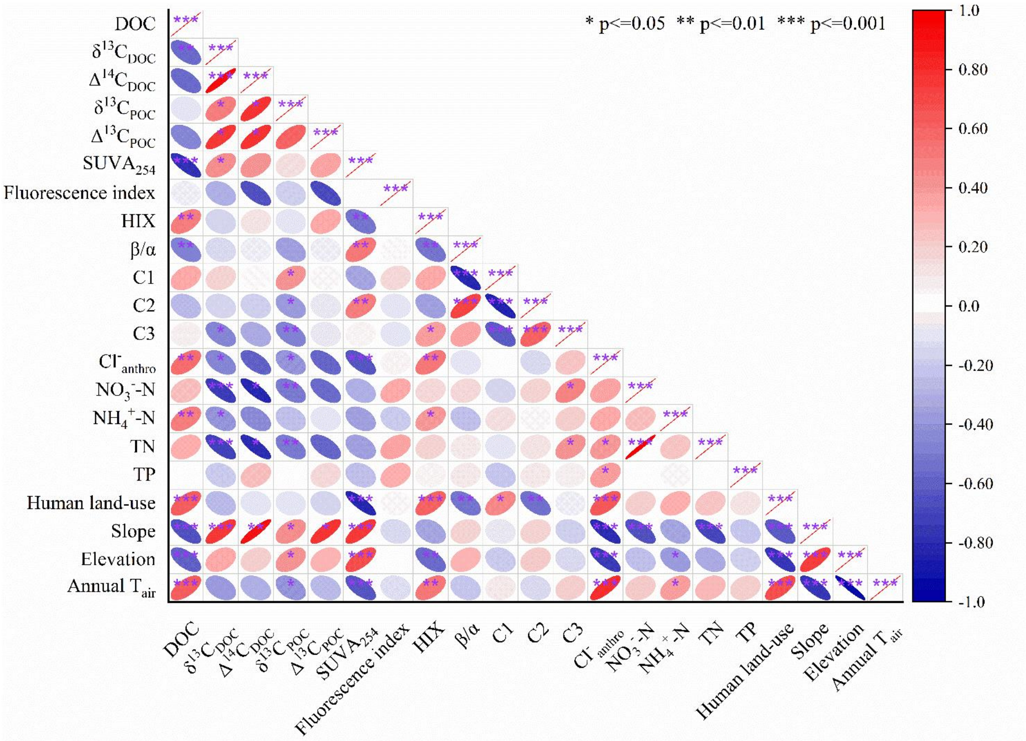

Figure S3 Correlation plot of the selected water chemistry and catchment characteristics. $\delta^{13}C_{DOC}$ and $\Delta^{14}C_{DOC}$ at site Y12 was excluded from analyses as the sample was collected after a rainfall event. In addition, $SUVA_{254}$ at site S3 was excluded from analyses as the sample was strongly influenced by the road construction, which was evidenced by high POC and TSM concentration (Chen et al., 2021). Human land use used here represents proportion of urban and agricultural land use. Elevation and Annual T_{air} represent mean drainage elevation and annual air temperature, respectively.

