

Study predicts accelerated warming of Indian Ocean

'There will be near-permanent heatwaves, intensified cyclones'

PTI

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The Indian Ocean is expected to experience surface warming of 1.4 °C to 3 °C between 2020 and 2100, which will push it into a near-permanent heatwave state, intensify cyclones, affect the monsoon, and lead to a rise in sea levels, according to a new study.

The study, led by Roxy Mathew Koll, a climate scientist at the Pune-based Indian Institute of Tropical Meteorology (IITM), showed that marine heatwaves (periods of abnormally high ocean temperatures) are projected to increase from 20 days per year (during 1970-2000) to 220-250 days per year, pushing the tropical Indian Ocean into a

IN TROUBLED WATERS

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> They cause habitat destruction due to coral bleaching, seagrass destruction, and loss of kelp forests, affecting fisheries sector adversely and also lead to the rapid intensification of cyclones

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there will be reduced warming off the Sumatra and Java coasts

> "The future increase in heat content is comparable to adding the energy equivalent of one Hiroshima atomic bomb detonation every second, all day, every day, for a decade," says Roxy Mathew Koll, a climate scientist

basin-wide near-permanent heatwave state by the end of the 21st century.

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ies sector adversely. They also lead to the rapid intensification of cyclones.

The rapid warming in the Indian Ocean is not limited to the surface. The heat content of the Indian Ocean, from the surface to a depth of 2,000 metre, is currently increasing at the rate of 4.5 zetta-joules per decade and is predicted to increase at a rate of 16-22 zetta-joules per decade in the future, the study titled 'Future projection for the tropical Indian Ocean' said.

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> Continued on P 10

Frequency of extreme dipole events predicted to increase

> Continued from P 1

The maximum warming will occur in the northwestern Indian Ocean, including the Arabian Sea, while there will be reduced warming off the Sumatra and Java coasts.

Amid the accelerated ocean warming, the seasonal cycle of surface temperatures is projected to shift, which could increase extreme weather events over the Indo-Pacific region.

While the maximum basin-average temperatures in the Indian Ocean ranged from 26°C to 28°C throughout the year during 1980-2020, the minimum temperatures by the end of the 21st century will be between 28.5°C and 30.7°C year-round, under a high

emission scenario.

Sea surface temperatures above 28°C are generally conducive to deep convection and cyclogenesis. Heavy rainfall events and extremely severe cyclones have already increased since the 1950s and are projected to increase further with increasing ocean temperatures, the authors said.

The increased ocean heat could also lead to a rise in sea level. Thermal expansion of water contributes to more than half of the sea level rise in the Indian Ocean, which is larger than the contribution from glacier and sea-ice melting.

The Indian Ocean Dipole, a phenomenon that affects the monsoon and cyclone formation, is also predicted

to change. The frequency of extreme dipole events is predicted to increase by 66% whereas the frequency of moderate events is to decrease by 52% by the end of the 21st century.

The authors of the study predicted that ocean acidification will intensify, with surface pH decreasing from a pH above 8.1 to below 7.7 by the end of the century. Surface chlorophyll and net primary productivity are also predicted to decline, with the strongest decrease of about 8-10% in the western Arabian Sea.

"The projected changes in pH may be detrimental to the marine ecosystem since many marine organisms, particularly corals and organisms that depend on calcification to build and

maintain their shells, are sensitive to the change in ocean acidity. The change may be easier to fathom when we realise that a 0.1 fall in human blood pH can result in rather profound health consequences and multiple-organ failure," Koll said.

Bordered by 40 countries, and home to a third of the global population, changes to climate in the Indian Ocean region have major societal and economic impacts.

Currently, the Indian Ocean and its surrounding countries stand out globally as the region with the highest risk of natural hazards, with coastal communities vulnerable to weather and climate extremes.