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SUPPLEMENTARY INFORMATION

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The role of calcification in carbonate compensation

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The Role of Biology in Carbonate Compensation

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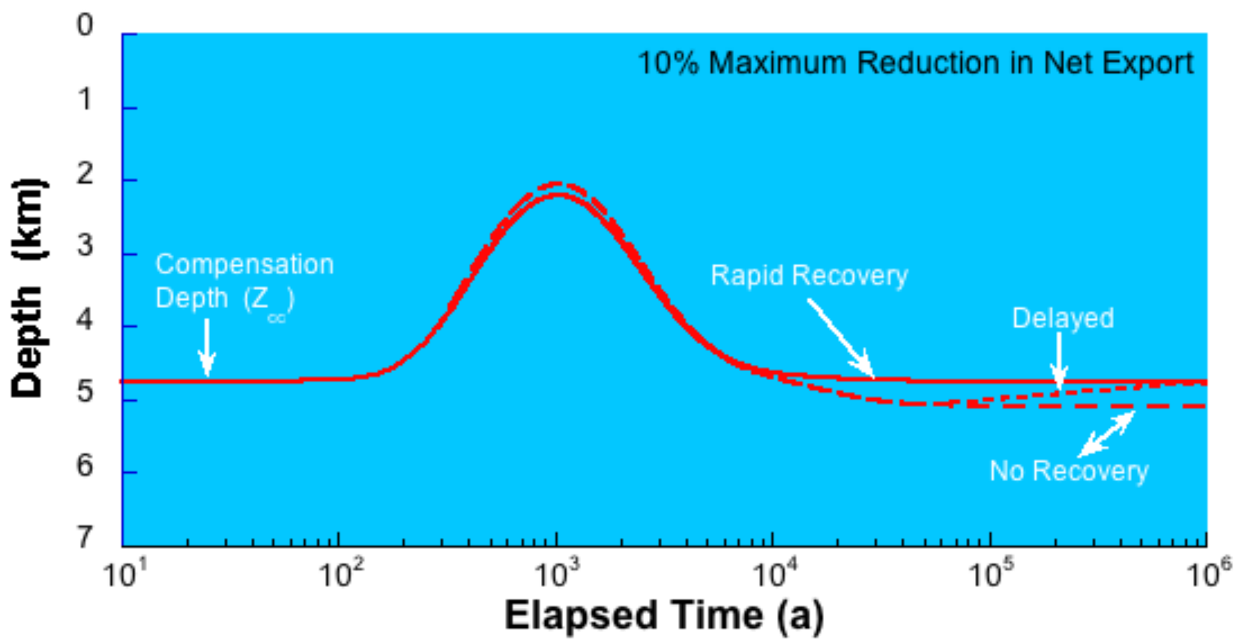
a



