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Hydrology and Earth System Sciences Discussions

HESSD

Interactive comment

Interactive comment on "A systematic examination of the relationships between CDOM and DOC in inland waters in China" *by* Kaishan Song et al.

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Editor comment HESSD-Manuscript "A systematic examination of the relationships between CDOM and DOC in inland waters in China" (HESS 2017-179).

Dear Dr. K. Song

Reading through the manuscript, I came across a number of aspects on which I'd like to comment on during this discussion phase.

Comments on content: L.70-75: Provide explanations on mechanisms how hydrology affects DOC and CDOM properties. Why shall catchment size per se be important? Can you explain why size is inïňĆuential apart from affecting for example travel times?

Response: The authors really thank for your thoughtful comments. To my knowledge, these hydrological factors may influence DOC and CDOM properties, 1) the source of DOC and CDOM drain to rivers from the catchment, thus the landscape and the soil organic density influence DOC and CDOM abundance in the rivers; 2) the hydrograph is another factor influences DOC concentration in rivers, generally before peak flow the river shows relatively lower DOC, but relatively higher DOC exhibits after the peak flow due to more DOC release from soil; 3) generally small river catchment tends to have homogeneous landscape, and DOC and CDOM easily drain to river without too much change during this draining processes, that explains why head water generally exhibit higher DOC and CDOM, also more close relationship reveals for DOC and CDOM in head waters; in terms of larger catchment, larger variability for landscape, soil properties will exhibit, longer travel time takes place (photo-degradation and microbial degradation reduce the colored fraction of DOC, and also DOC will mineralize), which ultimately affect the CDOM and DOC properties. Also, rivers in tropical or subtropical regions tend to show lower DOC, which is mainly due to the higher frequency of flushing dilutes the DOC in rivers; comparatively, less rainfall produce less surface flow in temperature regions, where higher DOC generally exhibit in rivers in these region, of course relatively higher soil organic matter also contributes the higher DOC and CDOM in temperature rivers.

L.316: If you know about these inïňĆuencing factors, why you cannot derive an explanatory model for the slope?

Response: Thanks for your comments, but I am not sure I fully understand your comments. We roughly know these influencing factors, however, the variation caused by

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each factors and the contribution to the total variation by each factor are not clear, and also these factors are intermingled or interacted each other, thus it is very hard to establish an explanatory model for the slope. In addition, the relationship between DOC and CDOM for different waters varies substantially due to the compositional differences for CDOM, and the fraction of colored components in DOC is changeable, which ultimately influences the relationship between DOC and CDOM, thus only a relative stable regression model is achievable for a specific types of waters, not possible for all types of waters. I am not sure if I have answered your question.

L.345-347: Again, you should explain how hydrology and catchment characteristics can inïňĆuence CDOM and DOC.

Response: Thanks for your valuable comments. Most of the explanation was presented in the responses above. Further, I would highlight that rivers in arid or semi-arid regions (through our work and also work by Spencer et al. (2012, JGR)) generally exhibit higher DOC concentration, but the absorption coefficient for CDOM is generally low with higher spectral slope, in which the high concentration of DOC is caused by the condensed effect through evaporation;as for the deep spectral slope, the longer traveling time, strong dose of irradiance with less cloud cover, can be attributed for this phenomenon.

L.350-357,Fig. 4: This part is highly misleading because the text evokes the impression that you compare DOC and CDOM to simultaneous measurements of discharge. Unfortunately, this is not the case. You write in the manuscript that the hydrographs correspond to long term averages and do not represent the actual ïňĆow conditions during the periods of your sampling campaign. However, you do notpayattentiontothatbasicfactwhendisplayingthedata: Byplottingdischarge and concentrations against the same time axis (Fig. 4) you give the impression that a ïňĆow rate value on day X is linked to the concentrations for the same day. However, this is not true. Therefore, this way of presenting and interpreting the data is not acceptable. Such ïňĄgures would only be correct if you can provide the discharge data from the years of sampling. Should it not

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be possible to get access to this data, you have to adapt you data analysis accordingly. Because you neither have information about the actual ïňĆow for a given sampling date nor about the actual sequence of actual discharge from day to day you should not plot the data against the time axis. Instead you plot for example the concentrations against a selected quantile of ïňĆow rates for the corresponding Julian day. This would also be more to the point because you argue that there is a relationship between ïňĆow rate and DOC/CDOM concentrations irrespective of the Julian day.

Response: Thanks for your comments, I am really sorry for this misunderstanding which caused by my carelessness for the "note" in the caption for Figure 4 was not removed, thus the previous caption was not changed according to the updated flow data. In the previous version, the hydrograph is the average value, however, the in the current version, we tried the best and purchase the concurrent river flow data (we could provide these data in excel if necessary), so all the flow data are concurrent to the sampling year. I am really sorry for this misunderstanding, which is my fault not updating the caption in Figure 4 conveying the wrong information.

L.425-426,Fig. 3,Fig. 6: ThedatasetsinthetwoïňĄguresseemnotbefullyconsistent. When comparing for example Fig. 3d and 6d, there are 3 – 4 data points with DOC concentrations of 80 – 120 mg L^{-1} in Fig. 3d that are absent in Fig. 6d. How does it come? The same holds in the opposite direction with data of about 45 mg L^{-1} in Fig. 6c. What is the explanation?

