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Impact of the nitrate content of subtropical mode waters on primary production in the subtropical North Atlantic: results from an idealized model

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Identifying what controls the primary production of the subtropical gyres is a key requisite for improving our understanding of the ocean biogeochemical cycles. However basin-scale patterns of biological production in the oligotrophic North Atlantic are still debated. A recent data study has proposed a new mechanism that might determine the primary production of the subtropical gyre. *Palter et al.* (Nature, 2005) show that the production and advection of North Atlantic Subtropical Mode Waters (STMW) introduce spatial and temporal variability in the subsurface nutrient reservoir beneath the North Atlantic subtropical gyre. Therefore the STMW may play a significant role on regulating the primary production in the subtropical North Atlantic.

In this study, we seek to complement the study of *Palter et al.* by addressing the following questions: How does the nitrate content vary within STMW along the annual cycle? What are the processes that control the nitrate content of the STMW on the annual cycle? What is the impact of the nitrate content of the STMW on primary production on large spatial and temporal scale?

This is done in the frame of a 1/3˚ resolution idealized 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 dissolved organic matter.

Here we will display what processes are responsible of the evolution of the nitrate

content of North Atlantic STMW (from their formation to their circulation through the subtropical gyre). Then we will show using a series of sensitivity analysis that the nitrate content of STMW has an important impact on the subtropical primary production essentially in the ventilated part of the gyre and in the region of the western boundary current.