

Interactive comment on “A systematic examination of the relationship between CDOM and DOC for various inland waters across China” by Kaishan Song et al.

Anonymous Referee #1

Received and published: 8 September 2016

General Comments:

This study examines the linkage between CDOM and DOC in numerous types of water systems throughout China. As expected, this relationship is highly dependent on the type of environmental setting (e.g. river, lake, salt water, watershed types, etc). The study provides a large dataset that will be potentially very useful for future remote sensing studies in China. However, I would like to see more discussion of the broader relevance and how this fits into the global picture. For example, are the findings unique to Chinese water bodies or will these water body types have similar DOC/CDOM relationships globally or at least in similar latitudes?

There was very little discussion of findings in the literature with respect to the findings

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of this study other than citing references to speculate on mechanisms. I would like to see more comparison of the slope results in the context of the above question. For example, do lakes generally fall within the same slope range?

Another major aspect that's lacking from this study, which focuses on inland waters, is the role of hydrology on these findings. It is surprising to not see any attempt to characterize the rivers studied in terms of average annual discharge and/or the season that samples were collected. For example, I am curious whether spatial or temporal variability plays a larger role in shaping the observations made here. At a minimum there needs to be discussion of the role that hydrology may play (there was one sentence saying hydrology wasn't considered).

Another point of discussion is whether or not these systems can feasibly be studied via remote sensing. There is no indication of the spatial scales that are being discussed. For example, a small stream cannot be resolved from space, so the authors should explain why it's important that we know a CDOM/DOC linkage for these waters. Perhaps because CDOM is easier/cheaper to analyze than DOC so we can get better temporal resolution in the future to address variability with the hydrograph? I think that Table 1 would be more informative if some basic information was provided about the size of the water bodies that are being examined. For example, adding the range/average of the basin scale and or river channel width/lake diameter to table 1 along with discharge if available would be useful. This would also allow some discussion of where the CDOM/DOC linkage is most robust and whether those particular water body types would be feasible for remote sensing applications (e.g. discuss the resolution of different satellites with respect to basin scale).

In its current form the manuscript does not provide much information that would be useful to the broader scientific community. However, it is a strong dataset, and if presented appropriately, this could have some very useful insight for the community. Finally, the authors should carefully review the manuscript for grammatical errors throughout (not all were noted), and potentially consider hiring a professional editor if unable to make

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these corrections independently.

Specific Comments:

Line 47: This sentence doesn't seem to add much and the citation of Raymond et al (2013) doesn't really speak to what the article was about. This paper estimated that inland waters outgas 2.1 Pg C/yr, further constraining the global carbon budget.

Line 48: This would transition better if it was mentioned why remote sensing would be a useful tool, e.g. better spatiotemporal resolution.

Line 54: This sounds backwards. DOC is the larger pool, of which CDOM makes up a large fraction.

Line 54: DOC strictly speaking is not necessarily a "source of nutrients". If you said DOM, this could be true, but we typically think of things like N and P (organic or inorganic) as "nutrients." DOC is more aptly a "substrate" for heterotrophic bacteria, i.e. an energy source.

Line 55-56: This part of the sentence needs to be fixed for grammatical errors and clarity. Also, the Jaffe et al (2008) reference is not really relevant here. This paper looked at optical properties of CDOM, and any discussion of breakdown of allochthonous (i.e. terrestrial) DOC is inferential at best. Raymond et al (2013) also doesn't actually examine the mechanistic breakdown of DOC to CO₂, they simply calculate global CO₂ outgassing rates. The conclusion that this CO₂ is from DOC breakdown comes from other studies. Some more suitable references that actually look at the breakdown of terrestrial DOC would be the following and references therein:

Ward, N.D., Keil, R.G., Medeiros, P.M., Brito, D.C., Cunha, A.C., Dittmar, T., Yager, P.L., Krusche, A.V. and Richey, J.E., 2013. Degradation of terrestrially derived macromolecules in the Amazon River. *Nature Geoscience*, 6(7), pp.530-533.

Mayorga, E., Aufdenkampe, A.K., Masiello, C.A., Krusche, A.V., Hedges, J.I., Quay, P.D., Richey, J.E. and Brown, T.A., 2005. Young organic matter as a source of carbon

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dioxide outgassing from Amazonian rivers. *Nature*, 436(7050), pp.538-541.

