

Implications of various depth levels used to compute export production

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In a steady state, the export of organic matter must be compensated by a supply of nutrients to the light-lit upper ocean. This nutrient supply can be simulated with considerable accuracy by a high-resolution ecosystem-circulation model of the North Atlantic.

The model results are used to examine physical processes that govern the transport of nutrients into the euphotic zone and the export of organic matter leaving it. Illustrated is the requirement for a rigid definition of the surface across which export production or nutrient supply are computed. Possible choices for this surface include a fixed depth level, the varying depth of the euphotic zone, and the depth of the winter mixed layer. Implications of the different choices are discussed with respect to the associated re-emergence timescales of an exported biogeochemical tracer flux. The basin-scale model is then used to investigate the climate sensitivity of organic matter export across the various depth surfaces.