

Balance de producción y consumo de oxígeno dentro de los sistemas oligotróficos del océano Atlántico.
(Metabolic balance within oligotrophic systems of the Atlantic ocean). Universidad de Oviedo, 2001.

González Benítez, N. PhD thesis

This PhD studies the metabolic balance (oxygen method) within the aquatic oligotrophic systems, taking into special account the temporal variability, and also the spatial variability related to the mesoscale structures. We also study the role that heterotrophic bacteria play on the biogeochemical circulation of the carbon and oxygen before and after and sporadic upwelling pulse. Although, these oligotrophic regions are of low productivity, they represent, due to their extension 80% of the global ocean production. Our main objectives were to elucidate whether the overall balance of autotrophy and heterotrophy within the central gyres varies over time and to establish whether the open ocean as a whole is substantially in a state of organic imbalance. We also evaluate the possible contribution of mesoscale instabilities, to sustain the deficit of organic matter identified in this area. In the last part of the thesis we studied the effect of a sporadic upwelling pulse on the magnitude of the contribution of heterotrophic bacterial to total planktonic biomass and metabolic activity. On the whole, our results suggest that the occurrence and extent of net heterotrophic metabolism in the oligotrophic ocean (north and south subtropical gyres) are not constant and can vary as a response to spatio-temporal variations in physical forcing. The degree of nutrient limitation is a critical factor in the control of the microbial community metabolism in the oligotrophic regions of the open ocean. Making a gross extrapolation, the regional organic carbon deficit within the Eastern Subtropical Gyre ($0.98 - 1.88 \text{ Gt C yr}^{-1}$) should increase by ca 14 and 52 percent in the absence of mesoscale structures. Bacterial respiration accounted for 70 % of the overall microbial respiration and the BGE responds to changes in primary production, increasing the efficiency as the system becomes more productive.