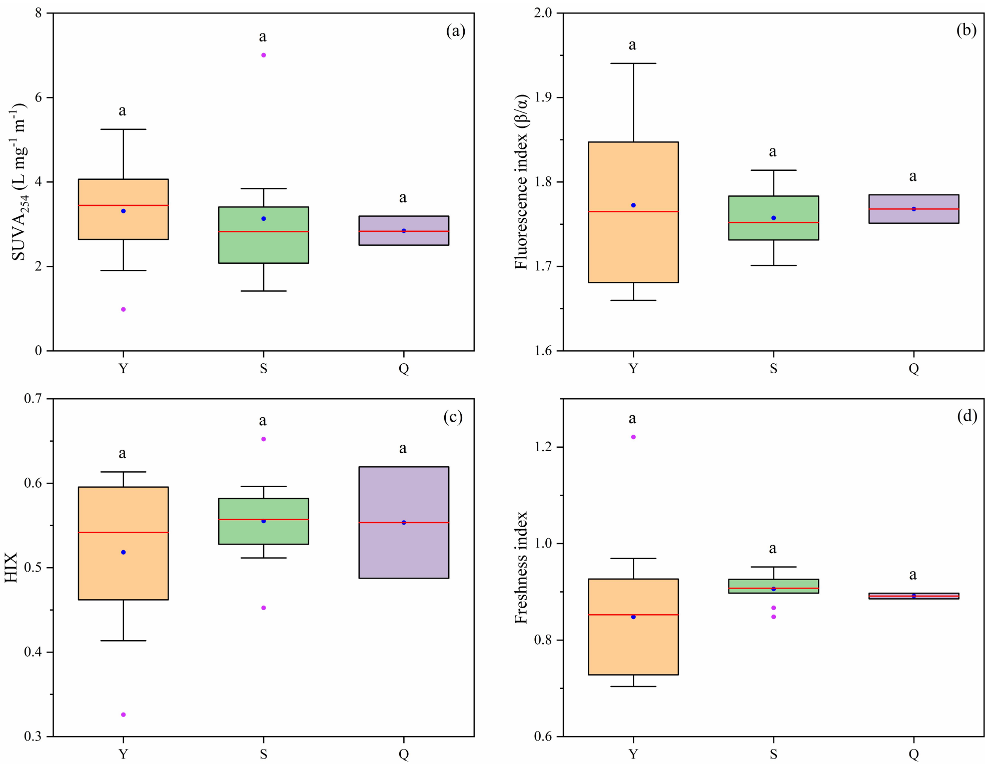

Figure S4 Spatial variations in DOM property in the Yinjiang (Y), Shiqian (S), and Yuqing (Q) catchments. (a) $SUVA_{254}$, (b) freshness index (β/α), (c) HIX, and (d) fluorescence index. In each box plot, the end of the box represents the 25th and 75th percentiles, the blue solid dot represents the average, 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. Different lowercase letters above the boxes denote significant differences across rivers based on statistical analysis with p<0.05.

Figure 5a: Why is the x-axis presented as 1/DOC? I feel it is confusing.
Our response: Thanks. Thanks. We have modified it to be reported as DOC in Figure 5 (please see figure below). The reason for using 1/DOC in the original manuscript is because previous studies have reported similar relationships (i.e., $\delta^{13}C_{DOC}$ vs 1/DOC) in "*spring water (Nkoue Ndondo et al., 2020) and for TOC in soil profiles (Lloret et al., 2016; Nkoue Ndondo et al., 2020)"* (P15 Line 330-331) to explain the lateral transportation of DOC from microbial active soil horizons into rivers (Lambert et al., 2011). We have also explained this correlation in the manuscript (please see P15 Line 329-334).

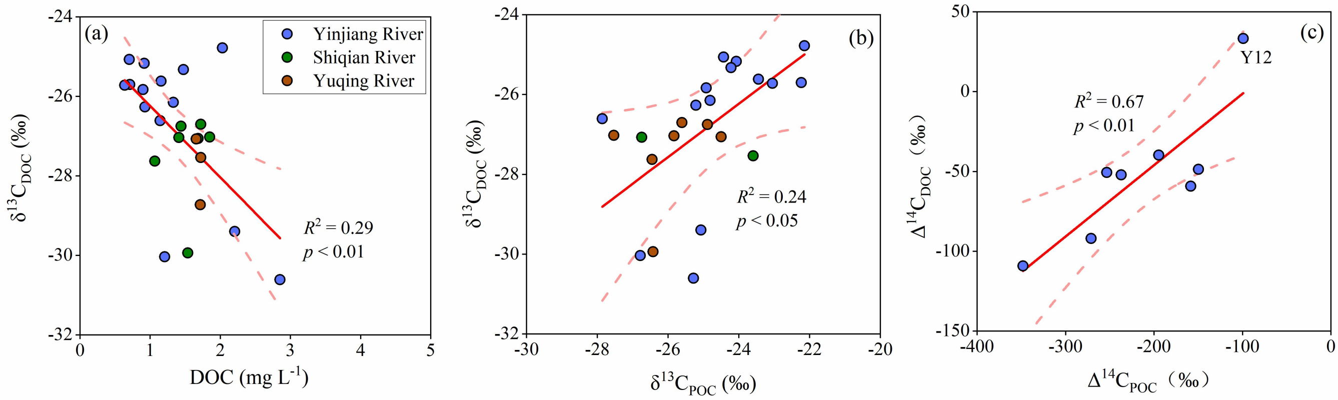

Figure 5. Scatter plot showing (**a**) $\delta^{13}C_{DOC}$ versus DOC in river water, (**b**)$\delta^{13}C_{DOC}$ against $\delta^{13}C_{POC}$ in the Yinjiang River (Y), Shiqian River (S), and Yuqing River (Q), and (**c**) relationship between $\Delta^{14}C_{POC}$ and $\Delta^{14}C_{DOC}$ in the Yinjiang River. For panel (**c**) the DOC with modern age at site Y12 was shown in the top-right corner. The statistical test used a significance level of 0.05.

