Review

"MOdern River archivEs of Particulate Organic Carbon: MOREPOC"

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for publication in Earth System Science Data.

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Ke and colleagues provide a large (~ 4x the size previously compiled sets) compilation of published data on riverine particulate organic carbon (POC, incl. isotopic composition and related N content), suspended particulate matter concentrations (SPM),and Al/Si weight ratios of the corresponding sediment. This comprehensible dataset is f good quality and accompanied by a wealth of metadata, such as geographical or methodological information, improving its interpretability and usability of the database. However, uncertainties are commonly reported alongside carbon isotopic values and could be integrated into the database. Clarity and variable naming could also be improved. Otherwise, I have only a few minor comments regarding the database (see below).

The descriptive article adequately summarizes database content, structure and patterns within the data. It gives most background information necessary to understand relevance, quality and acquisition of the data. At times the article is written too much in a POC-expert language and misses a few explanations necessary to fully understand the data. More specific comments are attached.

This publication seems timely, relevant and useful to the Earth science community and, generally, researchers interested in riverine and coastal organic matter processes and carbon cycling. The size and high spatial coverage of the set provide a proper statistical basis and will certainly help improving our understanding of terrestrial and marine carbon cycling. Detailed comments on data and article can be found below. After these issues have been addressed, I strongly support publication in Earth System Science Data.

Data Comments

General

- consider adding readme with variable & unit information. Consider providing here also values and equations used.

- some variable names could be more intuitive (riv_na, bas_na)

- Could uncertainties be added, at least of the carbon isotopic values, where uncertainty is usually reported? I acknowledge that this is (unfortunately) not really common practice in geochemical edatabase work, but would improve the interpretability (and thus value) of the database significantly.

In MOREPOC v1.0_RM

- add which variables given in which paper (apart from 14C & 13C)?

In MOREPOC v1.0

- Origin of values is not always clear: e.g., SPM of Santa Clara in Masiello & Druffel (2001) is derived from USGS monitoring & extrapolation based on relationship of SPM and water discharge. Couldn't find the actual numbers given in the database within the paper by Masiello & Duffel, except for 1 sample (March 25, 1998 with 17,813 mg/L in database and 17.,230 mg/L in M&D paper). How comes there is a difference? Did you use POC conc. and POC wt% to derive SPM conc.? Please indicate whether individual variables are originally given in the corresponding paper and/or more detail on how variables were derived..

- some variables could be formatted more user friendly ()

    - RCA '0' instead of 'modern' too keep it numerical? Also '14C_age' or similar could be a more intuitive name

    - No brackets, points, commas or empty spaces in the data fields, especially in text 'values' (or strings)

    - Separate countries and continent from 'cont' variable.

Article Comments

General:

The text is well structured and easily readable. It gives a good background and basic understanding to the database published. However, it could be written in less expert-language, could better explain notations/values and citations could be more thorough/original.

Specific:

L21: Not only input but also susceptibility to mineralization and specific environment where its deposited are key features of carbon cycling (see Blair & Aller 2012, who are cited just before).

L24: The 'biogenic' source could be split into river-authigenic, land plant (litterfall) and soil organic carbon. Generally, riverine authigenic POC generally seems to be a little underappreciated in the article.

L32: Are you referring global carbon fluxes of biogenic POC sequestration? Clarify and give estimates of these fluxes?

L35: 'played by' could be 'of' to be slightly more concise.

L47-48: Evtl. highlight here the contribution of old (petrogenic) carbon release from thawing permafrost?

L.50-51: It is also because of sedimentary dynamics (e.g., steady accumulation scenario vs. fluid and mobile mud layers) and increased oxygen exposure in highly energetic systems (the 'incinerator' concept of Blair & Aller).

L.54: Add reference: Dethier et al. 2022 Rapid changes to global river suspended sediment flux by humans. Science 376(6600), pp.1447-1452. There are also considerations on the impact of humans on riverine carbon cycling (by Taylor Maavara et al. 2017, Nature, or van Hoek et al. 2022, ES&T, among others). It would be suitable for the paper to address this here.

L61-62: Water quality datasets have significantly improved since 1996. This should be acknowledged here. There are also more recent and increasingly sophisticated model of riverine carbon cycling and fluxes (summarized e.g., in van Hoek et al. 2022, ES&T). These should also be acknowledged here.

L.65: Generally it would help the reader, especially if non-expert in respect to carbon isotopes, if notations (here D14C) and units (section 2.7) could be explained before using them in the text. Fm14C is never explained, not even in section 2.7, but extensively used.

L.79: Which statistical examinations were used?

L155: If space allows it may be instructive to mention Al/Si can also be related to specific surface area to derive carbon loading (mass OC per mineral surface area).

L.158: Also no data from Greenland and arid regions (N Africa & Arabia) as far as I can see from Fig 1.

L.159: If space, add a sentence or two on the other continents?

L.161: Maybe add to this suggestion a note on what could be done with this data and what would be the added value for insights into POC processes?

L.166: There is also control by biology/vegetation and by in-stream and generally fresh-water processes.

L178-179: The Fm14C in SE Asia (Fig 1) should also be mentioned here!

L.197: This explanation seems a bit too simple. Could the POC% vs 14C relationship also reflect a globally high terrestrial (and freshwater?) productivity compared to re-mobilization of petrogenic carbon by erosion? Is biogenic OC supply maybe generally lower in (mountainous) areas of high petrogenic OC supply?

Figure 2: Maybe indicate where C4, C3 and dead carbon would plot in your figures for clarity and easy readability of the graphs?

L. 211: Give potential explanation for these paradox observations.

L.216: Define ‘load’ - carbon loading is often the POC/SSA ratio, is that what you mean?

L.219: Interesting point. Insert the citations indicated. Maybe in combination with showing variation in POC concentration along depth profile (from database?)?

L.221: Those tropical rivers can still yield high sediment and POC fluxes because of high water discharge, despite relatively low SPM.

L.235: ‘,’ missing.

L.244: They are not only hotspots for sediment production, but also for petrogenic OC mobilization. Also mountainous catchments often expose ancient sediment outcrops providing source for petrogenic OC.