

Fate of Dissolved Black Carbon in the Deep Ocean

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Pyrogenic carbon (PyC), a byproduct of biomass and fossil fuel combustion, may control the climate because it can be stored on Earth's surface for centuries to millennia. PyC produced on land is transferred to the ocean through riverine inputs and atmospheric deposition. Dissolvable BC, often denoted as dissolved BC (DBC), ubiquitously occurs in the ocean, and the ocean possibly acts as an ultimate PyC sink. Currently, however, we lack a full understanding of PyC cycling on Earth's surface because the fate of DBC in the ocean has not been constrained. Here, we show the first basin-scale distribution of DBC in the Pacific Ocean and find that the DBC concentrations in the deep Pacific decrease along with deep-ocean meridional circulation. The DBC concentration is negatively correlated with apparent oxygen utilization, a proxy of the integrated flux of sinking particles, in the deep Pacific, implying that DBC is removed from the deep ocean to abyssal sediments through adsorption onto sinking particles. The burial flux of DBC to abyssal sediments is estimated to be 0.040–0.085 PgC yr⁻¹, corresponding to 15–33% of the global PyC produced by landscape fires and 1.5–3.3% of the anthropogenic CO₂ uptake by the ocean.

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