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Interactive comment on "Organic and inorganic carbon and their stable isotopes in surface sediments of the Yellow River Estuary" *by* Zhitong Yu et al.

Anonymous Referee #2

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In the manuscript BG-2017-353, Yu and coauthors analyzed OC, IC and N contents as well as δ13C and δ15N in 15 short sediments closed to the Yellow River mouth. The river dominated continental margin is the hotspot of global biogeochemical cycle because of the intense interaction between land and sea as well as relatively high primary productivity. Meanwhile, the river dominated margin is characterized by complex environmental processes, making it difficult to quantify the source, transport and burial of organic matter there. So the manuscript addresses an important issue. However, after carefully read it several times, I have to reject it since several data interpretations are misleading. My major concerns are listed as follows.

1) In lower Yellow River and the Bohai Sea, large anthropogenic nutrient inputs caused the eutrophication in the Bohai Sea. For example, Yu et al (2013, Mar. Environ. Sci. 32, 175–177) reported that the total Bohai Sea area with eutrophication status increased from 110 km2 in 1997 to 14080 km2 in 2010. Under this condition, the water and sediments contain significant amount of inorganic nitrogen that inevitably affects the C/N values. Based on method description of the manuscript, the authors did not separate organic and inorganic nitrogen. The C/N as a source indicator is valid only for organic carbon and organic nitrogen (C/N >15 for terrigenous plants and 4-10 for aquatic algae). If they did not pay attention to this point, the estimation of organic matter source based on the C/N is not proper and very likely to underestimate the contribution of terrigenous component, as the authors did in section 4.2 (line 243-248).

2) In the introduction part, the authors claimed that one of their objectives was to explore the underlying mechanisms that regulate the carbon burial in the Yellow River estuary. Unfortunately, I did not see much discussion about this topic. In fact, most of their statements are speculative. For example, from line 256 to 260, given a strong linear correlation between TIC and TOC ($r = 0.97$, $p < 0.01$), the authors concluded that the production of organic carbon influences on the formation of carbonate, and most TIC was from autogenic carbon in the Yellow River estuary. This conclusion is very surprising for me. How could it be like this just based on the correlation. A correlation does not mean cause and effect. Furthermore, in the semiarid region of China, such as Loess Plateau, soil contains a lot of inorganic carbon. Since Loess Plateau contributes 90% of the Yellow River's sediment load, the severe soil erosion at the Loess Plateau will bring large amounts of allochthonous organic carbon and inorganic carbon into the Yellow River as well as its estuary. Regarding the degradation of organic matter to produce CO2, the author did not explain at all which mechanism could convert organic matter derived CO2 into carbonate. I don't know either since the extremely turbidity in the Yellow River great restricts the algal growth.

3) In line 241, the authors suggested that TOC was mainly autochthonous in surface

sediments of the Yellow River estuary based on C/N (6.3) and δ13C (-23.35‰, whereas in the southern shallow bay, up to 60.8% of TOC was from soil source give slightly more negative δ13C (-23.91‰ and higher C/N (8.8). Here the author used 10.8 as the terrigenous end member value for C/N based on the soils collected from the river mouth. As I mentioned above, the major sediment load in the Yellow River is not from the soils around the estuary, but from the Loess Plateau in the middle to lower River. Second, there is no much difference in δ13C between the estuary (-23.35‰and southern bay (-23.91‰, so they should have similar organic matter sources. In the northern China marginal seas, C/N ratio is not as reliable as δ13C give the interference of inorganic nitrogen and selected degradation of N-containing organic matter.

Given these drawbacks, I do not think the manuscript meets the criteria of BG.

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