

Use of spatial statistics techniques in order to spatio-temporal variations of chlorophyll a concentration in the Persian Gulf

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Abstract

Investigation of the Chlorophyll a (Chl-a) concentration is important for various marine sciences such as marine biology, marine environment, climatology, and oceanography point of views. By examine and monitoring of this parameter it is possible to identify some important phenomena such as algal blooms and upwelling. In this study, satellite data of chlorophyll a concentration from the NOAA database and MODIS Aqua sensor with 0.05° spatial resolution were monthly collected during 2003 to 2016 in the Persian Gulf and then two important statistics techniques analyses such as global Moran and local Moran were employed. The results of the Global Moran analysis showed that there is strong autocorrelation and clustering distribution of data across all season, where winter season had the strongest and summer the weakest autocorrelation. In order to determine the type of spatial clusters and their location, local Moran analysis were applied. The results of this analysis indicated that higher number of high-high clusters (high concentrations of Chl-a) was belonged to winter season than other seasons. By analyzing the output maps of this analysis, it was found that high concentrations of Chl-a in the winter and spring season are generally formed along the northern coasts of the Persian Gulf. In summer, high concentrations of Chl-a mostly along the southern coast of the Persian Gulf. But in the autumn, high concentrations of Chl-a were observed along all coastal areas of the region. Low-low clusters (low levels of Chl-a) were also formed in the central part of the Persian Gulf. As a conclusion, changes in Chl-a concentration in the Persian Gulf depend on the sea surface currents, river inflows and climatic conditions of the region.

Keywords: Chlorophyll a, Spatial Statistics, Global Moran, Local Moran, Persian Gulf.