

Marine Heatwaves:Arctic Ocean

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Context:

A new study has been published in the journal Nature Communications titled- 'Arctic marine heatwaves forced by greenhouse gases and triggered by abrupt sea-ice melt', which shows that since 2007, unprecedented Marine Heatwave (MHW) events have occurred over the Arctic Ocean.

Background:

1. A MHW is an extreme weather event. It occurs when the surface temperature of a particular region of the sea rises to 3 or 4 degrees Celsius above the average temperature for at least five days.
2. According to the National Oceanic and Atmospheric Administration (NOAA), MHWs can last for weeks, months, or even years.

Key findings/highlights of the study:

1. There have been 11 Marine Heatwaves (MHWs) events in the Arctic from 2007 to 2021, characterized by prolonged high Sea Surface Temperatures (SST). These events coincide with record declines in Arctic Sea ice. In 2022, the Arctic saw severe and extreme marine heatwaves in the Laptev and Beaufort seas from spring to autumn, according to the State of the Global Climate 2022 Report.
2. The perennial sea ice cover over the Arctic Ocean, known to reflect solar radiation, has seen a marked decrease in both summer and winter since the mid-1990s. Since 2007, there has been a pronounced regime shift from a thicker and deformed ice cover to a thinner and more uniform one. The thin ice is less durable and melts more quickly, allowing incoming solar radiation to warm the water's surface.
3. Arctic MHWs primarily occur over marginal seas, including the Kara, Laptev, East Siberian, and Chukchi seas. These regions are characterized by shallow mixed-layer depths and predominantly first-year ice cover, creating conditions conducive to MHW development.
4. Without GHGs, marine heatwaves exceeding 5°C couldn't happen. GHGs are a sufficient cause for moderate marine heatwaves, with a 66-99% probability.
5. There is a pronounced long-term warming trend in the Arctic, with SST increasing at a rate of 1.2°C per decade from 1996 to 2021. Over the last two decades, there has been an increase in the frequency of extreme SST events in the eastern Arctic marginal seas.