

ASSESSMENT OF THE LONG-TERM DYNAMICS OF ALGAL BLOOMS AND THEIR LINKAGES WITH OCEANOGRAPHIC PARAMETERS USING TIMESERIES REMOTE SENSING DATA

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INTRODUCTION

- Excessive algal production results in bloom events, which are detrimental to the marine ecosystem
- * Climate change is influencing the ocean dynamics[1] Non-parametric statistics: Mann-Kendal trend, Cross-* The influence of changing oceanographic processes correlation, and Multivariate autoregression
- on dynamics of algal bloom is not well understood



Algal blooms and subsequent fish death [2], [3]

OBJECTIVES

- Evaluate the changes in the spatio-temporal patterns of algal bloom
- * Assess the linkage between blooms and oceanographic processes
- Spatial prediction of bloom events using statistical techniques

MATERIALS AND METHODS

- · Variables: Chlorophyll, temperature (SST), salinity (SSS), sea level (SSH), and particulate organic carbon content (POC)
- * Data: Remote sensing imageries from MODIS Aqua, and model derived data from HYCOM
- Resolution: 4Km spatial and 1-day temporal

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- Study Area: Northern Indian Ocean
- * Google Earth Engine platform: Detect blooms, spatial data gap-filling, derive areal extent of bloom patches



RESULTS AND ANALYSES

Seasonal trend in the spatial coverage of blooms * A decrease in area of bloom events in coastal waters * While an increase in Arabian sea offshore waters



Seasonal variations in size of algal bloom patches (produced using Man-Kendal test)

Influence of oceanographic processes on algal bloom events

- Temperature, salinity and sea level show a negative correlation with the occurrence of bloom in most of the coastal waters
- Particulate organic carbon content shows a positive correlation with bloom



Bloom variation with temperature, salinity, sea level and organic carbon. The correlation coefficient value: -1 (green) to 1(red colour)

Non-parametric modeling of algal bloom events

- Temporal prediction of algal bloom concentration
- * Multivariate autoregression modelling: current and lagged monthly values up to 5 months
- * Model with 2-months time lag have higher accuracy (mean $R^2 = 0.81$)





Accuracy of the spatial prediction of bloom concentration (R² value of model with 2-month time-lag)

- * Algal bloom areas are shrinking over the past 20 years over the Indian coastal waters
- Alterations in temperature, salinity, sea level and organic carbon content found to be influencing the **bloom** concentration significantly
- Multivariate autoregression modeling has a fairly well prediction for bloom concentration
- Regional and species-specific bloom prediction will enhance the model performance

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