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Quantifying the microbial regulation of gel particle biogeochemical cycling in the surface waters of the coastal sea

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Despite accounting for less than 0.5% of the global ocean volume, the shallow shelf seas account for up to 30% of the absorption of atmospheric CO_2 by marine ecosystems. Extracellular gelatinous polysaccharide particles (GPP) form from phytoplankton-derived dissolved precursors, and their production converts dissolved organic carbon into particulate organic carbon. The budgets of GPP and GPP precursors in surface coastal waters, including pool sizes and turnover rates, need to be understood in order to fully establish the importance of this ecosystem in the global carbon cycle.

We studied the phytoplankton blooms that occur during the winter-spring-summer seasonal transition at the L4 time-series station in the Western English Channel. During phytoplankton blooms, GPP and GPP precursors at the sea-air interface and underlying water column are large and highly dynamic organic carbon pools. We found no evidence that GPP and GPP precursor pools are directly coupled. GPP increase initially with phytoplankton blooms, followed by rapid decrease in both the microlayer and water column. The rapid decrease of GPP was significantly related to changes in the composition of the bacterioplankton.

Our results show that the dynamic properties of two major organic carbon pools in the coastal sea are controlled by different components of the ecosystem. Results will be discussed in the context of microbial mediation of ecosystem functioning.