b

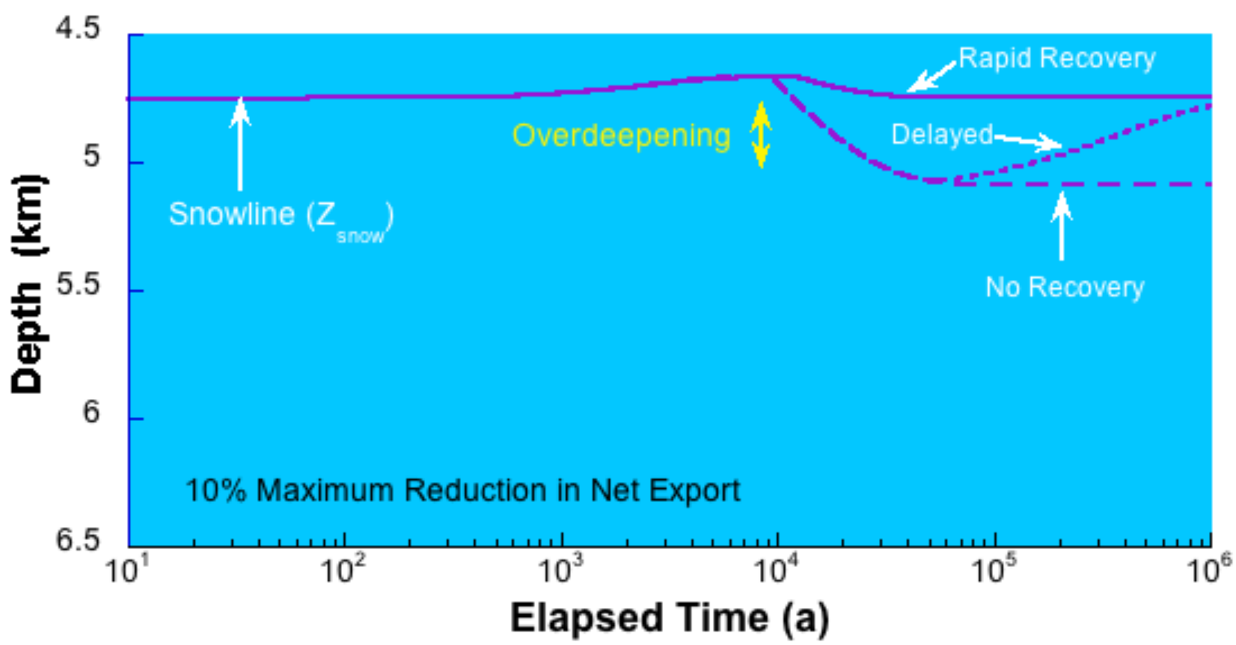


Figure S1 I Model predicted evolution of the carbonate horizons as a result of added biological compensation for Anthropocene-like conditions. (**a**) Evolution of Z_{sat} and Z_{cc} driven by the same acidification event as expected with a 10% maximum reduction in calcification (biological compensation) and three types of biological responses to acidification i.e., Rapid Recovery, Delayed Recovery and No Recovery, as explained in the text. Note the small but evident extra shallowing of the carbonate horizons at intermediate time scales and the small overdeepening of the records compared to pre-acidification state if there is no recovery or if it is delayed. (**b**) Evolution of snowline (Z_{snow}) for the same conditions. A loss of calcification after 10^4 a ET can cause Z_{snow} to deepen well below the pre-acidification depth and to accumulate at the deepest parts of the oceans.

