

This folder contains the code needed to run the NEMURO_{BCP} model. NEMUROBCP was developed with three distinct goals. The first was to mechanistically model the multiple pathways of the BCP (sinking particles, active transport by vertical migrants, and passive transport of organic matter by ocean circulation and mixing). The second was to enable direct comparability between the model and field measurements of standing stocks and rates. This allows the model to act as a synthetic tool that can use diverse measurement types to enhance investigation of underlying and unmeasured processes. The third goal was to develop a model that could be run efficiently in multiple physical configurations to allow extensive data assimilation and hypothesis testing. NEMURO_{BCP} is designed with a “core” nitrogen-based module (including all biological components, nutrients, detritus, dissolved organic matter, and oxygen) that includes all three pathways of the BCP, along with submodules (that can be turned on or off) that model the carbon system, ²³⁴Th dynamics, and nitrogen isotopes.

The core model is in the function NEMURObc.m. There are also multiple additional functions used for initialization and for implementing NEMURO_{BCP} in a one-dimensional physical framework as well as several functions for plotting different aspects of the model. The scripts TestRunNEMURObcEupOnly.m and TestRunNEMURObcTrueDVM.m can be used to run the model in test configurations with the euphotic zone only or with a deep water column including the mesopelagic, respectively. The NEMURObc.m function is written so that it can easily be implemented in other physical frameworks as necessary.

For additional details, see Stukel et al. (“Quantifying biological carbon pump pathways with a data-constrained mechanistic model ensemble approach”).