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{ CLIMATE CRISIS } GRIM WARNING

Indian Ocean basin to see accelerated warming, says study

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NEW DELHI: The Indian Ocean basin, the fastest warming basin in the world, will see accelerated warming at a rate of 1.7°C-3.8°C per century during 2020-2100, a new research paper has projected, warning that this will lead to an increase in severe weather events, prolonged marine heatwaves and extreme Indian Ocean Dipole events that will influence the monsoon and cyclone development.

The authors used observed data for the historical period

and the Intergovernmental Panel on Climate Change's simulations under low-to-high emission scenarios to simulate future conditions in the Indian Ocean. Based on the current trajectory of emissions, the ocean will be somewhere between these two scenarios, said Roxy Mathew Koll, climate scientist at the Indian Institute of Tropical Meteorology who led the research.

The worst warming will be in the northwestern Indian Ocean, including the Arabian Sea, while there will be reduced warming off the Sumatra and Java coasts in the south-east

Indian Ocean. Accelerated warming will lead to higher sea surface temperatures (above 28°C), which is generally conducive for 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 heat content of the Indian Ocean, from the surface to 2,000 meters deep, 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 worst warming will be in the northwestern Indian Ocean. AFP

"The future increase in heat content is comparable to adding the energy equivalent of one Hiroshima atomic bomb deto-

nation every second, all day, every day, for a decade," said Koll.

continued on → 9

{ FROM PAGE 1 }

INDIAN OCEAN

Increase in ocean heat content contributes to sea level rise too. 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, said the research chapter published in Elsevier's "The Indian Ocean and its Role in the Global Climate System".

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 set to decrease by 52% by the end of the 21st century. "Extreme IODs (Indian Ocean Dipole) can alter monsoon patterns but we do not have sufficient information on what those changes will be like," added Koll.

Marine heatwaves, periods of extremely high temperatures in the ocean, are expected to increase from 20 days per year to 220-250 days per year. This will push the tropical Indian Ocean into a near-permanent heatwave state, the paper has projected.

Marine heatwaves cause habitat destruction due to coral bleaching, seagrass destruction, and loss of kelp forests, affecting the fisheries sector adversely. They also lead to rapid intensification of cyclones, where a cyclone could intensify from a depression to a severe category in a few hours, the paper said.

Ocean acidification is predicted to intensify, with surface pH decreasing from above 8.1 to below 7.7 by the end of the century. There is growing observational evidence that oxygen concentrations are also declining in the tropical Indian Ocean.

"Accelerated warming and marine heatwaves cause habitat destruction due to coral bleaching, seagrass destruction, and loss of kelp forests, affecting the fisheries sector adversely. They also lead to extreme rains and rapid intensification of cyclones. High ocean temperatures could intensify a cyclone

from a depression to a severe category in a few hours, and our forecasting systems are unable to capture such rapid intensifications," said Koll, adding that "it is crucial to recognise that the impacts of these changes are not distant concerns for our grandchildren and future generations alone. As the current generation, we are already witnessing the repercussions firsthand. Monsoon floods, droughts, cyclones, and heatwaves over both land and ocean are increasingly affecting us."

Thomas Frölicher, scientist, climate and environmental physics, Physics Institute, University of Bern, Switzerland, said, "The Indian Ocean, a climate change hot spot, faces rapid and strong increases in marine heatwave frequency and intensity unless global CO2 emissions are substantially cut."