

Scientists identify tropical oceans as 'beating heart' of climate change

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(Phys.org) -- The world's oceans are increasingly pumping tropical warm water towards the poles with important consequences for life on Earth, according to a new study.

The tropical regions of the Indian, Pacific and Atlantic Oceans appear to be “acting like a heart”, accumulating heat and then pulsing it in bursts across the planet.

When the [warm water](#) reaches the continental shelves, it peels off in northerly and southerly directions, travelling along the shelf-line towards the poles. According to scientists at Plymouth University's Marine Institute and the National Centre for Scientific Research (CNRS), many of the pulses coincide with El Niño events – and their heat content is increasing in intensity.

The lead author of the report, Professor Philip Reid, of the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) and the Marine Institute, said the global mechanism provided an explanation for the timing and connection of a wide-range of observed hydrographic, ecosystem and cryospheric (frozen ice/snow) events.

He said: “We have described for the first time a globally synchronous pattern of pulsed, short-term (one year) emanations of warm temperatures that pass along continental shelves, from tropical seas to the poles.

“Warm tropical waters appear to be acting like a heart, accumulating heat and energy, and then pumping it in bursts that progressively move toward the poles, a process that seems to be accelerating.”

Reid and research partner Dr Gregory Beaugrand mapped and statistically analysed average temperatures for every two-degree square of latitude and longitude, from 1960 until 2008 for the whole global ocean, with a finer single degree resolution along continental shelves. They found a remarkable degree of symmetry, both north and south of the equator, and very clear spikes in the temperature followed by a period of cooling.

Co-author of the report Dr Beaugrand said: "We found sudden increases in temperatures in 1976, 1987, 1998, and throughout the first decade of the new millennium that coincided with well-documented ecosystem changes."

In the late 1980s for example, the change occurred at the same time as the collapse of the cod fishery off Eastern Canada; while in 1998, there was evidence of a transarctic migration of species from the Pacific to the Atlantic that was enabled by melting sea-ice.

Dr Beaugrand said: “When you compare the timing of these warm sea surface temperature anomalies with the reductions of polar sea-ice in the Arctic and to the west of the Western Antarctic Peninsula, and the melting of ice shelves in Antarctica and Greenland, they coincide to a strong degree.”

In conversation with Prof. Reid, Dr Doug Martinson, of Lamont-Doherty Earth Observatory, USA, described the contrast between the temperature at the bottom of the ice shelves of Western Antarctica and the warm water that is now penetrating from the adjacent shelf edge as “comparable to a dragon blowing flames at the base of the ice”.

Professor Reid concluded: “The discovery of this new mechanism by which heat from the tropics is being moved in this pulsating manner has major and wide-ranging implications for mankind, influencing energy consumption, weather, extreme events, the cryosphere, forest fires, heat waves, droughts and ecosystems.

“If this pattern continues, global temperatures may continue to rise in sudden jumps – and the evidence suggests that the rate of rise is accelerating.”

The report – Global synchrony of an accelerating rise in sea surface temperature – is published in the *Journal of the Marine Biological Association* today.

Provided by University of Plymouth

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