Climate Change Impacts on Phytoplankton Biodiversity and Its Consequences for the Ecosystem of the Arabian Sea

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ABSTRACT: Over the past few years the Arabian Sea has witnessed a rapid increase in summer-time phytoplankton blooms due to strengthening of the southwest monsoon winds and intensification of coastal upwelling. In a study based primarily on satellite-based datasets we showed that these changes were linked to the warming trend over Eurasia and a decline in snow cover over the Himalayan-Tibetan Plateau region. Our recent observations suggest that the warming trend is undermining convective mixing responsible for nutrient inputs during the boreal winter component of the monsoon cycle. More recently, we have been able to combine satellite data with shipboard observations to show the Arabian Sea may be experiencing a loss of phytoplankton biodiversity, with traditional winter-time dominant blooms of the heterotrophic dinoflagellate Noctiluca miliaris. At the moment, it remains unclear whether these changes are related to the warming trend. One of the difficulties is that, unlike the other major ocean basins, long-term shipboard observations in the Arabian Sea are lacking and continue to be a major impediment to a better understanding of the relationships between the oceanographic processes and biological productivity as they relate to climate change. As part of our studies funded by NASA, we have been working to overcome this shortcoming through the development of a coupled physical-biological model. A detailed analysis of atmospheric data from the region being undertaken simultaneously will be used to identify salient trends in climate and in conjunction with the coupled physical-biological model, for a coherent diagnosis of climate variability on the ecosystem of the Arabian Sea.

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