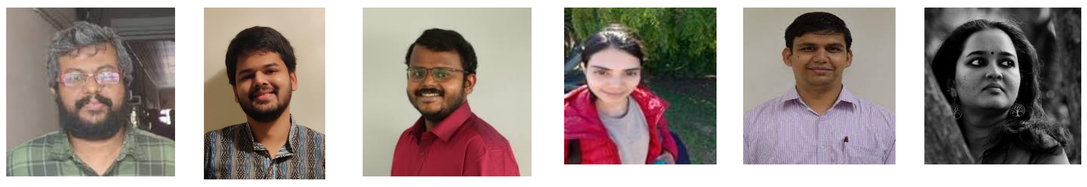

Seasonality, Trends, and Controlling Factors of Indian Ocean Acidification Over Distinctive Bio-Provinces

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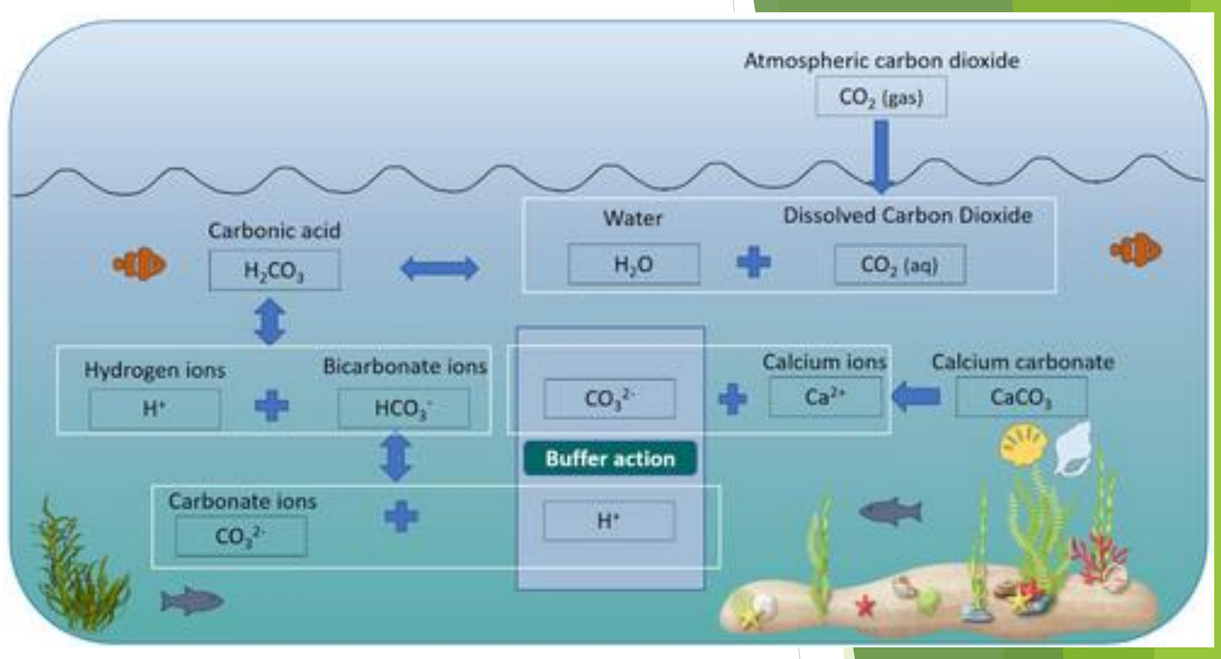


Abstract

The Indian Ocean (IO) is witnessing acidification as a direct consequence of the continuous rising of atmospheric CO_2 concentration and indirectly due to rapid ocean warming, which disrupts the pH of the surface waters.

This study investigates the pH seasonality and trends over various bio-provinces of the IO and regionally assesses the contribution of each of its controlling factors.

Simulations from a global and a regional ocean model coupled with biogeochemical modules were validated with pH measurements over the basin and used to discern the regional response of pH seasonality (1990–2010) and trend (1961–2010) to changes in Sea Surface Temperature (SST), Dissolved Inorganic Carbon (DIC), Total Alkalinity (ALK), and Salinity (S).

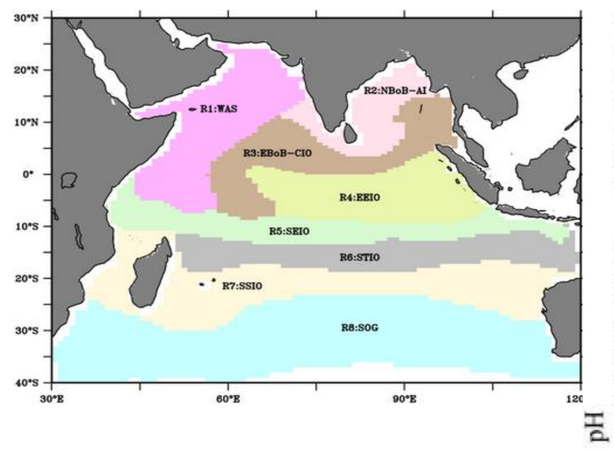
DIC and SST are significant contributors to the seasonal variability of pH in almost all bio-provinces.