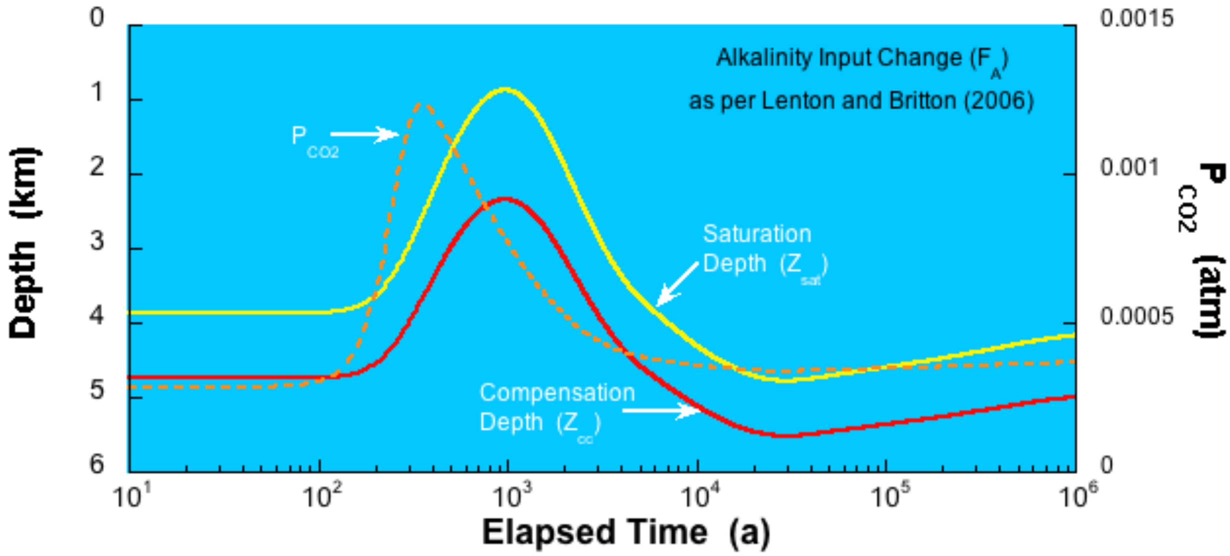


Figure S2 I Model predicted evolution of the carbonate horizons and P_{CO2} as a result of added carbonate alkalinity input (F_A) for Anthropocene-like conditions. Note that the trends are similar to Fig. 2A, without biological compensation, but there is now overdeepening starting at ~4.5 Ka ET. This effect is similar to that of biological compensation.

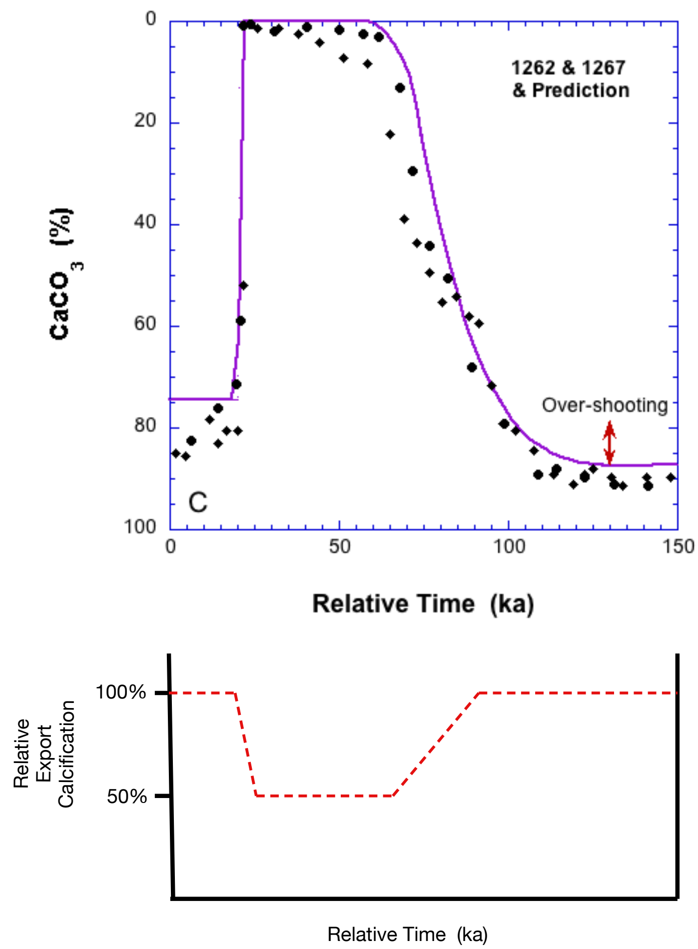


Figure S3 I Evolution of the carbonate content of sediments (top) during the PETM at Walvis Ridge sites 1262 and 1267, as reproduced from Luo et al.[31]. Bottom diagram illustrates the (approximate) relative calcification rate used to obtain this prediction. Note that the calcification rate falls early in the PETM and rises during the recovery phase, starting about 65 Ka relative time. It is this recovery in calcification that eventually corrects the overshooting.

