

Global Quaternary carbonate burial: updated reconstructions, persisting uncertainties, and new directions

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Reconstructing rates of marine carbonate burial through geologic time provides valuable insight into changes in ocean chemistry and the carbon cycle-climate feedbacks operating in the Earth system. The Quaternary Period (past 2.6 million years) is of particular interest due to sea level fluctuations over glacial/interglacial cycles which periodically exposed and flooded areas of carbonate accumulation on the continental shelf, likely impacting the global carbonate budget and atmospheric carbon dioxide. These important effects remain poorly quantified. We have reviewed the current literature on the carbonate budget over glacial/interglacial cycles and synthesized best estimates for carbonate burial across depositional environments (Wood et al., in prep.). We also present a new global compilation of carbonate mass accumulation rates for the Last Glacial Maximum based on ²³⁰Th-normalized sediment flux records synthesized by Costa et al. (2020). Persisting gaps in our quantitative understanding of carbonate production, preservation, and burial were evaluated; these include undersampling in heterogeneous shallow marine environments, underestimated contributions from neritic calcifiers such as *Halimeda* algae, and uncertainties associated with interpolation between deep sea records. We highlight emerging paleoceanographic proxies like the stable strontium and calcium isotope systems, which integrate a global signal of carbonate burial, and recent innovative modeling approaches as new opportunities to produce continuous records of global carbonate burial over glacial/interglacial cycles. New constraints on Quaternary carbonate fluxes, particularly in the shallow ocean, can bring fresh insight to whether the glacial/interglacial carbonate budget operated at steady state or was unbalanced by frequent sea level fluctuations, and the implications for atmospheric carbon dioxide and global climate feedbacks.

Costa KM et al. (2020). ²³⁰Th Normalization: New Insights on an Essential Tool for Quantifying Sedimentary Fluxes in the Modern and Quaternary Ocean. *Paleoceanography and Paleoclimatology*. 35(2):e2019PA003820

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