

Indian Ocean warming at alarming rate: Study

Pune: A study by top research institutes has warned that the Indian Ocean is warming at a staggering pace, with potentially catastrophic consequences, reports **Neha Madaan**.

The findings, from institutes such as Indian Institute of Tropical Meteorology (IITM) Pune, CSIRO Australia, Princeton University, USA, Sorbonne Universités, France and University of Bern, Switzerland, revealed accelerating ocean temperatures in future due to high CO₂ emissions, more extreme weather events and higher sea levels.

“While the Indian Ocean warmed by 1.2°C per century from 1950-2020, our latest research predicts that this rate will skyrocket to 1.7°C-3.8°C per

THE RISE

■ The total heat content of the **Indian Ocean down to 2,000m depth** is now rising by **4.5 zettajoules per decade**

■ This is predicted to surge to **16-22 zettajoules per decade**

■ A zettajoule is an enormous unit of energy, equivalent to approximately **239 billion tonnes of TNT explosive**

century by 2100 under current the CO₂ emission trajectories,” said senior climate scientist Dr Roxy Mathew Koll, who led the study from IITM.

► **Average basin temp...., P 6**



Indian Ocean's average basin temp above 28°C, says study

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Dr Koll said the north-western Arabian Sea was witnessing particularly rapid warming. “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.”

The findings of the study were recently published by Elsevier in its ebook, ‘The Indian Ocean and its Role in the Global Climate System’.

The seasonal cycle of surface temperatures was projected to shift, which might have implications of extreme weather events over the Indo-Pacific region, he said. “While the maximum basin-average temperatures in the Indian Ocean during 1980-2020 remained below 28°C (26°C-28°C) throughout the year under high CO₂ emission simulation scenario, the minimum temperatures by the end of the 21st century will be above 28°C (28.5°C-30.7°C) year around under similar emissions,” Dr Koll said.

“Sea surface temperatures above 28°C are generally conducive for deep convection and cyclones. Heavy rainfall events and extremely severe cyclones have already in-



File pic

People gather to watch sunrise in Kanyakumari

creased since the 1950s and are projected to increase further with increasing ocean temperatures,” he said.

The study suggested that the Indian Ocean is moving to a near-permanent marine heatwave state. “The total heat content down to 2,000m depth is rising by 4.5 zettajoules per decade currently, predicted to surge to 16-22 zettajoules per decade. This thermal expansion accounts for over half of the region’s sea level rise,” Dr Koll said. A zettajoule is an enormous unit of energy, equivalent to approximately 239 billion tonnes of TNT explosive.

Marine heatwaves, defined as periods of extremely high ocean temperatures, were expected to transition from around 20 days per year

currently to a staggering 220-250 days per year, he said.

Ocean acidification was also predicted to intensify as per the study, with surface pH decreasing from a pH above 8.1 to below 7.7 by the end of the century, Dr Koll said. “The projected changes in pH may be detrimental to the marine ecosystem since many marine organisms are sensitive to the change in ocean acidity. The surface chlorophyll and net primary productivity too are predicted to decline in the Indian ocean, with the strongest decrease of about 8-10% in the western Arabian Sea.”

Scientists involved in the study included Saranya J S, Aditi Modi, Anusree Ashok, Wenju Cai, Laure Resplandy, Jerome Vialard and Thomas Frölicher.