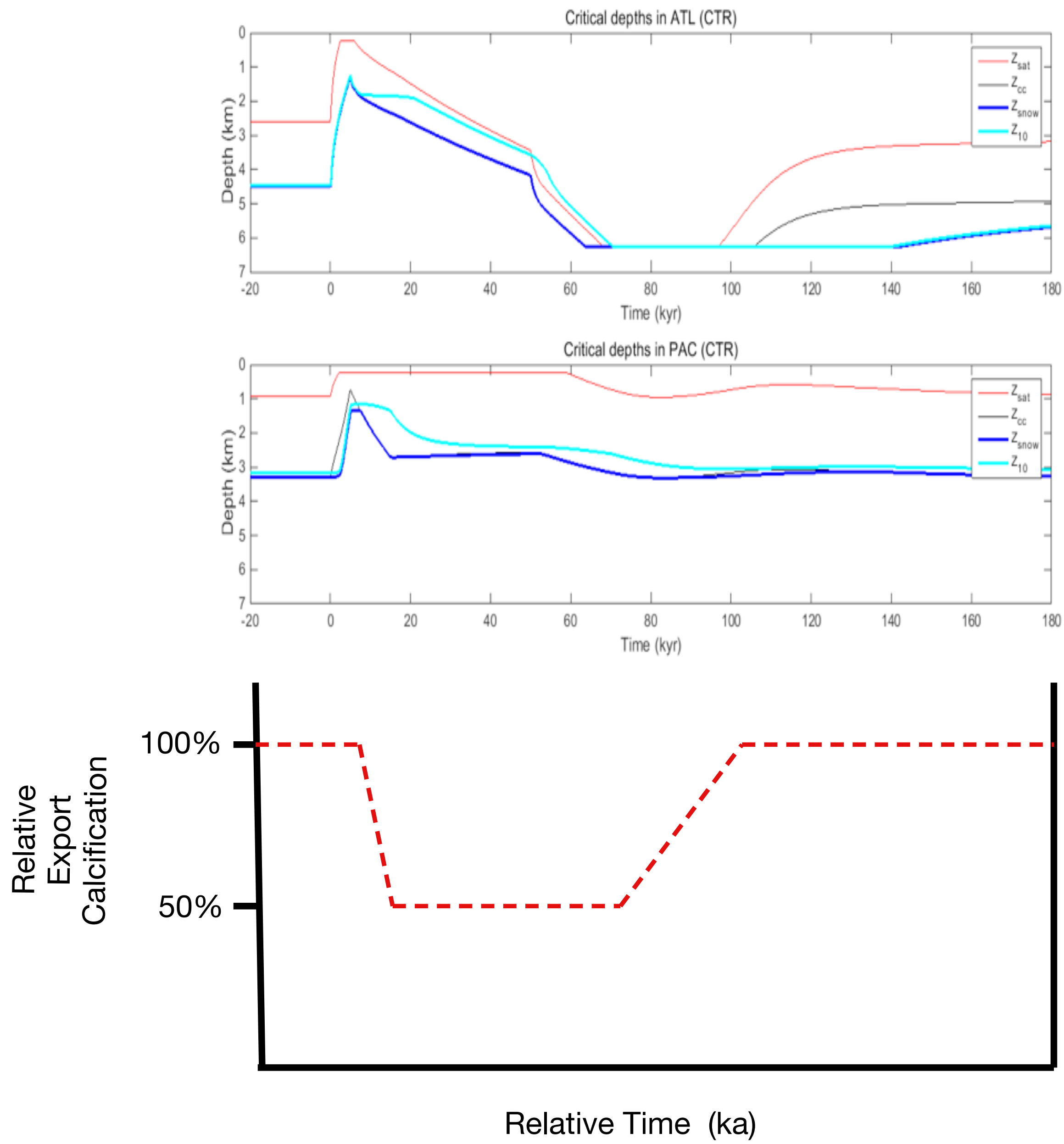


Figure S4 I Evolution of the carbonate horizons (top) during the PETM at Walvis Ridge, as reproduced from Luo et al.[31]. Bottom diagram illustrates the (approximate) relative calcification rate used to obtain this prediction. Note that the calcification rate falls early in the PETM and rises during the recovery phase, when the carbonate horizons start moving upward.