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# Global modeling of the coastal carbon cycle – A roadmap

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Coastal and margin regions are hotspots for global biogeochemical cycles and influence these cycles well beyond their actual spatial extent, yet these regions and their processes are currently poorly represented in global models. For example, a sizeable fraction of the organic matter that is fixed in coastal and margin regions is exported laterally to the open ocean, where it can lead to downstream productivity and respiration changes that may influence the air-sea $CO_2$ balance as well. So far, the global impact of coastal processes has been investigated by using ad hoc methods, as the computational power currently available permits only limited explicit consideration of these regions, and because process-based parameterizations have been lacking. We propose here a roadmap to overcome this limitation: The first step is the development and application of new parameterizations, followed by a second step, in which these regions are considered explicitly using embedding methods. We are currently developing parameterizations of the processes controlling productivity and vertical and lateral transport in eastern boundary current regions using a combination of statistical analyses of observations and high-resolution coupled physical-biogeochemical-ecological simulations at regional scales. First results support Ekman upwelling and shelf width as dominant factors controlling productivity and export, but we also identified eddies as having an important modulating effect – on the one hand by suppressing biological productivity, and on the other hand by being responsible for much of the offshore

transport of organic carbon to the open ocean. Hence, any coastal parameterization need to include at least these three factors.