IMPLICATIONS OF INTENSIFIED STRATIFICATION IN THE BLACK SEA FOR NUTRIENT CYCLING AND PRIMARY PRODUCTION (1971-2001)

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A coupled 3-D hydrodynamic-ecosystem model of the Black Sea has been developed in order to investigate the implications of specific climatic drivers on the Black Sea pelagic ecosystem. The model results revealed a gradual reduction in the mixed-layer depth over the period of the simulation, from 1972-2001. Whilst there are no continuous observations to support this trend, mixed-layer depths and water column structures derived from CTD casts collected during individual years throughout the simulation compare well with the model results, supporting this conclusion. A linear trend fitted to the annual mean, basin averaged mixed-layer depth time series exhibits a decline of 2.2 m over the period of the model simulations. Shallowing of the mixed-layer reflects an increase in the surface buoyancy input, the net heat flux from the atmosphere into the water has increased while evaporation minus precipitation has declined over this period, resulting in warmer and fresher surface waters. Wind stress time series showed no continuous trend over the study period, although as with the other surface fluxes exhibited considerable interannual variability. Both model simulations and observations revealed a reduction in nitrate availability at the base of the euphotic zone, associated with the increased water column stability. As nitrate is a limiting nutrient for phytoplankton growth in the Black Sea, primary production is expected to mirror nitrate availability. Due to the top down control of the Black Sea pelagic food web, however, phytoplankton concentrations do not exhibit a simple relationship with water column structure or nutrient availability. Model results suggest a positive feedback of reduced grazing pressure on phytoplankton during warm years due to increased grazing control on zooplankton by gelatinous species (i.e. *Mnemiopsis leidyi*).

Poster presentation