ECOSYSTEM AND PRIMARY PRODUCTION INTERACTIONS IN THREE CONTRASTING SITES IN THE NORTHERN LEVANTINE BASIN

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Abstract
To determine the effects of different nutrient dynamics in the Levatine Basin a 1-D multi component lower trophic ecosystem model is used and the carrying capacity and regulatory mechanisms of the nutrients on upper trophic levels at three contrasting marine sites in the Northeastern Mediterranean is assessed. Offshore waters of Mersin Bay, coastal sites of Erdemli and Rhodes Gyre is chosen as they represent distinctive characteristics in terms of nutrients dynamics. Model results suggest distinct mechanisms that drives the phytoplankton blooms in each region, for example in Rhodes Gyre highest productivity observed during late February, whereas the strongest bloom was during spring at Erdemli coasts. Offshore waters of Mersin Bay has the lowest productivity throughout the year with minor changes during winter and spring seasons.

Keywords: Levantine Basin, Primary production, Nutrients, Models

The nutrient inputs are limited both in terms of internal and external sources in the Mediterranean Sea. Primary production decreases further through the Eastern part of the Mediterranean and have been observed to be as low as 86.8 gCm-1yr-1 in the Levantine Basin (Antoine et al., 1995). In coastal areas, the production is induced by input through the river discharges and the nutrients introduced from aeolian deposits. Erdemli coasts of Mersin Bay receive important fresh water input through Göksu, Lamas, Seyhan, Ceyhan and Asi Rivers. Hence, Erdemli coastal waters are considered as a good case study where riverine and atmospheric deposition of nutrients are effective. Terrestrial and riverine inputs does not penetrate into the open Mersin Bay so it is chosen to represent the oligotrophic characteristics of Eastern Mediterranean water. Rhodes Gyre on the other hand represents a region where upwelling dominates the nutrient input mechanism. This region is known as the most productive area in Northern Levantine Basin with annual primary production of ~97 gCm2yr-1 (Napolitano et al., 2000). Climatological data are used to force and validate the model results for one-year using monthly averages of parameters of ~26 years data. Historical Erdemli Time Series (ETS) data obtained with biweekly cruises to 3 stations between 1997 – 2013 by METU-IMS. Offshore Mersin Bay and Rhodes Gyre data for years 1988 - 2014 are obtained from METU-IMS data inventory. For the Rhodes gyre stations were scarce especially for January and February due to harsh weather conditions in this area, so additional CTD data from CORIOLIS (http://www.coriolis.eu.org) is obtained and used.

To analyze the ecosystem dynamics, one-dimensional multicomponent lower trophic level ecosystem model developed by developed by SALIHOGLU, B. et al 2009 (NAGEM) oligotrophic and mesotrophic oceans adapted to specific conditions of these three sites. The model includes enough complexity to consider the limitations which differs among these three regions, while estimating the primary production.

5 algal groups included in the model which are cyanobacteria group. (Low and High Light adapted Prochlorococcus, Synecococcus) with cell size ~0.9um, Autotrophic Eukaryotes ~2.5um, and Diatoms ~15um . Other than advected and regenerated nutrients, atmospheric nutrient input and nitrogen fixation are another nutrient sources. Model-data comparison shows that model skill is high for chemical variables and chl-a results. Mixed layer depth is observed to have the greatest impact on growth of the species. The model results of yearly distribution of primary production for each sites represented in Fig. 1. With the effect of mixing, primary production is at its highest levels during late February to early March. for all sites. Deep chlorophyll maxima occurs at the bottom of the euphotic zone (<~100m) consistent with available literature (e.g., Ediger, 2005). Since the deep waters with rich nutrient contents upwelling to the euphotic zone, nutricline is shallower in the in the center of the Rhodes Gyre. As phytoplankton carried deeper with the winter mixing, meeting the nutrients, more intense deep chlorophyll occurs in Rhodes Basin compared to the other sites. In May, vanishing of the winter mixing and nutrient input is introduced to coastal areas through increasing river runoffs, spring bloom occurs with higher intensity in ETS site compared to others. In Mersin Bay weak seasonal pulses also occur as a minor increase in winter and spring season, however this site has the lowest primary production and chl-a values amongst the other 2 regions.

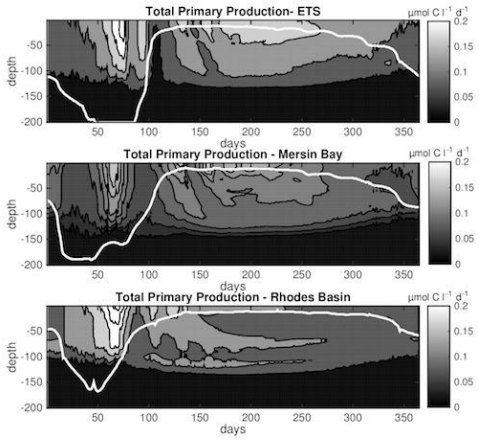

Fig. 1. Primary Production of 3 different sites inferred from model results -White lines indicate the Mixed Layer Depth at each day

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