

Global distribution of downward particle flux from models and measurements: Do we believe any of them?

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Three approaches have been made to examine the strength of ecosystem models in the description of downward particle flux in the deeper parts of the water column. The first has been to use a simple one dimensional upper ocean model at a location near to the NABE site in the Northeast Atlantic. This model is driven by meteorology to predict export flux and from that to provide a measure of downward flux at 3000 m over a ten year period. The results have been found to compare very favourably with measured flux at this depth using sediment traps in terms of both the general magnitude and the characteristics of seasonal variation. The observed of interannual variability in flux is not however well described by the model.

The other two approaches have taken the global perspective. Ecosystem models have been embedded into two general circulation models of the oceans (HADOM3L and OCCAM). Both are Bryan-Cox based level models the most important difference between them being the level of spatial resolution. The ecosystem models are of similar complexity. They have been used to derive global patterns of downward flux of organic carbon and we compare the model outputs with each other and, at 41 specific locations in the oceans where long term sediment trap data are available, we compare the model output with measured data. Conclusions are drawn about the conditions under which sediment traps provide reliable data and the potential of simple ecosystem models embedded in GCMs to provide satisfactory descriptions of carbon sequestration.