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Biogeosciences Discussions

Interactive comment on "Influence of distributary channels on sediment and organic carbon supply in event-dominated coastal margins: the Po prodelta as a study case" *by* T. Tesi et al.

Anonymous Referee #1

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"Influence of distributary channels on sediment and organic carbon supply in event-dominated coastal margins: the Po prodelta as a study case" by Tesi, Miserocchi, Goñi, Turchetto, Langone, De Lazzari, Albertazzi and Correggiari

General comments: The authors present new results from a study relying on a carefully planned sampling campaign during a flood event of the Po River in the spring of 2009. The aim of this sampling campaign and subsequent analyses was to elucidate the controls on deposition of terrigenous sediment and organic matter in the prodelta of the Po River. The study is well designed and addresses an important issue in sedimentology and carbon cycle studies. Samples from suspended material in the river

and in the water column of the prodelta region were compared with sediments taken on transects off the individual branches of the delta. A number of analyses were carried out on the samples including grain-size measurements, determination of bulk organic geochemical parameters like OC content, C/N ratios, δ13C and Δ14C measurements. In addition, lignin phenols were analysed as biomarkers for terrigenous organic matter delivered to the ocean. While I think the data set is very interesting, the presentation of the data is mainly restricted to reporting the results. The discussion section would benefit if the authors tried to make more general inferences based on their findings. In particular, a comparison with results from a previous study carried out in the year 2000 during an autumn flood event would be helpful to elucidate the controls on delivery of terrigenous material to the ocean. The manuscript is generally well written, but very long. I have the impression that it would benefit from thorough editing by a native English-speaker. I have made several suggestions to edit the language (see detailed comments), which are probably not complete. Furthermore, much information is given in more than one of the sections (e.g., Results and Discussion), and the paper could be shortened if these repetitions were avoided. There are many figures, which all are helpful to display the data, but many of the labels are too small to read (see detailed comments below).

Specific comments: Abstract: The abstract seems very long and could be shortened. For instance, the paragraph starting line 1, page 7851, could be moved to Background. It is also not clear from the abstract that suspended material was collected both from the river before it branches into the several channels of the delta, and from off the mouths of the delta channels. Section 2.1, page 7854, line 19 ff: How were these numbers generated? Describe methods or give reference. Section 3.1.2, page 7858, line 3 ff: How is complete detachment of particles from the filters ensured? Section 3.2.2, page 7860, line 9: What is "Cut, FA, and DA"? Section 3.2.3, page 7860, line 22: Why was 3.9 μm chosen as the boundary between clay and silt, and not 2 μm? Section 5.1, page 7867, line 6 ff and page 7868, lines 16ff: What is the mechanism behind the described flocculation process? Is it related to salinity? If a certain salinity

threshold has to be crossed in order for river-transported particles to flocculate and settle, this would also be a good explanation why during peak discharge almost no deposition of suspended material was observed in the regions with lowest salinities (central and southern prodelta). Section 5.1, page 7868, paragraph starting line 27: What is the source of the suspended particles transported through the delta? Is it expected to be composed of eroded soils and riverbank material from upstream, or is the suspended load expected to mainly consist of re-suspended sediments from the delta channels? How does the composition of suspended material differ between the river at Pontelagoscuro and off the delta? Why is all the organic matter found in suspended material so radiocarbon depleted? Section 5.3, page 7872, lines 3 ff: What about redistribution of fine-grained material from the Tolle channel mouth out into the prodelta to the position of the core? If Tolle is more similar to an estuary, high water energy (e.g., tidal energy) should occur at the mouth and cause regular sediment sorting. Please discuss. Section 5.3, page 7872, lines 15-17: "sediment texture . . . is mainly driven by the delta architecture. . .." This seems to me like a chicken-and-egg problem: The delta architecture should be the result of which sediments are deposited under a certain current regime, while of course the current regime later on is dependent on the channel geometry. Cause and effect are not clear. Please rephrase. Section 5.6, whole paragraph: The paragraph reads a bit like the authors don't believe that lignin phenol data provide any additional insight. Please make clearer the added value that is taken from these biomarker analyses. Section 6, page 7878, lines 2 ff: Are there data on flow velocities in the southern distributaries? This might help in stating the conclusions more clearly. Section 6, page 7878, lines 18 ff: The stimulation of phytoplankton by river discharge is not discussed in the text and is first mentioned in the summary. Please discuss evidence in the main text.

Detailed comments: Note that the list of suggested edits is likely far from complete!

Title: Please change "organic carbon" to "organic matter", as the former is just an operational term. Page 7850: Line 1: insert "of" after "North" Line 4: (Northern Italy) Line

