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Earth Surface Dynamics Discussions

Interactive comment on "Late Holocene evolution of a coupled, mud-dominated delta plain–chenier plain system, coastal Louisiana, USA" *by* Marc P. Hijma et al.

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In this work, Hijma et al. present a comprehensive dataset documenting the temporal co-evolution of the chenier plain (CP) and the Mississippi delta plain (MDP) in southern Louisiana. Using a combination of detailed sedimentology and stratigraphy and extensive chronological data (OSL and radiocarbon), the work convincingly explains the initiation of CP formation and its evolution resulting from a combination of changes in RSLR, local sediment supply, and the evolution of the MDP. The manuscript skillfully builds on existing literature and offers new insights into the evolution of mud-dominated coastal systems that will surely be of interest globally. With some minor revisions, this

paper will inform scientists interested in the factors that influence the spatial and temporal evolution of fluvio-deltaic systems and coastal resource managers concerned with managing them.

The paper is very successful, but it could be further improved by 1) clarifying the objectives of the paper in the introduction and 2) expanding the discussion to address the global implications of the work. The introduction sets up the reasoning for exploring connections between CP and MDP evolution very well and the corresponding discussion of this relationship is rigorous and thoughtful. However, the discussion begins with a review of the use of cheniers for sea-level reconstruction, which is not clearly established as an objective of the work earlier in the paper. Suggestions for achieving better balance between the introduction and discussion with regard to sea-level reconstruction are included in the technical comments. Finally, the broader implications of the work could use more emphasis. It is completely reasonable to point out the local implications of this study to planned coastal restoration within the MDP, but explicitly identifying other systems that might benefit from the conclusions of this work will broaden the audience.

Technical Comments: Manuscript

Pg. 2, line 17: consider rewording "gain in importance"

Pg. 6, lines 18-20: The vertical error associated with the borehole locations is 0.25m + the variability in elevation within 5-10 m (horizontal accuracy) of the borehole location. The latter component of the vertical error should be easily determined with GIS. Does this influence the interpretation?

Pg. 7, line 3: latest last

Pg. 9, line 2: Is this sample really "anomalously young" or is it just at a higher elevation than the other samples? (and therefore truly younger?) It's difficult to determine the exact elevation from the plots; it would be helpful if the elevations for each sample

(relative to NAVD88) were reported in Table 1 (in addition to surface elevation and depth below surface) to facilitate such comparisons.

Pg. 9, lines 5-8: Is the upper sample in Mura (Creole Ridge) rejected for the same reason above? Is it expected that the base of a chenier and the middle of a chenier would have formed contemporaneously?

Pg. 9, line 26- Pg. 10, line7 and Fig. 6b: It's surprising that there's no discussion of why the JE I-1 sample isn't rejected here given the large 2sigma error (the largest, no?) and that the resulting age does not obey the law of superposition relative to the ages of other JE I and II samples. I realize that the OSL age range of the samples overlaps when the 2sigma error is considered, but I think this is worth mentioning, particularly since similar logic wasn't applied to the rejected samples from the CP. Why are the 2sigma errors are so high for the Jeanerette cross-section relative to all of the other cross-sections?

Pg. 10, line 9: Refer to figures 7 and 8 here.

Pg. 10, lines 25-27 and Fig. 10: Text does not appear to be consistent with figure. The peat bed at -4 to -5m NAVD is clear in Fig. 10, but there aren't any radiocarbon sample locations at the top of this peat bed. There are samples at the top of the peat bed at 0 to -1m NAVD, but these are not what is discussed in the text.

Pg. 12, lines 23-24: Why would erosion in C be a significant source to A, but not to B during the 1.6-1.2ka time period?

Pg. 13, lines 26-27: Add "through" between "halfway" and "the."

Pg. 14: The use of cheniers to construct SLR wasn't really an objective that was laid out in the introduction, but more than 1/3 of the discussion is devoted to it. This point is an important one, but introduce the idea in the introduction. The first paragraph of section 6.1 could be reworked for the introduction.

Pg. 14, lines 9-10: A reference is made to Dougherty et al., 2012, but no explanation

is given as to why this methodology was not employed at the study sites in LA.

Pg. 14, lines 29-31: More explanation of the relationship between Yu et al., 2012 data and the new data is needed here. There is no question that the data fill in a gap in the RSL record, which is exciting. All of the new data, with the exception of 1 point, appear to sit above the Yu et al. data points; only if the values are extrapolated to the extreme end of the error range do they seem to fall in line, undercutting the argument for gradual decrease in RSLR over the last 3ky even if these values are considered maximum limits. Furthermore, given that compaction in the marshy areas is likely to have occurred over the last 2ky, using the modern marsh elevations behind the cheniers is likely underestimating the elevation of the contact between overwash deposits and the marsh behind the chenier. Given these limitations, make your argument for this metric over other metrics stronger. Finally, RSL estimates around 1 ka BP vary by about 1m. What is the explanation for this?

Pg. 15, lines 16-17: Is there a relationship between the area (m2) of headland loss and the increase in downdrift areal gains? If so, presenting this information will help lend support for this argument.

Pg. 15, lines 17-18: Explain why a similar response is not evident in B.

Pg. 17, line 26: slowdown of erosion deceleration of erosion OR decrease in erosion

Technical Comments: Figures

Figs. 3,4,6,8, and 10: Consider adding a legend to each of these figures so readers don't have to flip back and forth between figures.

Figs. 14 and 15: Why not use the same x and y axis orientation for each of these figures?

Technical Comments: Supplementary Material

Fig. S1: The brown color in the cross-section doesn't appear to be in the legend. Also,

“Inner bay” and “Marsh and bay” colors are very difficult to differentiate.

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