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Interactive comment on "Last interglacial sea levels within the Gulf of Mexico and northwestern Caribbean Sea" *by* Alexander R. Simms

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*Reviewer Comment: The Author presents a detailed summary of last interglacial shorelines around the Gulf of Mexico. It is clear that many of the studies reviewed for this paper, particularly those of the US Gulf coast did not contain or reported low quality data, specifically palaeoshoreline age control and elevations, and therefore challenging to extract meaningful data to include into the WALIS database. What was missing is a more detailed description of shoreline/coastal geomorphology, particularly along the siliciclastic dominated US Gulf coast. It is important when comparing the elevations of modern and LIG shoreline elevations, on make inferences on last interglacial sea level elevations, that the formations are comparable, i.e., comparing the elevations of a LIG barrier island and modern barrier island is reasonable, but directly comparing a LIG

strand plain and modern barrier island is not. It was not made clear in the manuscript that when comparing the average elevations of modern and LIG shorelines that you are comparing like for like. It was also not made clear how the average elevations of modern and LIG coastal geomorphic features were calculated.

**My response: Thank you for the comment. I have tried to be more explicit that we are comparing the average elevation of a LIG barrier island to a modern barrier island. In order to allow the readers to compare the similarity between the modern and LIG barrier islands we have included elevation profiles through the two features.

*Reviewer comment: Also missing from the manuscript is any detailed description of the sea level indicators used in the calculations of LIG sea level's and their indicative ranges.

**My response: I have tried to be more explicit in our indicative ranges, having added that language on lines 163, 169, 176, 184, 249, 378, 388, and 516.

*Reviewer Comment: The was no mention of the influence of GIA along the Gulf of Mexico coast and how this along with neotectonics may result in smaller or larger differences in the relative height difference between modern and and LIG shorelines.

**My response: The Simms et al. (2013) study did include GIA, I added a statement to make that clear. As for neotectonics, growth faults are present but the actively mapped growth faults are seaward of the LIG shoreline – I have added a sentence (line 74) to address that while providing more background for the general area as requested by a reviewer.

*Reviewer Comment: While the figures are fine it would be better if there was high resolution DEM imagery or even a topographic profile of the modern and adjacent LIG shorelines so the reader is able to make an assessment on how similar of different they are geomorphically, and whether it is a simple as comparing the relative height difference between the two shorelines or if they are sufficiently different having formed

under different metocean/sediment supply regimes that a more nuanced analysis of the indicative range of these sea level indicators is made.

**My response: Thank you for the comment, we have added figures (4, 6, and 7) showing topographic profiles through the features to allow for a comparison between the LIG "barrier islands" and their analogous modern barrier islands.

*Reviewer Comment: I have made additional comments in the attached PDF file.

**My response: Most of the comments on the annotated PDF were minor editorial suggestions (wording change or please include a definition for that). The following is reprinted list of the comments made on the annotated PDF that were more substantial than a simply expansion or grammar correction:

*Reviewer Comment: Line 126: "Not sure what you mean by turn-round? can this explain the volume of sediment that form this shoreline, up to 16 km wide and 30 m think, I would suspect you would need an extended interval or stable sea level to build such a massive shoreline feature"

**My response: - Rewrote as "maximum shoreline transgression" - Modern (more appropriately, the Holocene) Mustang Island is up to 30 m thick and the strain plain at Sabine Pass extends over a width of 15 km – both formed within the last 7,000 years (near the extent of the LIG highstand).

*Reviewer comment: Line 128: Have there been more recent studies:

**My response: To my knowledge there have been no new studies focused on these eastern portions of the Ingleside since the work of Otvos (1997)

*Reviewer Comment: Line 141: "How can dunes "cover" a shoreline at the time of formation, a dune and shoreline form contemporaneously?"

**My response: Today along progradational barriers dunes of less than a couple hundred years overlie beach deposits of less than a couple hundred years – e.g. Bolivar

Peninsula (Rodriguez et al., 2004 – JSR).

*Reviewer Comment: Line 151: "It is really not clear to me how you came to these values, you have not discussed the tidal range, how you came to conclude the indicative range of your shell horizons is limiting value of -2.5 m? If the shell layer represents a beach/shoreface then given the upper and lower tidal range will be you the upper and lower limiting elevations of the shell deposit."

**My response: - As explained in lines 144-149, we arrived at this value because equivalent facies are not found above +1 m – setting the upper limit for the deposits. They could not have been deposited in water depths more than 2.5 m as that would submerge equivalent eolian deposits (which should have been deposited above contemporaneous sea levels). This gives an indicative meaning of -0.75+/-1.75. Add that to the 2 m elevation of the highest LIG shell deposits gives a value of +2.75+/-2.0.

*Reviewer comment: Line 166: What about GIA?

**My response: Yes, Simms et al. (2013) did account for GIA differences across the Ingleside locations of Texas.

*Reviewer comment: Line 191: "I think it is entirely reasonable to use the modern beach ridge elevations as a modern analogue for the LIG elevations, but I think you need to discuss potential uncertainties in the LIG elevations, such as dissolution of carbonates grains which could lower the elevations of LIG, general deflation, you have already mentioned that they may be aeolian reworking of the tops of dunes. even different wind and have climate during the LIG can result in higher or lower dune heights. It would have been useful to measure not just the dune height but the relative height difference between the dune crest and swale for both the modern and LIG beach-barriers as this would then at least let you know if there has been a post depositional deflation."

**My response: - I think we should have been more explicit about what elevation difference Simms et al. (2013) used. It wasn't the difference in elevation between the

modern and LIG beach ridge elevations but the entire paleo barrier island and modern barrier island. That is also the approach favored by the “Short Comment” of Barbara Mauz.

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