# CONCEPTS

# Pamir Karakoram Anomaly



- The Pamir–Karakoram Anomaly refers to the **unusual behavior of glaciers** in the parts of Karakoram Range & parts of Pamir Mountain range since the late 1900s, where glaciers have remained stable or even advanced, while most glaciers worldwide are retreating due to global warming.

# Arabian Sea Warm Mini Pool



- A **localized region of high sea surface temperature** .
- Located in the **southeastern Arabian Sea near the Kerala coast**.
- Develops during **April–May**, just before the monsoon onset.
- Though small (few hundred kilometres wide), it has a **significant influence on monsoon dynamics**.

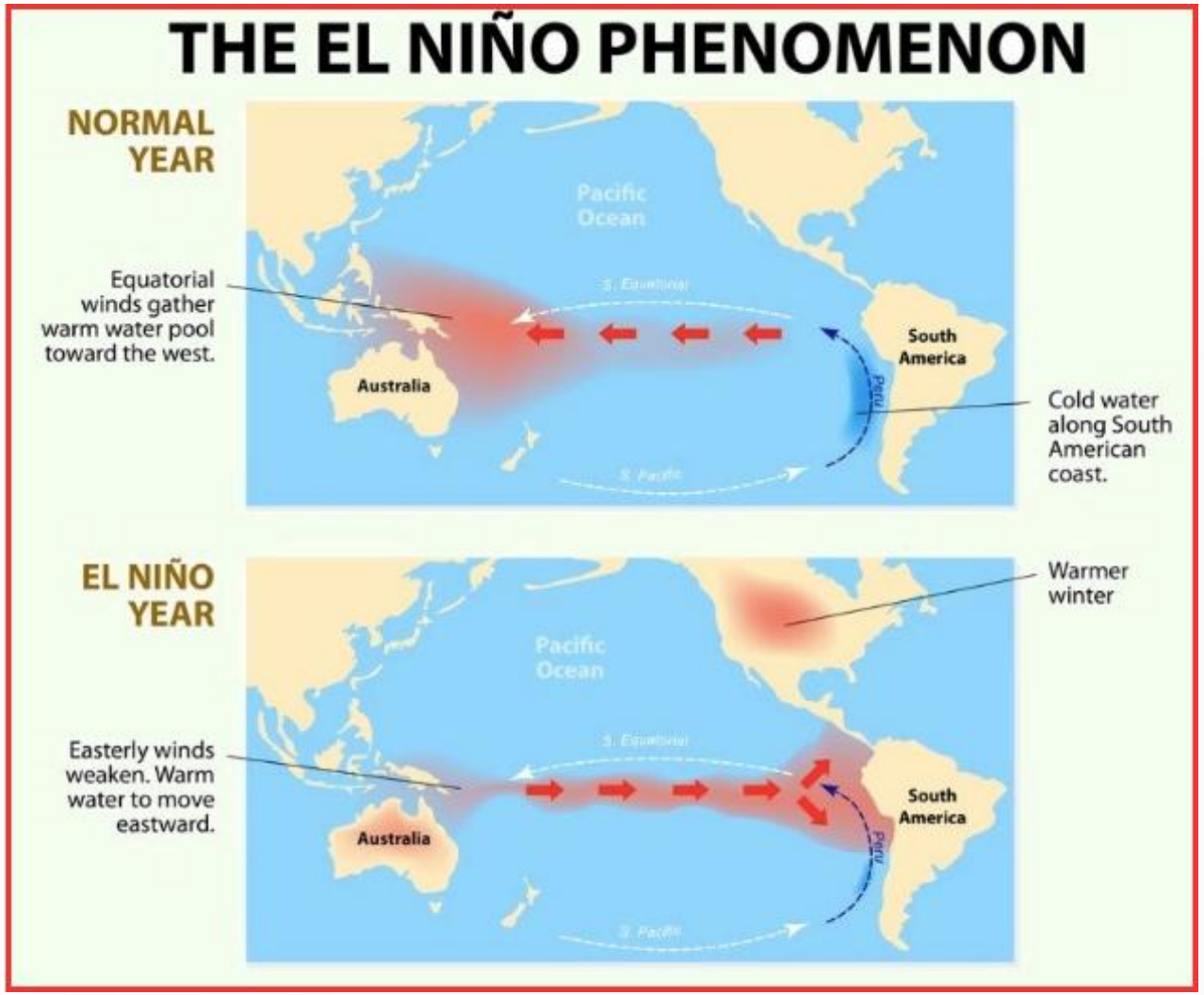
## Key Function

- Generates **strong convection**.
- Helps **pull southwesterly monsoon winds towards Kerala**, aiding the onset of the monsoon.

