



Toward a dynamic biogeochemical division of the Mediterranean Sea in a context of global climate change

Gabriel Reygondeau, Jean Olivier Irisson, Cecile Guieu, Stephane Gasparini, Sakina Ayata, and Philippe Koubbi
université Pierre et Marie Curie. Laboratoire d'océanographie de Villefranche sur mer, 181 Chemin du Lazaret, BP 28. 06230
Villefranche-sur-Mer, France

In recent decades, it has been found useful to ecoregionalise the pelagic environment assuming that within each partition environmental conditions are distinguishable and unique. Indeed, each partition of the ocean that is proposed aimed to delineate the main oceanographical and ecological patterns to provide a geographical framework of marine ecosystems for ecological studies and management purposes. The aim of the present work is to integrate and process existing data on the pelagic environment of the Mediterranean Sea in order to define biogeochemical regions.

Open access databases including remote sensing observations, oceanographic campaign data and physical modeling simulations are used. These various dataset allow the multidisciplinary view required to understand the interactions between climate and Mediterranean marine ecosystems. The first step of our study has consisted in a statistical selection of a set of crucial environmental factors to propose the most parsimonious biogeographical approach that allows detecting the main oceanographic structure of the Mediterranean Sea. Second, based on the identified set of environmental parameters, both non-hierarchical and hierarchical clustering algorithms have been tested. Outputs from each methodology are then inter-compared to propose a robust map of the biotopes (unique range of environmental parameters) of the area. Each biotope was then modeled using a non parametric environmental niche method to infer a dynamic biogeochemical partition. Last, the seasonal, inter annual and long term spatial changes of each biogeochemical regions were investigated.

The future of this work will be to perform a second partition to subdivide the biogeochemical regions according to biotic features of the Mediterranean Sea (ecoregions). This second level of division will thus be used as a geographical framework to identify ecosystems that have been altered by human activities (i.e. pollution, fishery, invasive species) for the European project PERSEUS (Protecting European Seas and borders through the intelligence US of surveillance) and the French program MERMEX (Marine Ecosystems Response in the Mediterranean Experiment).