Ln 235: I don't think you have enough evidence to say that the more negative $\delta^{13}C$ and $\Delta^{14}C$ are from autochthonous production – isn't aged DIC (if autochthonous DOM is incorporating aged weathering productions) more enriched in ^{13}C (see Mayorga et al. 2005, doi: 10.1038/nature03880)? Can the authors provide an explanation for the positive relationship between $\Delta^{14}C$ and $\delta^{13}C$? Further, DOM derived from deeper flow paths is more depleted in ^{14}C, enriched in ^{13}C, and looks more "microbial" in composition (see Barnes et al. 2018, doi: 10.1021/acs.est.7b04717 and Butman et al. 2007, doi: 10.1016/j.orggeochem.2007.05.011). Therefore you may not have allochthonous vs autochthonous DOM driving these trends as you suggest, and it may be differences in flow path depth (surface soils and fresh plant material vs. microbially-degraded deep soils).
Our response: Thanks. As you suggested, we have modified the original view (two endmembers mixing and autochthonous production to explain $\delta^{13}C$ and $\Delta^{14}C$ of DOC) due to further discussion. We have deleted the figure which showed relationships between $\delta^{13}C_{DOC}$ and $\Delta^{14}C_{DOC}$, and take it as common controls of landscape and/or hydrology on the sources of organic carbon. Please see related discussion in the revised manuscript as: "*Furthermore, the weak positive correlation between the $\delta^{13}C_{DOC}$ and $\delta^{13}C_{POC}$ of these three rivers (Fig. 5b) indicated that DOC and POC may derive from the same source. We also found a strong positive correlation between $\Delta^{14}C_{DOC}$ and $\Delta^{14}C_{POC}$ in the Yinjiang River ($R^2 = 0.67$, $p < 0.01$; Fig. 5c). The coupling between $\Delta^{14}C_{DOC}$ and $\Delta^{14}C_{POC}$ was an unusual relationship rarely found in other rivers (Campeau et al., 2020; Longworth et al., 2007). Campeau et al. (2020) have attributed this relationship to common controls of landscape and/or hydrology on the sources of organic carbon in rivers, and this correlation could be masked by the mixing of waters from other tributaries, which further support the combined geographical controls (e.g., as a driver of landscape) and anthropogenic impacts (e.g., dam construction, see discussion below) on DOC sources.*" (P18 Line 415-422)

Figures 6 and 7 are really strong and interesting. On the other hand, I don't see the utility of including section 4.1. It is more of a summary of past work with a lot of speculation, and it is mostly tangential to the main purpose of the manuscript (i.e., the effects of geomorphology and anthropogenic impacts on DOM in mountainous rivers). I think some of the text in this section can be incorporated into later sections when the authors are discussing the relationships between DOM parameters and slope / anthropogenic impacts, but much of it can be removed.
Our response: Thanks. We have modified this section and move part of it to be the last section of the discussion (please see section "4 Discussion" in the revised manuscript). In addition, we have removed some of the content which seems to be more of a summary of past work with a lot of speculation and added some new evidences to support the conclusion. For example, more details on groundwater contribution to riverine DOC have been added in the revised manuscript as: "*Groundwater with large SOC inputs due to highly active microbial activities has long been recognized as a significant*

source of DOC, especially under warm and wet conditions (McDonough et al., 2020; Shen et al., 2014). Several studies have reported increased groundwater contributions with distance downstream at the watershed scale (Asano et al., 2020; Cowie et al., 2017; Iwasaki et al., 2021), suggesting the important role of groundwater in mountainous rivers, though this is not a general phenomenon due to great differences in catchment characteristics (e.g., bedrock and topography) and climate (e.g., precipitation; Somers and McKenzie, 2020). The positive relationship between conductivity and $\delta^{18}O$ are due largely to the mixing of two end-members for river water (Fig. S2a), though it may also indicate the evaporation processes in the catchment (Zhong et al., 2020). The trend showed that one of the end-members was characterized by high-conductivity with ^{18}O-enriched (groundwater), and the other was characterized by low-conductivity with $\delta^{18}O$-depleted headstream water. Similar relationships were also identified in other mountainous rivers (Lambs, 2004). In addition, $\delta^{18}O$ values increased progressively from upstream to downstream (Fig. S2b), which also validates the two sources (i.e., headstream water, and groundwater) of downstream river water, indicating that groundwater was likely an important contributor to downstream river water. Despite that groundwater inflow seemed to be of great importance to river water, groundwater DOC was likely not the most important source of riverine DOC due to the relatively low groundwater DOC concentrations as compared with riverine DOC concentrations (Fig. 2d). Moreover, the groundwater contribution was probably much less significant in the wet season, even in catchments where DOC is mainly derived from groundwater (Lloret et al., 2016). Thus, we infer that groundwater is an important but not a crucial source of riverine DOC in the three study rivers." (P16 Line 335-351). Furthermore, we have added 14C-DOC of other mountainous rivers for comparisons (please see section "4.3" below).