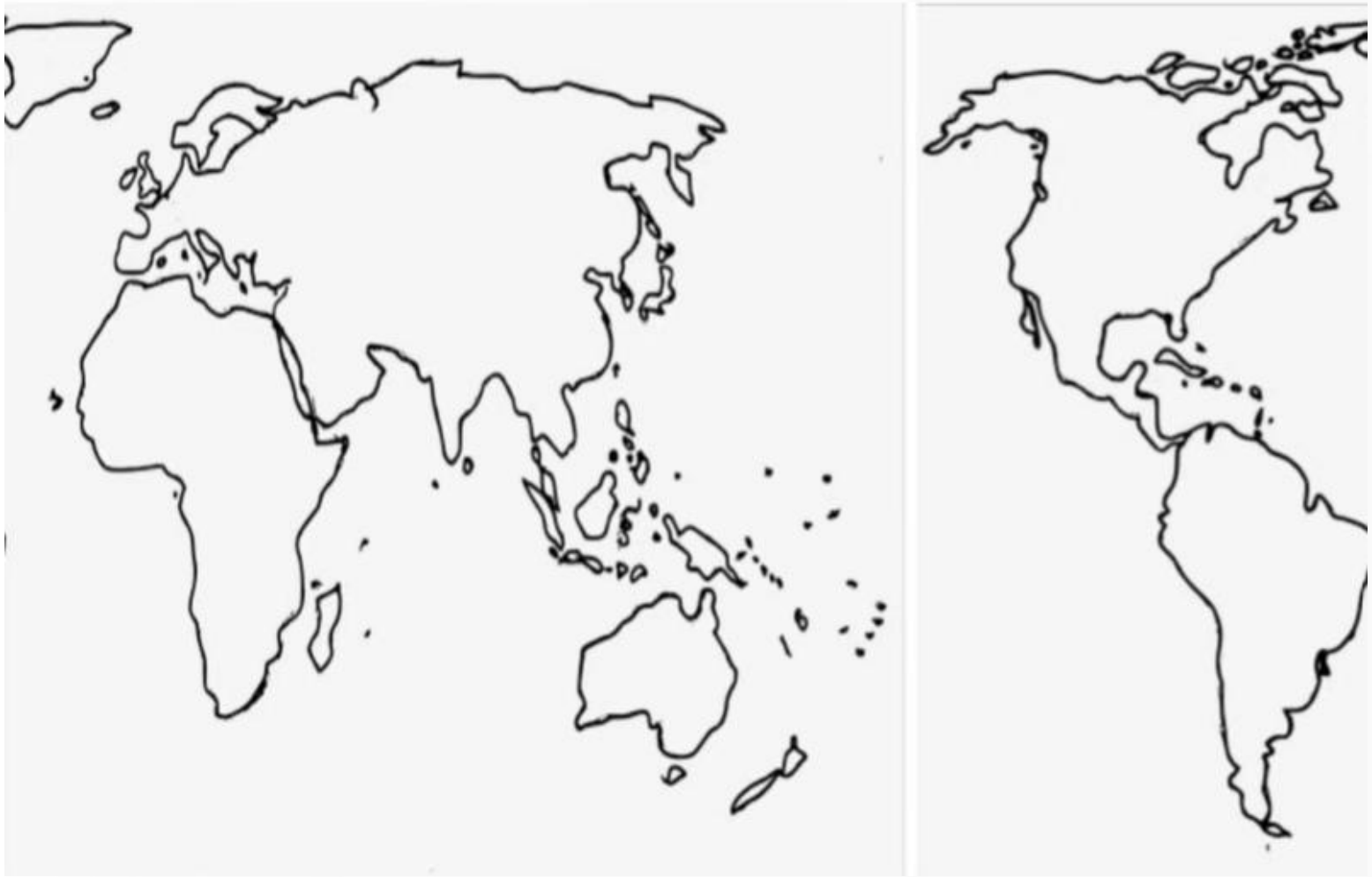
Climate Change

# The Arabian Sea's secret: A warm pool that helps the monsoon resist El Niño's disruption

*Though just a few hundred kilometers in area, the Arabian Sea MWP influences winds, rains, and lives across the Indian subcontinent*



# Indian Context



# Philippines' Kanlaon volcano eruption

# Grey Rhino Event



- "Grey rhino event"—**a highly probable, high-impact disaster that loomed in plain sight but was ignored by policymakers and institutions until it trampled everything in its path.** The phrase, coined by policy analyst Michele Wucker, is used to distinguish foreseeable disasters from so-called "black swans," which are rare and unpredictable.

