Author response to comments by Anonymous Reviewer #1

I agree with the numerous grammatical changes (and improvements) that are suggested by the reviewer.

In terms of the reviewer's comment:

"Stage 5e reefs in the Caribbean, which were subjected to apparently higher insolation and presumably higher CO_2, are characterised by some spectacular branching morphologies"

It is important to keep in mind that the hypothesis as presented in the manuscript does not preclude the persistence of branching symbiotic corals above pCO_2 = 260 ppm. This threshold is the proposed *minimum* level after which nutrient-enrichment can permit the development of an enlarged symbiont population that can act to destabilise the symbiosis during high temperature and irradiance conditions. In this case, the availability of nutrients is an important co-requirement in the predicted reef demise ('drowning') sequence above pCO_2 = 260 ppm. During deglacial sequences, more intense oceanic circulation due to rapid sea level rise is predicted to increase large-scale upwelling and related nutrient-enrichment (Marshall, 1988). Indeed, the postglacial ocean nitrate inventory (as expressed by $\delta^{15}N$ of bulk sediments) is suggestive of an enhancement of nitrate (NO_3^-) in surface waters related to major meltwater events (e.g., Meltwater pulse 1B, Montaggioni, 2005).

The occurrence of major meltwater events (and associated nutrient enhancement) during the last interglacial are less clear, owing to greater chronological uncertainty. However, there appears evidence that sea-level variation was punctuated by instability during the late stages of MIS 5e. After prolonged stability around sea level +2.5m, sea level peaked at levels of +6m at the close of MIS 5e (~119 ka). Interestingly, reef crest corals (e.g., *Acropora palmata*) in the Bahamas have never been reported to be more than +2.5m (Neumann and Hearty, 1996). Yet, White et al. (1998) maintain that sea level hovered around +6m for the period between 124 and 119ka. Had sea level remained at this +6m level for ~5000 years, it appears difficult to conceive why no reefs grew higher than +2.5m anywhere in the Bahamas. Presumably ideal coral growth conditions would prevail if an additional +4m of accommodation space were provided by a sustained +6m highstand. That

is, unless the growth conditions weren't ideal due to the combination of pCO_2>260ppm, high nutrients, and high irradiance/temperature.

References

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