

# Application of the Reanalysis Data to Assess the Climatology of Desert Dust Deposition in the Adriatic Sea and Response of the Marine Biological System

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Atmospheric mineral dust has a significant role in climate change processes such as delivering nutrients to marine ecosystems which inhibits the primary production responsible for CO<sub>2</sub> absorption. In this study, the climatology of dust deposition in the Adriatic Sea area was determined based on Modern-Era Retrospective Analysis for Research and Applications, version 2 reanalysis from 1989 to 2019. These aerosols in the reanalysis are simulated with the GOCART model. The corrections to improve the aerosol deposition are made using the AOD measurements from the AERONET sun photometers network and MODIS onboard Terra and Aqua satellites. The dust deposition in the reanalysis is evaluated using measurements for the 3-year period from the CARAGA network instruments situated in the western Mediterranean. Although the reanalysis overestimates the deposition, the correlation with measurements is high and significant at most of the stations. The annual deposition cycle in the Adriatic Sea exhibits two maxima: a stronger maxima in March–April and a weaker maxima in November. Wet deposition is a dominant process with a relative contribution to overall deposition from 67.35% to 88.53%. Deposition hot spots are along the Montenegrin coast and Otrant. The average contribution of dust deposition events (DDEs) is 16.5% (60.2 dy yr<sup>-1</sup>), with the strongest deposition during 1999–2009 and a positive trend in deposited mass during the study period. The EOF method was applied to the geopotential field at 850 hPa to determine the characteristic synoptic situations related to dust deposition. It was found that in spring the Mediterranean cyclones deliver most of the dust in the Adriatic Sea followed by the situations with upper-level troughs over Western Mediterranean in the autumn. The effect of dust deposition on primary production is observed by a high level of oxygen saturation of up to 250% (usually it is lower, up to 150%) in the stratified middle water layer (5–8 m) of the central Adriatic marine system (Rogoznica Lake) during an intense wet deposition episode. Such extreme values of oxygen saturation can be taken as an indication of biological activity related to an increase in phytoplankton abundance and activity, diatoms in particular.