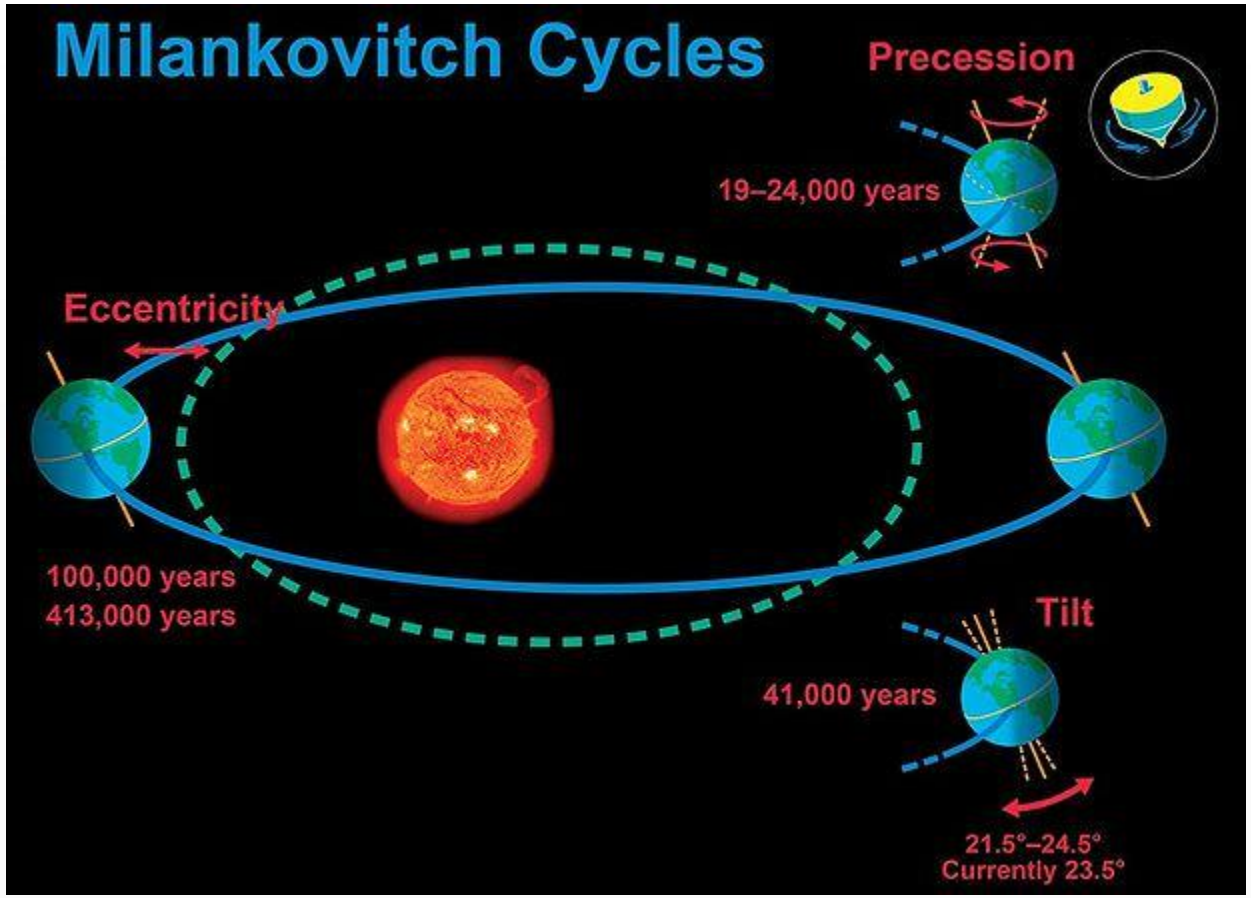
Natural Disasters

# ‘Grey rhino’ in the Western Ghats: Kerala ignored warnings before Wayanad’s deadly landslide, says new report

*Landslide not unavoidable act of nature, but direct consequence of reckless human interference with fragile ecosystems and failure of governments to act on known risks, according to analysis*