4.3 Combined effects of geomorphologic and anthropogenic controls on DOC and comparison of Δ14CDOC in mountainous rivers

In this study, geomorphologic characteristics and anthropogenic activities were identified as significant drivers of DOC export and DOM composition across broad spatial scales. We further discussed how the two critical factors together shift the riverine DOC. The riverine DOC age ranged from modern to greater than 1000 years, which is mainly determined by its sources and aquatic processing (Butman et al., 2012; Koch et al., 2022; Moyer et al., 2013). Generally, DOC is mainly derived from surface soil, decaying terrestrial plants, and autochthonous production, which usually contain a modern carbon pool (Findlay and Sinsabaugh, 2004; Zhou et al., 2018). In addition, old carbon is usually exported from pools such as deep soil layers, peat, shale, groundwater, and terrestrial organisms which incorporate inorganic carbon from weathering sources (Butman et al., 2014; Moyer et al., 2013; Raymond et al., 2004). Petroleum-based carbon export through wastewater, urban, and agricultural runoff has recently been recognized as a potentially important source of old carbon (Butman et al., 2012; Griffith et al., 2009; Sickman et al., 2010). The DOC ages of the Yinjiang River were younger than that of DOC reported in agricultural rivers (Moyer et al., 2013; Sickman et al., 2010) or treated wastewater (Griffith et al., 2009), which is typically more than 1000 years old. However, we cannot conclude that DOC in the Yinjiang River was not influenced by anthropogenic activities as the wide range of anthropogenically-impacted DOC ages (Butman et al., 2014) and various sources of anthropogenic DOC as discussed above, which led to insignificant correlation between the proportion of urban and agricultural land uses and isotopes of organic carbon (Fig. S3). The input of large amounts of young terrestrial-derived organic matter through surface runoff during rainfall events could explain the young age of the DOC and POC at site Y12 (Table 2 and Fig. 5c), where the sample was collected after a rainfall event (Chen et al., 2021). Furthermore, the weak positive correlation between the $\delta^{13}C_{DOC}$ and $\delta^{13}C_{POC}$ of these three rivers (Fig. 5b) indicated that DOC and POC may derive from the same source. We also found a strong positive correlation between $\Delta^{14}C_{DOC}$ and $\Delta^{14}C_{POC}$ in the Yinjiang River (Fig. 5c). The coupling between $\Delta^{14}C_{DOC}$ and $\Delta^{14}C_{POC}$ was an unusual relationship rarely found in other rivers (Campeau et al., 2020; Longworth et al., 2007). Campeau et al. (2020) have attributed this relationship to common controls of landscape and/or hydrology on the sources of organic carbon in rivers, and this correlation could be masked by the mixing of waters from other tributaries, which further support the combined geographical controls (e.g., as a driver of landscape) and anthropogenic impacts (e.g., dam construction, see discussion below) on DOC sources.

In addition, the widespread dams and reservoirs for irrigation and water supply would lead to the prolonged water retention time across river systems, entailing a great change in organic carbon reactivity and CO_2 emissions (Catalán et al., 2016; Ran et al., 2021; Yi et al., 2021) and providing a favorable environment for aquatic photosynthesis and bacterial production. This may have significantly influenced the organic carbon dynamics in the study rivers (Chen et al., 2021). Therefore, the carbon cycling in the three rivers is affected by a combination of factors, including geographical controls, anthropogenic impacts, and in-stream processes. Particularly, geographical controls on DOM were mainly evidenced by carbon isotopes, while anthropogenic impacts were supported by the DOM fluorescence characters (Figs. 3 and 6). However, it should be noticed that anthropogenic activities and other impacts are spatially related to elevation, air temperature, and channel slope (Fig. S3), which in turn would influence the river water quality and aquatic processes. It is evident that DOC dynamics are complicated in the study rivers, and a comprehensive assessment of the biogeochemical processes of DOC and their multiple controlling factors will advance our understanding of carbon cycling.

