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NCPOR Study reveals unprecedented phytoplankton blooms in Southern Ocean

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Phytoplankton are microscopic photosynthetic organisms like plants and bacteria that drift in the top layer of the world's oceans. They bloom behind them, forming a key part of most ocean ecosystems. The phytoplankton are the lungs of our planet; they store excess carbon dioxide from the atmosphere and provide nearly half the oxygen we breathe.

Global modeling studies using historical data have revealed declines in phytoplankton over the past few decades, with significant losses occurring in the North Pacific, North Indian and Equatorial Indian oceans. The reduction in population may reduce the amount of carbon dioxide drawn out of the atmosphere and transferred to the deep ocean for long-term storage.

However, National Centre of Polar and Ocean Research (NCPOR) Scientist, Babula Jena observed unprecedented phytoplankton blooms in the Maud Rise (MR) polynya, Southern Ocean (SO) with high concentration of chlorophyll a during 2017. The bloom appeared for the first time in the satellite record since 1978.



For the past 50 years, the loss of ice shelves and glacier retreat around the Antarctic Peninsula have increased. However, the occurrence of polynyas can enhance the chlorophyll a concentration due to the increase in surface area of new open waters and growth season of the phytoplankton in SO. Chlorophyll a, the green pigment plants produce as part of photosynthesis and more than half of the world's oceans will shift color by the year 2100, due to changes in the types and location of phytoplankton. Climate change is already having profound effects on our planet, and here's one more: It's changing the color of the oceans, with the blues getting bluer and the greens getting greener.

NCPOR Scientists revealed that the formation of the observed bloom in austral spring (October– November 2017) due to maximum supply of nutrients into the upper ocean through Ekman upwelling (driven by wind stress curl and cyclonic ocean eddies) in this period and improved light conditions that favored the phytoplankton photosynthesis and growth. Given access to sunlight and nutrients, phytoplankton can bloom in numbers of millions of cells per litre of seawater.

The Study suggest the occurrence of phytoplankton bloom in MR may turn it into a potential sink of atmospheric carbon dioxide through biological pumping and convert it into carbon and energy for the essential base of the marine food web. A portion will circulate back to the surface because of ocean currents, and, like fertilizer, fuel another phytoplankton bloom.

In present study, NCPOR demonstrates how the phytoplankton in the Southern Ocean (specifically over the shallow bathymetric region) would likely respond in the future under warming climate conditions and continued melting of Antarctic sea ice.

Babula Jena suggests that phytoplankton in the Southern Oceans, especially in the shallow bathymetric region, will react in 2016 under a warmer climatic condition in the future and continue to melt Antarctic sea ice from 2016 onwards.

Led by Babula Jena, the research team comprised Anil kumar N. Pillai of NCPOR, Ministry of Earth Sciences, Goa. The research paper has been published in the Journal of *The Cryosphere*, (available online from 14 April 2020).