# Milankovitch Oscillations

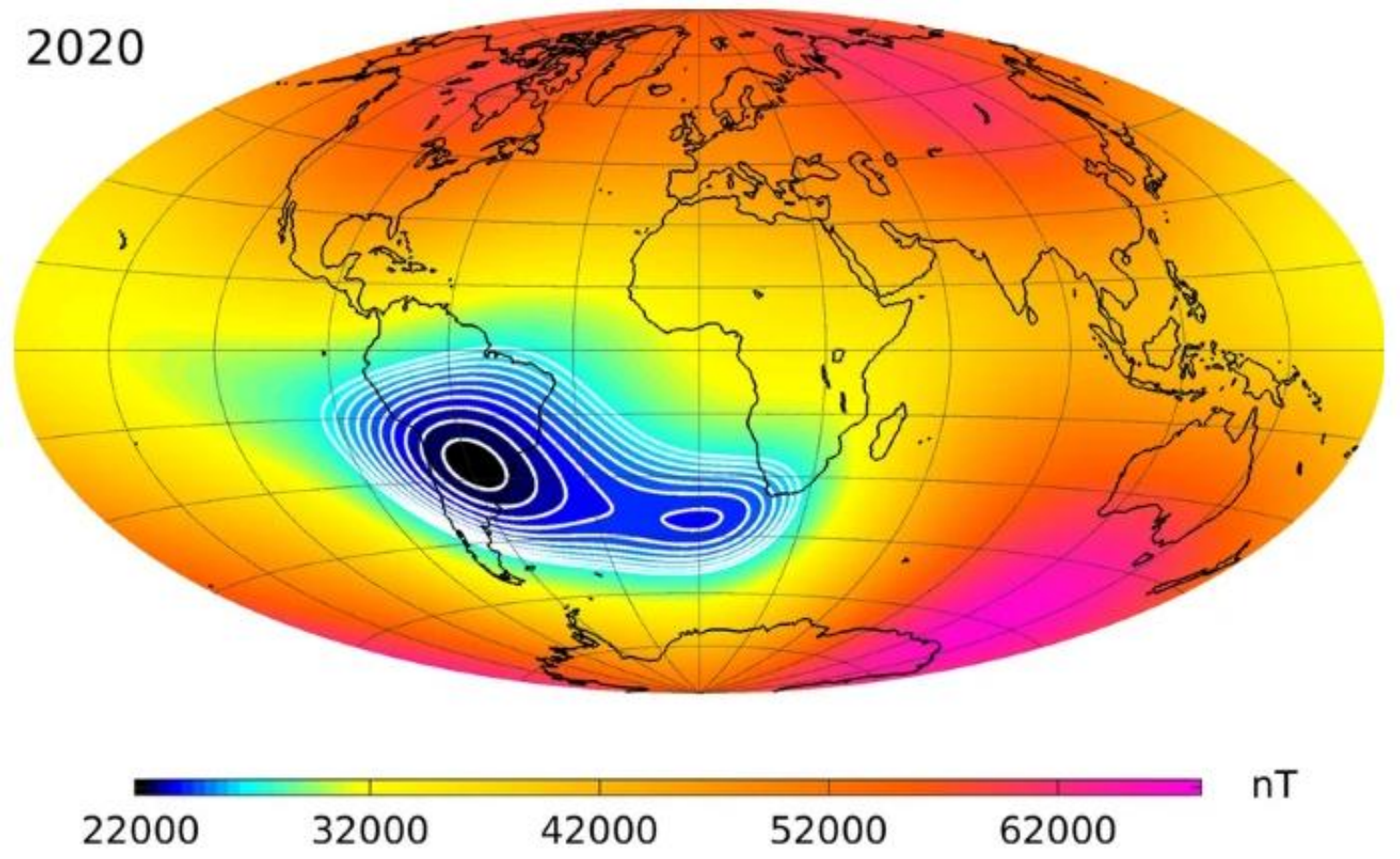
An another astronomical theory is Millankovitch oscillations, which infer cycles in the variations in the earth's orbital characteristics around the sun, the wobbling of the earth and the changes in the earth's axial tilt. All these alter the amount of insolation received from the sun, which in turn, might have a bearing on the climate.



