

# A Revised Budget for Sedimentary Carbon Subduction during the Cenozoic

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Carbon plays a central role in governing the climate and biosphere of Earth, yet quantification of carbon's long-term cycling from the mantle to the surface remains contentious. Sedimentary carbon represents a significant part of the budget and can be recycled to the mantle if underthrust in subduction zones. I estimate that ~60 Mt/yr is presently being subducted below the outer forearc, 80% in the form of carbonate carbon, significantly more than previously estimated (~20-25 Mt/yr). Sedimentary carbon represents around two thirds of the total carbon input at the trenches. An additional 7 Mt/yr is averaged over the Cenozoic as a result of passive margin subduction during continental collision (~83% CaCO<sub>3</sub>). This revision brings the input and output budgets within the range of uncertainty. Degassing from arc volcanoes and forearcs totals ~55 Mt/yr. When carbon in hydrothermal veins in the altered oceanic crust and serpentinized upper mantle is accounted for a net flux to the mantle appears likely. The efficiency of carbon subduction is largely controlled by the carbonate contents of the sediment column, and is partly linked to the latitude of the trench since that controls carbonate production. Accretionary margins are the biggest suppliers of carbon to the mantle wedge, especially Java, Sumatra, Andaman-Burma and Makran, reflecting the inefficiency of offscraping, the thickness of the subducting sediment and the trench length. The Western Pacific trenches are negligible sinks of sedimentary carbon. Increases in deep-sea carbonate in the Oligocene and Mid Mesozoic had a large impact on the subduction budget, increasing it greatly compared to earlier times.

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