Response to Anonymous Reviewer 3 on "Efficient retention of mud drives land building on the Mississippi Delta plain" *by* C. Esposito et al.

Christopher R. Esposito o*n behalf of* Zhixiong Shen, Torbjörn E. Törnqvist, Jonathan Marshak, Christopher White

We appreciate the constructive reviews submitted by Anonymous Referees 1, 2 and 3 (AR1, AR2, and AR3). We provide responses to the AR3's comments below, in underlined italics.

This manuscript concerns the important issue of sediment retention, particular that of the finer mud fraction, on floodplains. As set out in the manuscript, the retention of sediment on floodplains is vital for the management of deltaic and wetland envrionments. Furthermore, previous work on this subject has focussed intently on the sand, or coarser, fractions of the sediment load. This work adds a novel and important refocus on the finer fraction which is shown here to represent ~95% of the sediment volume in the studied crevasse-splay system. As such this manuscript is an important addition to the literature. It is well writen and clearly presented. However, I think the framing of the work, and some of the comparisons to other splay systems needs revisiting, or more justification.

The splay system under consideration in the manuscript is one that developed in a swamp environment (line 27) and which is characteristic of several such features found along the Mississippi Delta which are key to the maintanence of the landward portions of the MD (line 28 - 30). These splay systems are not developing in open water basins at the marine edges of the delta where they are being effected by tides and waves in the Gulf of Mexico, rather they likely develop in empty basins where the main control is topography and fluvial inputs and where mud is potentially rapidly deposited (rather than resuspended) as sediment enters the basin. It is therefore interesting that the main area of comparison is with the Wax Lake Delta, which is a coastal deltaic deposit developing at the marine interface and is influenced by tides and waves. It seems to me that these two systems are not directly comparable as the marine influences are likely to effect the processes of deposition and resuspension which occur at the splay edges, thus impacting the proportions and locations of the sediment fractions understudy.

This comment echoes concerns expressed by AR1. We do not view the ACS and the WLD as "comparable" in the sense that they should be expected to behave similarly. Rather, we compare the two to emphasize the variability in SRE between different environments on a delta, and point out the value in understanding that variability to coastal restoration efforts. We have made changes to Sections 4.2 and 2.2 of our manuscript to make sure that this intent is more clear.

It would be more useful to compare the findings of this work to other terrestrial/fluvial crevasse-splay systems found along the main channels of the "inland" MD rather than deltaic deposits at the marine interface.

We have reworked sections our manuscript (Sections 4.2 and 2.2) to emphasize that the ACS is likely to represent an upper limit on sand content for crevasse splays in the region, and therefore a lower limit on SRE. And we have reordered our figures so that the figure showing that crevasse splays are fundamental building blocks of the delta plain (Figure 2, Formerly Figure 4) appears early in the manuscript.

It would also be interesting to have a discussion around the errors in the authors estimates of ratings curves used to estimate sediment load and fractionations, and also the water levels in the assumed trunk channels from which the splay eminates. Is there any hysteresis displayed in the sediment ratings curves that could impact upon the functioning of the splays? How good is the fit of the ratings curves and what the propograted errors through the estimates of sediment concentration and dischagre? The estimates of SRE the authors report are likely to vary with these and it would be useful to have an idea of the sensitivity of the metrics used by the authors to characterise the ACS to these input parameters.

We have expanded the last paragraph of Section 4.1, which explains our error analysis and sensitivity testing. All of these calculations are present in the supplemental spreadsheet.

We also added a sentence in the second paragraph of Section 2.3 to indicate that we binned the data so that sediment load hysteresis is not likely to be an issue.