# South Atlantic Anomaly



- South Atlantic Anomaly is a region where **the intensity of the magnetic field is particularly low.**
- Researchers analysed data from the European Space Agency's 'Swarm' mission and recently reported **that the South Atlantic Anomaly, the region of weakest intensity in the earth's magnetic field, has expanded since 2014**.
- The field has weak spots because the molten iron and nickel circulating in the earth's outer core don't move uniformly.
- Weak regions can expand, shrink or migrate over decades without threatening the planet's overall magnetic shield or indicating a magnetic reversal.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52000
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# Role of Melting Ice and Volcanic Eruption



- Usually, the **weight of the ice exerts pressure on underground magma chambers of volcanoes**.(Sub glaciated Volcanoes)
- However, **when glaciers or ice caps melt, this pressure is reduced**, and **underground gases and magma expand which can ultimately result in explosive eruptions**.
- Precipitation — also modified by climate change **— can infiltrate deep underground and react with the magma system to trigger an eruption.**

# How melting glaciers can lead to more volcanic eruptions

Sustained volcanic eruptions can release large amounts of greenhouse gases, including carbon dioxide and methane, which could further heat the planet

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# Hawaii's Kilauea Volcano

# True Polar Wanderer



- New research has revealed that humans have built so many dams that the Earth's poles have shifted slightly. According to research, nearly 7,000 dams have been built globally, storing enough water to move the Earth's poles approximately 1 metre (3 feet) due to mass redistribution.

- The phenomenon is known as true polar wander, where Earth's surface shifts over its inner magnetic north due to changes in mass distribution.

