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Long-term oceanographic variability of the South Adriatic Gyre (Mediterranean Sea) and a large-scale climate pattern

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The interannual variability of the South Adriatic Gyre and its relation to the wind vorticity and the large climatic pattern (North Atlantic Oscillation - NAO), has been studied using the time series of satellite altimetry data and ocean surface wind products. The Adriatic Sea is a source of main component of the dense water for the entire Eastern Mediterranean - Eastern Mediterranean) Deep water. The cyclonic circulation observed in the South Adriatic area is mainly sustained by the wind forcing, as suggested by the positive correlation between the rate of change of the current vorticity and the wind stress vorticity. Nevertheless, the influence of vorticity advection from the adjacent area (North Ionian Sea) cannot be ignored and it is more significant during the anticyclonic phase of Adriatic-Ionian Bimodal Oscillation System. The geostrophic current vorticities of the South Adriatic and North Ionian Seas are correlated with a time lag of 15 months, which corresponds to an advection speed of $\sim$1 cm/sec. The different wind configuration, observed during the positive (NAO+) and negative (NAO-) NAO states, induces the stronger vorticity during NAO- and vice versa. Moreover, the positive correlation between the NAO index and the frequency of the cold and dry Northerly wind suggests the strengthening of the winter convection, and of the consecutive deep water formation, during the NAO+ states. Southern Adriatic area, being subject to the winter convection, is characterized by the late winter/early spring algal bloom. Spatially averaged surface chorophyll concentrations were correlated with the northerly wind frequencies and it was shown that the two biological productivity regimes likely exist: the subpolar one and the subtropical one depending on the frequency of windy days. We also show that the bloom timing is a linear function of the wind frequency and it can vary within the range of almost two months.