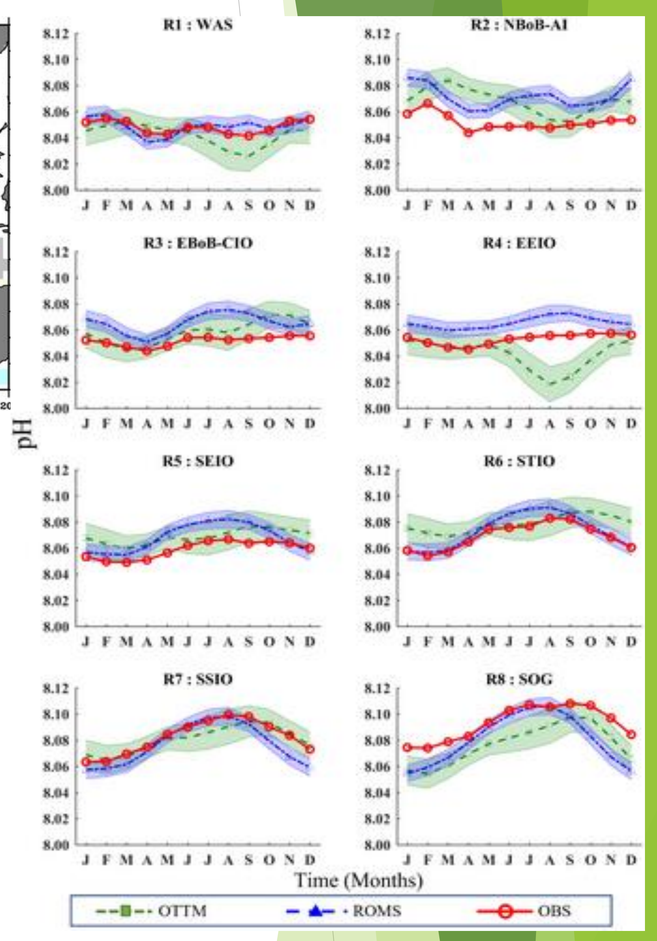
Total acidification in the IO basin was 0.0675 units from 1961 to 2010, with 69.3% contribution from DIC followed by 13.8% contribution from SST.

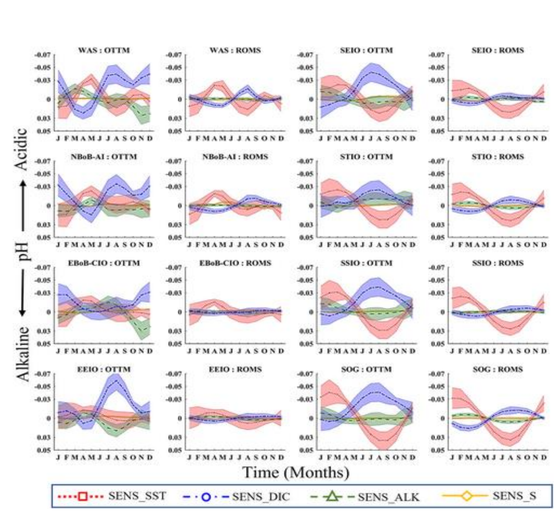
For most of the bio-provinces, DIC remains a dominant contributor to changing trends in pH except for the Northern Bay of Bengal and Around India (NBoB-AI) region, wherein the pH trend is dominated by ALK (55.6%) and SST (16.8%).

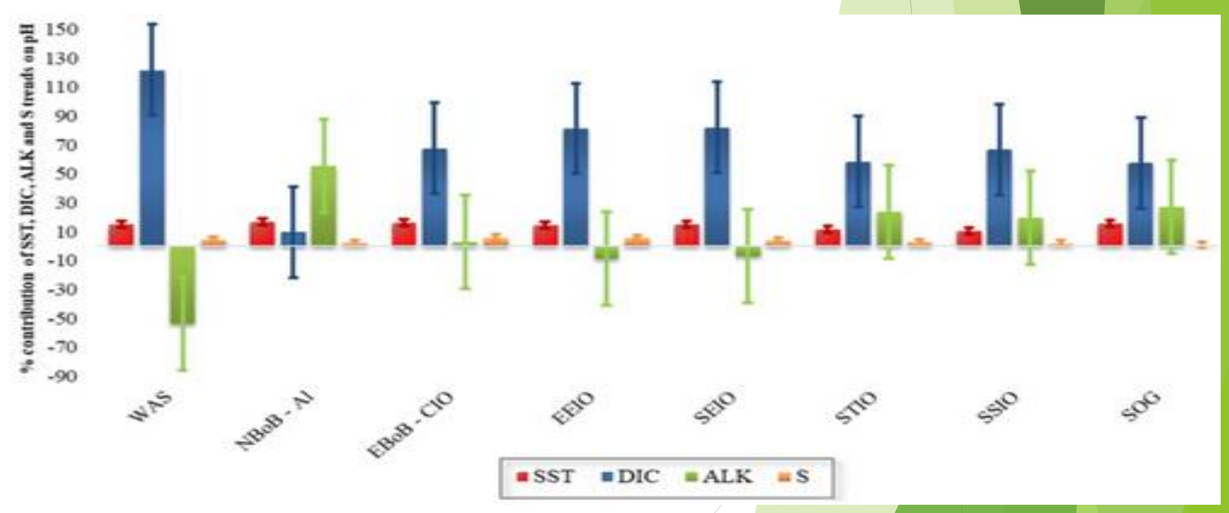
Interdependence of SST and S over ALK is significant in modifying the carbonate chemistry and biogeochemical dynamics of NBoB-AI and a part of tropical, subtropical IO bio-provinces.