# True Polar Wanderer



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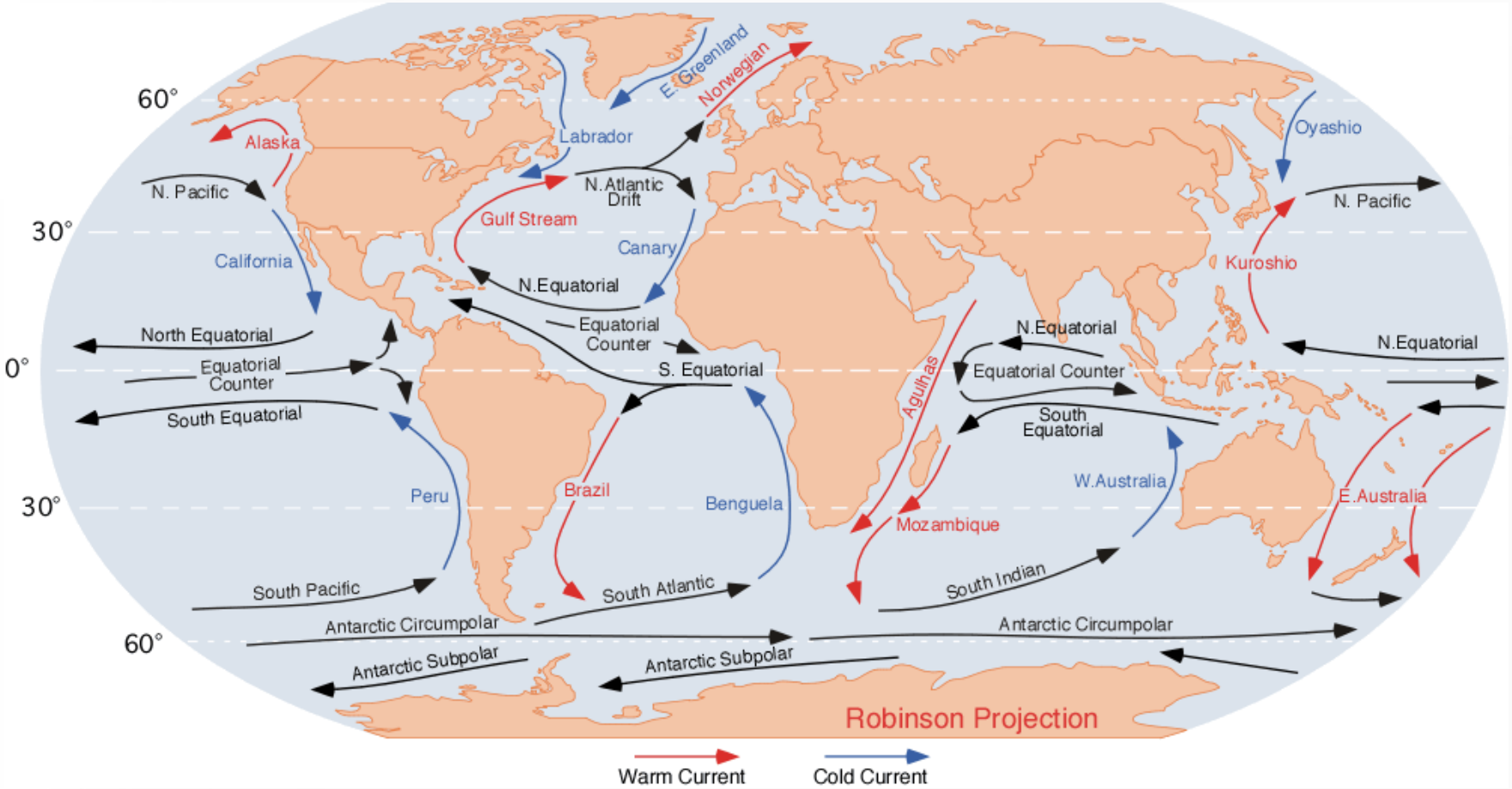
# Antarctic Circumpolar Current


A ship sails alongside a large iceberg in Ilulissat, Greenland.