Response: Thanks for your comments that really help to improve the manuscript. As you may know that the manuscript has revised at least two times, and some of the figures were updated, removed or added. The first version of the data processed by myself, and the figure 6 was provided in the last revised version, in which the data was processed by my students. The large data set were collected in different field campaigns, also some data were added in the revised manuscript, thus, inconsistency was caused due to our change of data processing person, and new data incorporated in the revised manuscript. We will further check the data set, and make sure all the data sets are consistent. Thanks again for pointing out the inconsistency, that really help for improving our manuscript, also we should bear in mind for being more careful during data processing and manuscript preparing.

L.451: I cannot see this low M values in Fig. 7B. Can you support your statement by a statistical metric?

Responses:the authors thank for the comments, we could provide the statistical metric in the revised manuscript.

L.462: Your selection of categories for M is rather arbitrary. Additionally, when looking at them in their entirety, it is obvious that there is a general pattern in that the slope decreases with increasing M (see ïňĄgure in the attachment). Hence, the slope simultaneously depends on DOC and M. Because M is simply the ratio between aCDOM250 and aCDOM365, it follows that aCDOM275 is a function of DOC, aCDOM250, and aCDOM365. Instead of introducing ïňĄrst M and then classify M into categories, you better directly express aCDOM275 as a function of these three variables. This would make also any relationship that you ïňĄnd much easier to interpret.

Response: The authors really thank you for the thoughtful comments. Here, I might not make myself clear, we tried stepwise regression with CDOM absorption at 250 nm, 275nm, and 365 nm according to your kind suggestion, and found that there is no significant improvement for DOC estimate. It is two different things by incorporating M into regression model, and by grouping CDOM into different groups based on M value. In fact, if we try to incorporate aCDOM250 and aCDOM365 into the regression model, these two variables are just absorption intensity that won't help two much for the regression model. The essential thing here is to group CDOM of different waters into various group based on M values, thus each group roughly have similar absorption characteristics, which ultimately helps to improve the model accuracy. However, if incorporate M into regression model, which won't help for the accuracy.

L.489-491: This is confusing: In Fig. 8 you try to demonstrate that the aCDOM275 -

DOC relationship depends on M, here you argue that one regression model is sufiňĄ-cient. Can you elaborate on this (apparent) contradiction?

Response: the authors thank you for the concern. As you might have noticed that these few high values of DOC and CDOM have leveraged the good relationship (Figure 9a), and remove these points will decrease the relationship between DOC and CDOM. Further, the DOC concentrations are still very high in Figure 9b, however the R-square value is only about 0.66. Thus, this model is roughly accurate for inland waters at national or sub-continental scale with large variation of DOC and CDOM. However, if accurate estimate of DOC through CDOM absorption needs to be achieved, then different types of waters should be classified, for instance based on M values which help to differentiate CDOM absorption efficiency. Further, the regression based on pooled data also give readers an approximate idea how the relationship between DOC and CDOM looks like with large data set covering different types of inland waters (river, freshwater, saline water, and urban water influenced by effluent and sewage discharge). If you suggest to remove this part, we would be happy to do so, thanks again for your consideration.

Minor aspects (style, wording etc.):

L.12: Has this algorithm been developed previously? Clarify.

Response: this algorithm was developed by Fichot and Benner in 2011, and it was clarified in the revised manuscript, thanks for the comments.

L.58: Replace acted by considered. Response: the authors thank for the suggestion, we replaced ‘acted’ with ‘considered’.

L.60-61: Is this not trivial? What other sources exist?

Response: the authors thank for the comment, the sentence was rephrased. The sources are external, internal, and anthropogenic origin.

L.77: CDOM is not a single substance.

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Response: the authors thank for the comment, we replaced ‘substance’ with ‘constituent’ in the revised manuscript.

L.110: What is the particular link between urban water sources and saline lakes? Response:sorry for the ambiguous statement, there is no link between urban water sources and saline lakes, the authors rephrased this sentence in the revised manuscript.

L.168: Why don’t you provide this information for river samples?

Response: the authors thank for the concern, I might have clarified in the responses for the previous review and the resubmission for the current manuscript, we sampled quite a lot river sections, and some of these rivers or streams even don’t have name for it, particularly for these in Tibet Plateau, thus it is not practical for use to provide this information. We could provide these sampling station with a map if necessary.

L.219: I assume changed should be replaced by ranged.

Response: The authors really thank for the comment, your kind suggestion was incorporated in the revised manuscript.

L.258: Replace in by during the. Response: your kind suggestion was incorporated in the revised manuscript, Thanks a lot for comment.

L.599–619: The references are not in the correct alphabetic order.

Response: The authors really thank for comment, the correct alphabetic order for the references were achieved in the revised manuscript.

L.643: The reference is not in the correct alphabetic order.

Response: The authors really thank for comment, the right order was corrected.

Fig. 1: Please explain what do you mean by Hydrological features.

Response: The authors thank for the concern, here the authors mainly talk about the lake morphologic characteristics. We could add note in the figure caption to explain what the hydrological features are in this context.

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