

Comments on egusphere-2022-30

Major comments:

This paper presents DOC and POC data at the Xuliujing Station of the Yangtze River over three years. These data are very valuable to explore the seasonal and long-term variations and controls of organic carbon exported by the Yangtze to coastal oceans. However, the analysis is not complete or thorough. Some of the major conclusions are not supported by the presented data.

(1) The authors conclude that higher ^{13}C -POC in summer was due to autochthonous production in upstream intensified by human activities (e.g., the Three Gorges Dam). However, I am not convinced on this point. The authors should also consider other factors potentially affecting ^{13}C signals of organic carbon. First, Poyang Lake and Dongting Lake are very important sources of water to the main channel of Yangtze (20-30%). These large lakes also contribute organic carbon to the main channel. Second, summer features high discharge and high sediment load, which does not favor autochthonous production (authors also stated this point, e.g., in line 287-288). In fact, a lot of studies have shown high phytoplankton activities in the Yangtze in winter or spring when flow and suspended sediment content are low. Third, Xuliujin is the last station before Yangtze enters the coastal ocean. Hence, the tidal influence is significant. Is it possible that autochthonous production in coastal ocean cause the higher ^{13}C values in summer? How does estuarine process affect organic carbon biogeochemistry of the river?

(2) The authors conclude on a significant increase of POC, ^{13}C -POC and ^{15}N -PN over the past decades based on the literature and their own data, which was attributed to increase in the proportion of autochthonous organic components owing to intensified human activities and global warming in the river basin. However, these data are from three different stations (Datong, Nantong and Xuliujing), and the distance between Datong and Xuliujing stations could be as high as > 500 km. In particular, the Xuliujing station is also likely affected by autochthonous production in the estuary. It seems that the increasing trend of POC and isotopes is likely caused by geographic rather than temporal variations. Also, there is a large gap linking the observed variations with human activities and global warming.

I think the above problems are critical to the validness of the conclusions.

Specific comments

Abbreviations (not full name) should be shown in brackets in the text for the first time.

Line 1-2: the words “variations” and “dynamics” in title are replicate.

Line 8-10: the abstract did not show research background or scientific questions. Research significance is not shown in the Abstract either.

Line 19-21: the increasing trend need to be reconsidered based on the same station; contribution of autochthonous component to DOC and POC should consider the influence of estuary phytoplankton dynamics and tidal activities.

Line 39-47: authors stated that biogeochemical cycles of carbon in aquatic environments had long been of great interest in the literature, but did not state the existing work on carbon variations under the influences of climate change and anthropogenic activities. And the knowledge gap deducted from existing work is not clear either in this paper.

Line 56-59: these sentences are research methods.

Section 4.1: the potential factors influencing organic matter quantity and quality were only discussed using their own data when referring to flushing and dilution effects (e.g., lines 263-265, 267-268), but all the others were repeating the conclusions that have been reported by literatures without discussing the major findings of the present study. Therefore, it is hard to tell whether human activities, global warming and autochthonous production did show their effects in the present study. I suggest that the authors concisely summarize their major findings that directly answer their main research questions and focus on explaining and evaluating what they found.

Section 4.2: I agree that the seasonal variations of POC and its isotopes may be related to the ratios of autochthonous to allochthonous components, but I am reserved on that the autochthonous signal of

POC at Xuliujing station is related to the upstream reservoir constructions (e.g., the Three Gorges Dam) which is like >1500 km far away. What about the influences of autochthonous production in upstream lakes (e.g., Dongting and Poyang Lakes)? And is it possible that the POC quantity and quality are influenced by the phytoplankton dynamics in the estuary or coastal ocean where autochthonous production is strong in summer?

Line 309-311: is there any data supporting the source of POC from deep soils? Why are waters from deep flow paths high in DOC concentration? Can belowground water influence DOC concentration?

Section 4.3: authors tried to show the decadal trend of SPM, DOC, POC and their isotope signals using reported data and literature data. This is a great idea, however, these data are from three different stations (Datong, Nantong and Xuliujing), of which the Xuliujing station is likely severely influenced by estuary phytoplankton dynamics and tidal activities. More importantly, the increasing trend of POC, ^{13}C -POC and ^{15}N -PN in Figure 11 is very likely caused by different stations (higher values in Xuliujing station) instead of time. I'm afraid that the decadal trends need to reconsideration.

Figure 1: add dam positions.

Figures 9 and 10: when investigating temporal variations, using data from the same station should be more compellent.

Figure 11: add legend of points including station name.