The **Antarctic Circumpolar Current** (ACC), the world's strongest ocean current, is slowing down due to **climate change**, according to a study by the **University of Melbourne** published in Environmental Research Letters. Researchers found that the current could slow by about 20% by 2050 under a high carbon emissions scenario, which may have serious consequences, including **sea level rise** and ocean warming.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Labrador
E. Greenland
Norwegian
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Equatorial Counter
S. Equatorial
North Equatorial
Equatorial Counter
South Equatorial
Peru
Brazil
Benguela
South Pacific
South Atlantic
Antarctic Circumpolar
Antarctic Subpolar
Oyashio
N. Pacific
Kuroshio
N.Equatorial
Equatorial Counter
South Equatorial
Aguilhas
Mozambique
W.Australia
E.Australia
South Indian
Antarctic Circumpolar
Antarctic Subpolar
Robinson Projection
Warm Current
Cold Current

# Antarctic Circumpolar Current



**Melting Ice Sheets Affecting Ocean Circulation**

Researchers noted that melting ice shelves are a major factor in this slowdown. "The melting ice sheets dump vast quantities of fresh water into the salty ocean. This sudden change in ocean 'salinity' has a series of consequences—including the weakening of the sinking of surface ocean water to the deep (called the Antarctic Bottom Water), and, based on this study, a weakening of the strong ocean jet that surrounds Antarctica," Gayen explained.

# Antarctic Circumpolar Current



**Impact on Climate and Carbon Absorption**

The ACC, which moves clockwise around Antarctica, plays a key role in regulating global climate. It influences the ocean's ability to absorb heat and carbon dioxide and prevents warm waters from reaching Antarctica. Lead researcher Expert feels that if this current 'engine' breaks down, there could be severe consequences, including more climate variability, with greater extremes in certain regions, and accelerated **global warming** due to a reduction in the ocean's capacity to act as a **carbon sink**."

