

THE POTENTIAL OF CARBON STORAGE IN THE OCEAN AS BICARBONATE

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Bicarbonate (HCO_3^-) and carbonate (CO_3^{2-}) ions in the ocean are a fundamental component of the global carbon cycle. The oceans contain approximately 38,000 billion tonnes of C as HCO_3^- and CO_3^{2-} (40x that in the atmosphere) with fluxes between different parts of this reservoir on the order of <1 GtC per year (Figure 1). Eventually, most of anthropogenic CO_2 emitted to the atmosphere will be incorporated into this sink as a consequence of mineral weathering. Intentionally storing additional CO_2 as HCO_3^- in the ocean has been suggested since the mid-90s (e.g., ocean liming, accelerated weathering of limestone, enhanced weathering), but estimates on storage potential, environmental impact, and technical feasibility remain poorly constrained. Our recent work has used the output of recent modelling studies in an attempt to estimate the carbon storage potential of this reservoir, and it is apparent that trillions of tonnes of CO_2 can be stored with marginal changes in ocean chemistry when the impact is distributed globally. The changes are more acute around the points of addition, and vary with each technology. All proposals for ocean bicarbonate storage require the extraction, comminution, transport, and dissolution of silicate or carbonate rocks. While the global decadal scale-up of such an operation to impact the climate is not unprecedented, it raises questions regarding environmental and social acceptability.

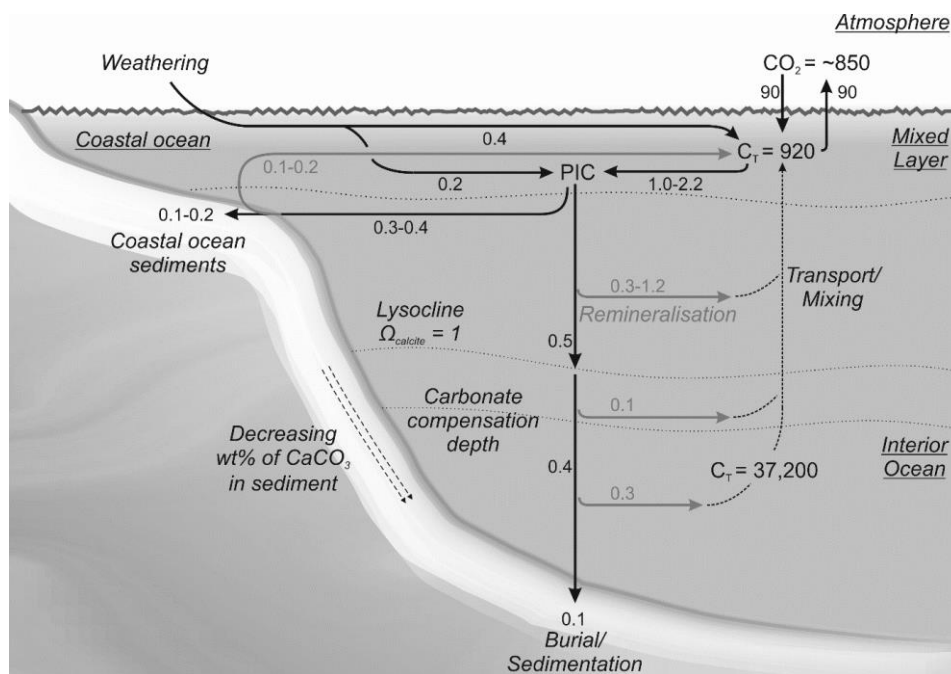


Figure 1: The global ocean carbonate cycle. Arrows represent fluxes in Gt C per year (lighter arrows denote remineralisation). C_T represents the dissolved inorganic carbon pools in Gt C. PIC refers to particulate inorganic carbon.