Carbon isotopes of DOC and its concentration in mountainous rivers were summarized in Table 3. Global average $\Delta^{14}C_{DOC}$ is -11.5 ± 134‰, higher than that in the Yinjiang River (-54.7 ± 39.9‰; Tables 2 and 3; Marwick et al., 2015) while similar to many other mountainous rivers (e.g., the Mackenzie River; Campeau et al., 2020) and small mountainous rivers in Puerto Rico; Moyer et al., 2013). $\Delta^{14}C_{DOC}$ values for the world's mountainous streams and rivers were shown by climate (according to the Köppen–Geiger climate classification (Beck et al., 2018; Table 3) and ranged from tropical monsoon climate (Marwick et al., 2015), temperate oceanic climate (Evans et al., 2007), cold semi-arid climates (Spencer et al., 2014) to continental subarctic climate (Hood et al., 2009). DOC of young age in mountainous rivers were reported across climate (Evans et al., 2007; Mayorga et al., 2005; Voss et al., 2022). While the most aged DOC was observed in the Tibetan Plateau (Song et al., 2020; Spencer et al., 2014) and the Gulf of Alaska (Hood et al., 2009). The riverine aged DOC from these regions with cold climate was mainly sourced from melting glacier with high bioavailability (Hood et al., 2009; Spencer et al., 2014) or derived from permafrost thaws in deeper soil horizons with deeper flow paths (Song et al., 2020). As global air temperature increases, the greater input of the aged yet microbially labile DOC into the rivers would lead to increasing emission of CO_2 and CH_4 and further intensify global warming (Vonk and Gustafsson, 2013).

Figure-result?

Ln 318-319: see above comment about the definition of allochthonous vs. autochthonous DOM

Our response: Thanks. We have modified is throughout the text to avoid the misunderstanding. E.g., "*Component C1 is similar to traditionally defined peak M and, sourced form microbial processes or autochthonous production (Kim et al., 2022; Li et al., 2016; Walker et al., 2009)*." (P13 Line 278-280).

Technical Comments:

Ln 20-21: *"Both allochthonous and autochthonous sources had an important effect on riverine DOC export"* Unclear what is meant here – what effect? Be specific

Our response: Thanks. This sentence was deleted as we change some conclusions due to our further discussion on the manuscript.

A table in the methods describing the characteristics of the three rivers with average slopes, land-use properties, drainage areas, etc. would be helpful.

Our response: Thanks. We use a figure in the supplement to show the distribution of mean drainage elevation, mean channel slope, and proportion of urban and agricultural land use of the three rivers more intuitively.

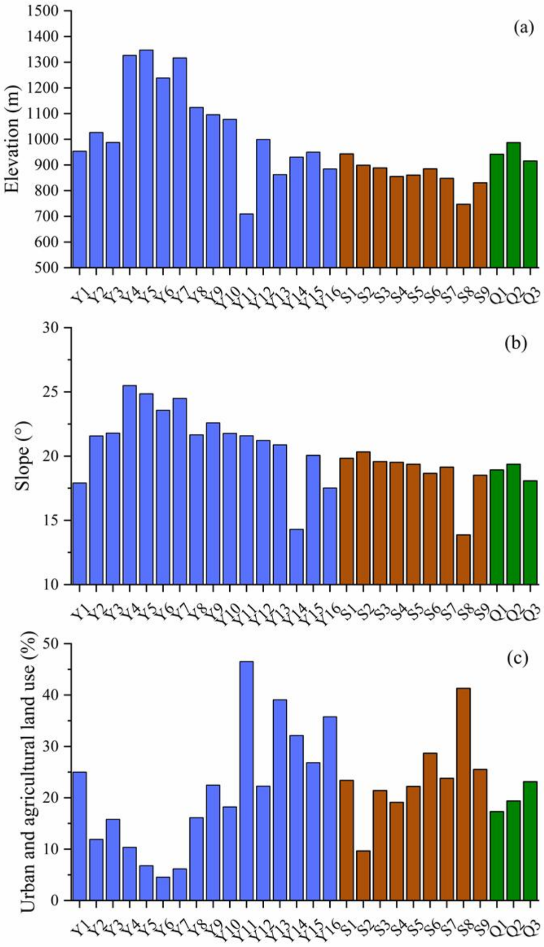

Figure S1 Distribution of (a) mean drainage elevation, (b) mean channel slope, and (c) proportion of urban and agricultural land uses in the Yinjiang (Y), Shiqian (S), and Yuqing (Q) catchments.

Ln 146: Confusing wording. Decreasing trend in DO in regards to what? Over time? Downstream?
Our response: Thanks. After new statistical tests for multiple comparisons, we modified the original sentence as: "*The average DO presented similar values between the Yinjiang River, Shiqian River, Yuqing River, and springs with the majority of the river water samples being DO supersaturated (Fig. 2b)*." (P8 Line 197-199). What we want to describe here is whether there are differences in DO among different rivers.

Ln 230: This sentence should be split into two.
Our response: Thanks. This sentence was deleted as we change some conclusions due to our further discussion on the manuscript.