



Nitrate variability within North Atlantic subtropical mode waters: model derived mechanisms

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The evolution of the biogeochemical characteristics of mode waters remains subject to conjecture. Recent studies have shown that a significant fraction of the Dissolved Organic Matter (DOM) produced in the euphotic layer accumulates during the warmer months. This seasonally accumulated DOM is then subducted within mode waters where it is remineralized. It has also been suggested that the nitrate content of mode waters depends on the strength of winter productivity in the region of mode water formation.

In this study, we explore the role of DOM subduction and of winter productivity on the nitrate content of the subtropical mode waters. This is done in the frame of a coarse resolution basin scale model. The model configuration is a double-gyre 3000 Km * 2000 Km that mimics the North Atlantic including the western boundary current, the subtropical and subpolar gyres and the mode water formation processes. The physical model is coupled with a simple ecosystem model, comprising nitrate, ammonium, phytoplankton, zooplankton, detritus and DOM. Conclusions are drawn from diagnostics on the nitrate and DOM budgets within the mixed layer and the mode waters, and from a series of sensitivity analysis. The tests consist of (1) varying the remineralization rate of DOM within mode waters and (2) changing the nitrate content during mode water formation.