

Organic carbon burial in continental margin sediments of the global ocean

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Continental margin sediments are the largest reservoir of organic carbon (OC) in the surficial Earth system and, thus, a key long-term sink for atmospheric carbon dioxide. Yet, despite its significance, the magnitude and spatial distribution of OC burial in this environment remains poorly quantified, mainly due to the exceptional heterogeneity of the coastal ocean. Here, we integrate rapidly growing seafloor observations with machine learning and reaction-transport modelling approaches to capture the spatial heterogeneity of OC transfer fluxes in continental margin sediments. We estimate a global OC transfer flux of 441 Tg C yr⁻¹ through the base of the mixed layer, which decreases to a “*long-term*” burial flux of 246 Tg C yr⁻¹ at the 5 kyr age horizon. Approximately 70% of this burial occurs in the northern hemisphere, and >50% is concentrated within the latitudinal band 10°S–30°N. Tropical regions show the highest *long-term* OC burial flux (71 Tg C yr⁻¹), representing 29% of the global total flux, followed by marginal seas (45 Tg C yr⁻¹, 18%) and polar regions (39 Tg C yr⁻¹, 16%). The substantial contribution of these regions to global OC burial is generally caused by either higher-than-average burial flux densities (tropics, marginal seas) and/or extensive areal coverage (tropics, polar). A country-level analysis of our results indicates that the highest *long-term* OC burial fluxes occur in the Exclusive Economic Zones (EEZs) of Indonesia (31 Tg C yr⁻¹, 13%) and Russia (22 Tg C yr⁻¹, 9%), followed by the Philippines, Antarctica, the United States, Japan, Papua New Guinea, Canada and New Zealand (each accounting for 4–5% of global OC burial). The European EEZs collectively account for approximately as much OC burial as the Russian EEZ. Our results represent the first spatially resolved estimates of natural carbon sequestration in global continental margin sediments, providing policymakers with crucially needed information to guide successful management and protection strategies.