7: in the sediment record Line 11: replace "whereas" with "and" Line 15: here and throughout the text: biomarker analyses (biomarker in singular) Line 20: insert "," after periods, replace "whereas" with "and" Page 7851: Line 1: replace "In spite" with "Although" Line 2: . . .did not exhibit. . .. Line 7: . . .not sufficient to be preserved as distinct layers. Line 9-10: . . .we estimated event layers of 17 and 6 cm thickness, respectively. Line 16: replace "architectures" with "bodies" Page 7852: Line 24: replace "have been" with "has been" Page 7853: Line 1: replace "river-born" with "river-borne" Page 7854: Line 13: . . .two discharge peaks, ... Line 14: Replace "Although" with "In spite of" Line 15: . . .by reservoir management... Line 21: . . .in variable with. . . Page 7855 Line 1: Only the relative contribution of fresh water exiting through Pila dropped, the absolute value likely increased during the flood event. Rephrase. Line 19: . . .previously published studies, we occupied the same station. . .. Line 24: delete "the" before "significant Line 25: . . .temperature rising since. . . Line 26: . . .heavy precipitation. . . (Singular) Line 27: replace "coexistence" with "co-occurrence" Line 28: Later in the text, the peak of the flood event is always dated 1 May. Page 7856: Line 9: delete "the" before "Northern" Line 20/21: replace "nominally" with "at the" Line 22: here and in the following text: replace "weighted" with "weighed" Page 7857: Line 1: replace "calculate" with "determine" Line 6: transferred into plastic tubes and centrifuged. Line 7 and Page 7858, line 6: replace "grind" with "ground" Line 11: insert "the" before "distance" Line 12: replace "Considering" with "Assuming" Line 15: insert "by" before "adding" Page 7858: Line 3: . . .vigorously shaken until complete detachment. . .. Line 12: insert "deposits from" before "the October 2000 flood" Line 19: insert "had" before "dropped" Page 7859: Line 1: insert "the" before "mean" Line 8: insert "of the" before "scale" Page 7860: Line 8: "Phenol" biomarkers (phenol in singular) Line 15: Give reference for the 5-point BET method. Page 7862: Line 5: replace "shown" with "reported" Line 14: here and throughout the text: use "isotopically enriched/depleted", not the colloquial expressions "heavy" or "light" Page 7863: Line 5: replace "not enough" with "too small" Line 9: . . .the northern region. . .. Line 10: . . .Gnocco/Goro distributaries. . . Line 13: . . ..the northern prodelta. . . Line 14: insert "the" before "Pila" Line 15: insert "the"

before “center”, replace “south” with “southern” Page 7864: Line 5: Do the OC and TN values refer to suspended material? Please specify. Page 7865: Line 17: replace “however” with “therefore” Page 7866: Line 17/18: “they will be compared”. In this paper or elsewhere? Could not find this very interesting comparison in this manuscript. Line 24: insert “in” before “event-strata” Page 7867: Line 6: insert “a” before “flocculation” Page 7869: Line 28: relatively modest.... Page 7870: Line 6: insert “the” before “seabed” Line 23: replace “stratigraphy” with “sediment” Page 7871: Line 5: ...the northern region... Line 18: Is the surface plume off Tolle meant? Please specify. Line 24: delete “to” before “highlighting” Page 7872: Line 11: insert “water” before “samples” Line 13: ...the northern prodelta... Line 14: insert “to” before “the central” Line 21: insert “the” before “coarse” Page 7873: Line 2/3: mono-layer equivalent Line 6: replace “coated” with “coatings” Line 11: replace “proxy” with “proxies” Line 15: replace “sampled” with “samples” Line 18: replace “a diverse proportion” with “different proportions” Line 19: replace “apply” with “applied” Line 21: delete “it showed” Line 23: delete “an” before “enriched” Line 27: replace “chance” with “possibility” Page 7874: Line 9: change word order to “higher relative opal contents” Line 14: typo in “estuarine” Line 20: replace “At the” with “On” Page 7875: Line 4: insert “to be” before “relatively” Line 9: reword “fresh-sea water mixture” Line 18: insert “An” before “averaged” Line 22: converted into Page 7876: Line 7: southern prodelta Line 10: reword to read: “However, different from the Pila region, the central....” Page 7877: Line 20: The following are....(singular) Line 23: replace “after” with “beyond” Page 7878: Line 2: replace “The trapping processes” with “These trapping processes” Line 3: southern prodelta Line 14: replace “decreasing” with “decrease” Line 15: northern prodelta Line 16: replace “stratum” with “layer” Line 26: phenol concentrations (Singular)

Tables: There are 8 tables reporting all sediment properties measured during this study. Some of these could be moved to a supplement section and/or combined (e.g., Tables 3 and 4; Tables 5 and 8). The last column in Table 6 is labelled “Oct-2000 flood thickness”, whereas the caption specifies this to 7Be penetration depth for the October 2000 flood, which would be comparable to the column labelled 7Be. Please revise to

be consistent. Table 7 is printed in very small font and hard to read.

Figures: Figure 1: Core labels in the inset are too small to read. Caption should read: (a) Satellite image of Northern Italy and the Po river drainage basin..... (b)...Stations were grouped into subregions: north, center, south. Figures 4 and 5: Scale labels are very small and hard to read. What are the numbers displayed in the coloured panels of Figure 5? Figure 6: Are the radiographs arranged such as to imply correlations between the sediment layers? If so, dashed lines indicating the suggested correlation could help guiding the reader’s eye. Figure 7: Please also indicate 7Be penetration of May 2009 core. There is an inconsistency between the caption (core collected on 30 April 2009) and the figure legend (May 2009 flood). Figure 8: In the caption, please spell out the meaning of parameters (e.g., SA, D50, etc.) Figure 9: The two panels should be displayed on the same horizontal scale to facilitate comparison. Caption: “...sediment cores”. (b) Grain-size distribution of surface water suspended sediments at.... Figure 12: Typo in caption (Blue and red bars represent samples...)

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