**Geoscientific
Model Development
Discussions**

Interactive comment on "The role of phytoplankton dynamics in the seasonal variability of carbon in the subpolar North Atlantic – a modeling study" *by* S. R. Signorini et al.

Anonymous Referee #1

Received and published: 18 March 2011

In this paper, the authors present a 1D physical model, coupled to a complex ecosystem / carbon model for the subpolar North Atlantic. They validate the model with satellite and insitu data. Then they use the model to evaluate the impact of coccolithophores on surface ocean pCO2.

This paper is not a significant contribution. The 1D physical framework with deep restoring (>500m) leaves out critical processes such as subsurface nutrient advection (Palter and Lozier 2008). Remineralization of exported POC appears to be neglected entirely (there is no POC pool in the model), such that any interaction between changing export and vertical mixing is ignored – this has been shown critical for carbon cy-

cling in this region (Bennington et al. 2009). Restoring at depth to empirical DIC-T and ALK-T/S relationships has not been shown to be a valid approach by passing of peer review (this paper is only in prep). How much does this approach capture observed variations?

A 1-D model can be tuned to fit data, particularly when you control so much of the deep processes with restoring. What is learned by this model if it is fit to the data so closely and then is only applicable in 1D? Does it work when you apply it to another location (Friedrichs et al. 2007, JGR).

I recommend rejection of this paper.

Minor comments

1. Sweeney et al. 2007 coefficients should be used in Wanninkhof 1992 equation to calculate gas exchange.

2. Some information about the GCM physical model should be presented. "Personal communication" is not an appropriate reference for this model, particularly when the individual is the second author on this paper.

3. Figure 6 a. The color scheme is confusing. Please be consistent with what is model and what is data throughout

4. Figure 7 a. The figure is too small to see b. The caption needs more detail

5. Figure 10 and 11 – These are impossible to see. Show a mean seasonal cycle and then an anomaly figure for the variability.