



# Palaeo Proxies

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## Why in News?

Recently, it was proclaimed that a particular day in July 2023 as the Warmest in over **100,000 Years** is scientifically unfounded.

- This claim is based on temperature **estimates from before the invention of thermometers**, which rely on "**Palaeo Proxies**" that cannot provide daily timescale temperatures.

## What are Palaeo Proxies?

- **About:**
  - Palaeo proxies, short for paleoclimate proxies or paleoenvironmental proxies, are indicators or records used by scientists to **reconstruct past climate and environmental conditions**.
  - These proxies are typically derived from **physical, biological, or chemical processes that respond to changes in temperature** or other climatic factors.
  - Since direct measurements of climate from the distant past are not possible, scientists rely on **these proxy records to understand past climate variations** and long-term trends.
- **Examples:**
  - **Ice Cores:** Ice cores drilled from glaciers and polar ice sheets contain **trapped air bubbles and isotopic compositions** that provide information about past atmospheric conditions, including temperature and [Greenhouse Gas](#) concentrations.
  - **Tree Rings:** The width, density, and isotopic composition of tree rings can reveal **past climate variations** and growth conditions of trees, serving as a valuable proxy for temperature and precipitation changes.
  - **Coral Records:** The growth patterns and **Isotopic Compositions of corals offer information about past sea surface temperatures** and ocean conditions.
  - **Pollen Records:** The presence and abundance of specific pollen types preserved in **sediment cores can indicate past vegetation** and climate changes.
- **Limitations:**
  - A major assumption required to make the "paleo proxy" technique workable is that the **processes that produced the proxies have operated similarly back then as they do today**.
  - However, proxies buried in ocean and lake sediments can **only record temperature anomalies on timescales of centuries or thousands of years**, making daily temperature estimations impossible.
  - Temperature proxies provide **only local or regional estimates of historical temperature anomalies** with significant uncertainties.
  - Global estimates based on averaging all local proxies have even higher uncertainties, making claims about **daily temperatures at a global scale unreliable**.

## What are the other Methods to Estimate Temperature over longer Timescales?

- Some isotopes with known radioactive decay rates can provide estimates of temperature changes

over longer timescales like Holocene Epoch.

- The **Holocene Epoch** is a geological times scale that **began approximately 11,650 years ago** and continues to the present day. It is the current and most recent epoch within the **Quaternary Period**.
- Carbon or lead isotopes with half-lives ranging from 5,000 to over 10 million years can be used to estimate past temperatures.
- Nonetheless, these methods are also limited to longer timescales and cannot provide daily temperature data.

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