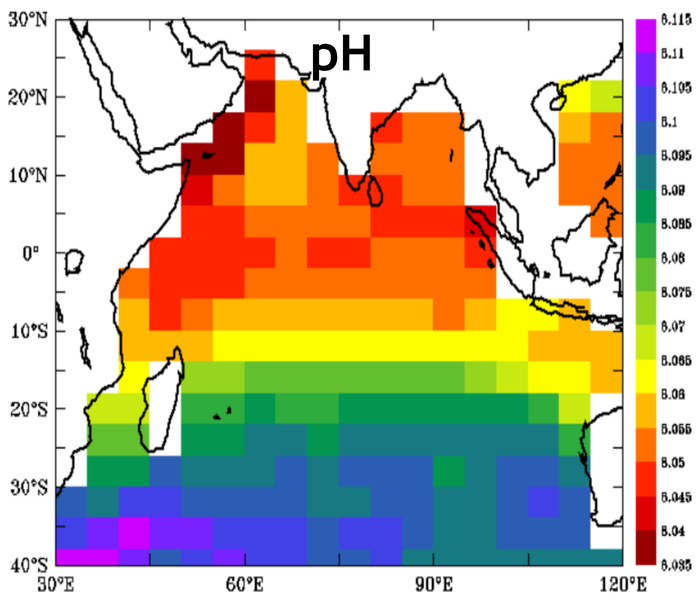
A strong correlation between SST and pH trends infers an increasing risk of acidification in the bio-provinces with rising SST and points out the need for sustained monitoring of IO pH in such hotspots.

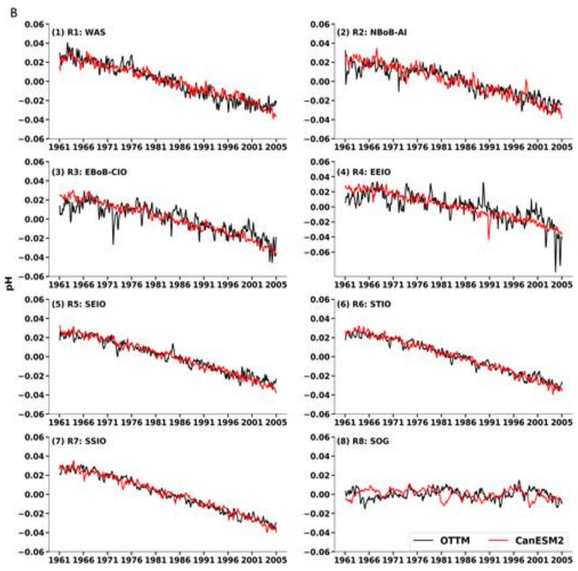


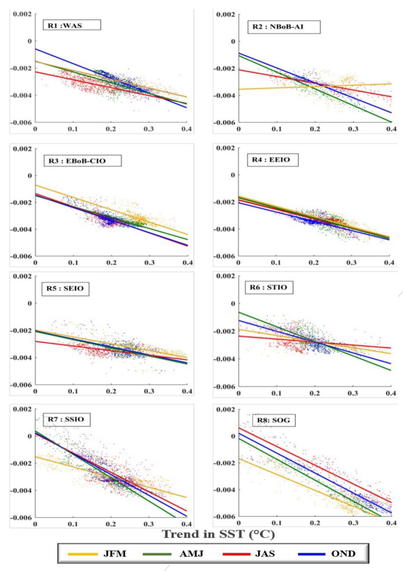












Madkaiker, K., Valsala, V., Sreeush, M. G., Mallissery, A., Chakraborty, K., & Deshpande, A. (2023). Understanding the seasonality, trends, and controlling factors of Indian Ocean acidification over distinctive bio-provinces. ***Journal of Geophysical Research***, 128, e2022JG006926. https://doi.org/10.1029/2022JG006926