

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

Barbara Mauz

mauz@liverpool.ac.uk

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In an attempt to improve our scientific approach, I wish to make the following comment regarding the data reported for the northern Gulf of Mexico coast. These are listed here and published in Simms et al. (2013). Alexander Simms state that a number of sedimentary features indicate “an old barrier-beach system” that would maintain the topography of “old beach ridges”. For estimating the LIG elevation of the Gulfport barrier the modern analogue approach was used: The elevation “was determined by subtracting the average elevations of the closest modern barrier islands from the average elevations of the five segments of the Gulfport Shoreline dated”. “LIG beach ridges were 4-5 m in height while the modern beach ridges were 2-3 m in height”. “We thus assign a modern analogue value of 2.5 ± 1.0 m and a LIG elevation of 4.5 ± 0.5

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m for the LIG beach ridge elevation.” “This suggests a LIG RSL of $+2.0 \pm 1.1$ m”. For the northwestern coast OSL samples were collected from “the core of the barrier”, i.e. from sand in core depths of 140 cm, 250 cm and 380 cm. These ages were “obtained for the Ingleside shoreline”. I think this approach delivers inaccurate sea-level index points for the following reasons:

- 1 - The height of a barrier is controlled by local parameters such as sand supply, accommodation space, wind regime and high-energy events. Instead, the beach/upper-shoreface facies overlying the uppermost flooding surface should be the sea-level indicator. The surface marks the latest rollover or overstepping event and the overlying shoreline-related deposits provide the indicative meaning (IM). In the Holocene barrier the uppermost flooding surface is at ca 160 cm depth in the barrier where it truncates back-barrier and fluvial-deltaic deposits (Odezulu et al., 2018, in: Barrier dynamics and response to changing climate. Springer, p.147ff).
- 2 - The modern analogue is a great tool for first-order approximating the usefulness of a sea-level indicator, but it is mostly not sufficient for quantifying the LIG shoreline position. Blum et al. (2008; Geology) show how post-glacial sediment re-distribution impact on the lower Mississippi valley and this, in turn, should influence the sediment supply to the Ingleside shore during the Holocene.
- 3 - There is no evidence that the OSL ages were obtained from the sea-level indicator, i.e the beach facies.
- 4 – There is an unfortunate mix of terms: beach ridge seems to be used synonymously to shoreline, shoreline synonymously to barrier and barrier island synonymously to barrier. However, each of these coastal features have a different IM (e.g. Rovere et al., 2016; QSR, for beach ridge) and a shoreline is an undatable theoretical line.

The barrier complex is a high-quality indicator with a well-defined IM and IR and, because it occurs on a microtidal coast, IR/2 is small. This should be explored for Gulfport and Ingleside.

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