



Linear trends or regime shifts: statistical analysis of data and biogeochemical model simulations for the last 50 years in the Aegean Sea

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We perform a detailed statistical analysis of measured data and results from 50-year physical-biogeochemical simulations in the Mediterranean Sea. The simulated data are generated by the 3-D General Estuarine Transport Model - GETM for the hydrodynamic fields and by the Fasham biogeochemical model for nutrients and chlorophyll. The coupled model is mainly forced with ECMWF atmospheric data, realistic bathymetry, river discharges and riverine nutrient inputs. The horizontal resolution of the model output is 5'x5' and the multiannual runs cover the period from 1960 to 2009. We use sea-surface temperatures and chlorophyll-a distributions derived from satellite observations for comparison to the physical-biogeochemical model results. Specifically we examine here several sub-domains within the Aegean Sea that differ in the forcing and in the nutrient inputs.

The data are analyzed with respect to autocorrelation, linear trends and the occurrence of breakpoints in the time series. The applied statistical methods always comprise significance tests and confidence limits for the investigated characteristics.

Trends in the North Aegean are not persistent, only some variables have a significant trend in some of the selected areas. Phytoplankton (chl_a) and wind show the most pronounced increase in the last 2 decades.

It was not possible to identify a clear regime shift in the Aegean Sea, at least not at the by Conversi et al. (2010) proposed date for a Mediterranean regime shift at the end of the 1980s. This must not be a contradiction, as nearly all the variables considered in Conversi et al. (2010) are from the Western Mediterranean and Adriatic Sea and not from the Aegean Sea. Therefore it might be that the Aegean Sea has an own different dynamics than the whole Mediterranean Sea. We cannot confirm the speculated regime shift in SST at about 1998 of Raitzos et al. (2010), when applying rigorous statistical testing methods.