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Deconvolving the coastal carbon mosaic

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Coastal oceans play a crucial role in the global carbon cycle, and are increasingly affected by anthropogenic forcing. It is presently unclear whether these dynamic regions constitute a net carbon source or sink within the global carbon budget. These estimates are confounded by the large diversity in depositional environments present in coastal oceans. Furthermore, the multitude of factors influencing carbon storage in the sediment (e.g. particle size, density and flow regime) add another layer of complexity. In this study, we deconvolve the sedimentary organic carbon mosaic manifested in the Chinese Marginal Sea (CMS) using a novel numerical clustering algorithm based on 14C and total organic carbon contents. Results reveal five regions that enclose geographically distinct depositional settings. Complementary statistical analyses reveal contrasting region-dependent controls on carbon dynamics and composition. Overall, clustering is shown to be highly effective in demarcating areas of distinct organic facies resulting from superimposed effects of organic carbon provenance, reworking and deposition on a shelf region exhibiting pronounced spatial heterogeneity. This information will aid in constraining region-specific budgets of carbon burial and assessing underlying carbon cycle processes. We envision that this approach could be exported and used in other coastal oceanic settings as well (e.g. the Arctic Ocean).