Line 131: What pore-size, diameter and manufacturer were the filters? Was surface water collected for all of these analyses? What type of bottles were used and how were they cleaned? How were samples stored and for how long before analyses were performed? It seems as though bulk water was brought to the lab for filtration, so it's important to know how long samples sat and at what temperature. The decomposition processes alluded to in the introduction can occur quite rapidly. This appears to be noted on line 164. . . I would prefer this to be more upfront assuming the timing was the same for all bulk analyses. Also describe if samples were stored on ice, etc.

Line 134: It should at least be mentioned what type of filters were used.

Line 136: GF/F filters are typically 0.7µm nominal pore size. Is this description accurate? Also, were samples preserved in any way?

Line 192: This raises an important point. This manuscript does not consider hydrographic variability in its discussion of CDOM/DOC, which are tightly coupled to river discharge. For example, one could see large variability at one particular site throughout the hydrograph and even hourly during rapid events. It's not clear what amount of the variability observed in this study is due to site differences versus hydrographic differences. This should at least be minimally addressed in the discussion. The next sentence begins to address this, but the odd phrasing for both sentences don't adequately get the point across.

Line 203: There should be some level of discussion of why DOC was so variable in each river, i.e. hydrologic controls. There needs to be some level of discussion on hydrologic controls. For example, DOC has been shown to be tightly linked to discharge both seasonally and especially during rapid storm event. See these articles and the references therein:

Raymond, P.A. and Saiers, J.E., 2010. Event controlled DOC export from forested

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watersheds. Biogeochemistry, 100(1-3), pp.197-209.

Ward, N.D., Richey, J.E. and Keil, R.G., 2012. Temporal variation in river nutrient and dissolved lignin phenol concentrations and the impact of storm events on nutrient loading to Hood Canal, Washington, USA. Biogeochemistry, 111(1-3), pp.629-645.

Line 322: It's not clear how this conclusion was reached. Is it speculation based on literature?

Line 355-369: Are there comparisons to other studies in the literature that can be discussed/compared to here?

Line 372-405: Are there comparisons to other studies in the literature that can be discussed/compared to here?

Technical Corrections:

Line 17: Add "and" to end of list, also write "rivers and streams" if both were studied.

Line 18: Use the past tense, i.e. "ranged"

Line 20: It's not immediately obvious what is meant by "winter waters."

Line 23: "expected"

Line 24: Replace "sunshine" with "daylight." Remove "the" from "In the contrast"

Line 29: Make this sentence read more clearly.

Line 58-59: Fix grammatical errors (i.e. add "and")

Line 59: Choose more formal and grammatically correct wording than "A bunch of researches"

Line 69: Fix grammatical errors

Line 72: Fix grammatical errors

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Line 74: Fix grammatical errors

Line 80: "Relatively"

Line 86: Consider re-wording this sentence

Line 89: "Two forms of carbons" is not accurate. CDOM is a subset of DOC.

Line 90-92: This is somewhat redundant as the same argument was made on lines 62-64.

Line 95: Fix grammatical errors

Line 103: Fix grammatical errors

Line 119: Use a word other than "data", i.e. dataset

Line 122: Fix grammatical errors (i.e. "of")

Line: 124-125: This sentence doesn't need to be included in the methods.

Results and Discussion:

Line 178: Perhaps add a subheading for "Bulk Geochemical Parameters" or something similar here.

Line 179: This is an odd sentence. The goal was to study diverse water types. It would be more fitting to say that geochemical properties across the unique water body types were diverse. Line 181: Use the past tense when describing results here and throughout the rest of the manuscript.

Line 185: Fix grammatical errors

Line 190: Fix grammatical errors

Line 212-218: Fix grammatical errors

Line 230: "wavelengths"

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Line 243: Consider a different word than “endorsed.”

Line 289: Fix grammatical errors

Line 303: Fix grammatical errors

Line 309-313: Fix grammatical errors

Line 315: Write (Chl-a = 7.3 ug/L). Also, this isn't an incredibly low value...that still indicates decent amounts of primary production.

Line 315: Fix grammatical errors

Line 317-319: Fix grammatical errors

Line 337: Fix grammatical errors

Line 377: Fix grammatical errors

Line 383-386: Fix grammatical errors

Line 397: Fix grammatical errors

Figure 1: There is probably better terminology than “Winter water”, is this snow/ice-covered lakes, for example?

References:

The reference list appears to be incomplete. For example, Raymond et al (2013) is not present.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-380, 2016.