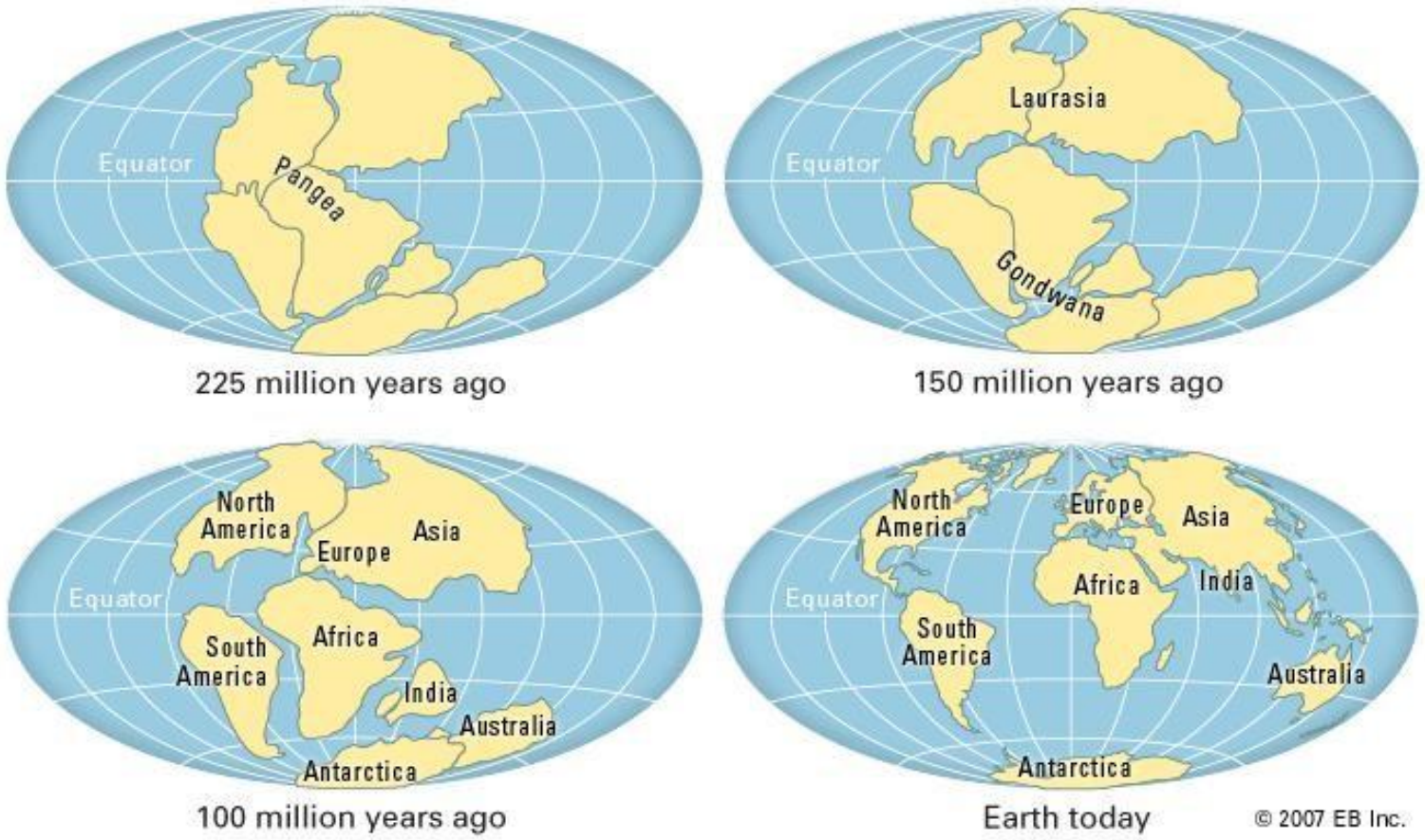
**Threat to Antarctic Ecosystem**

The study also highlights the potential for invasive species to reach Antarctica as the ACC slows. Currently, the current acts as a barrier preventing species like southern bull kelp, shrimp, and mollusks from reaching the continent. If these species establish themselves in Antarctica, they could disrupt the food web, potentially affecting the feeding patterns of native species such as penguins.

# Davis Strait proto Microcontinent



- **New Microcontinent Discovered Between Greenland And Canada**
- A **hidden landmass** has been found beneath the icy waters of the **Davis Strait**, the body of water that separates Canada's Baffin Island from Greenland. **The discovery was made by a team of scientists from the UK and Sweden during a study of the ocean floor in the region.** T
- he landmass is now named the Davis Strait proto-microcontinent. It is made up of unusually thick continental crust and measures between 12 and 15 miles (around 19 to 24 kilometres).
- It lies submerged beneath Greenland's western offshore waters and has been identified as a **primitive microcontinent which is an ancient fragment of crust that never fully separated when Greenland and North America drifted apart**.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India
Australia
Antarctica
100 million years ago
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Asia
Africa
India
South America
Australia
Antarctica
Earth today
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# Mount Lewotobi Laki-laki

# Ministry of Mines classifies Barytes, Felspar, Mica and Quartz as Major Minerals

Posted On: 21 FEB 2025 1:14PM by PIB Delhi

The Ministry of Mines vide gazette notification dated 20th February, 2025 has shifted minerals Barytes, Felspar, Mica and Quartz from the list of minor minerals to the category of major minerals.

This move follows the recent approval of the National Critical Mineral Mission by the Union Cabinet on 29th January, 2025. The Mission envisages exploration and mining of critical minerals within the country including recovery of these minerals from mines of other minerals, overburden and tailings.

Quartz, Felspar and Mica are found in pegmatite rocks, which are an important source of many critical minerals such as Beryl, Lithium, Niobium, Tantalum, Molybdenum, Tin, Titanium, Tungsten, etc. These minerals have vital role in various new technologies, in energy transition, spacecraft industries, healthcare sector, etc. When the leases of Quartz, Felspar and Mica are granted as minor mineral leases, the lease holders do not declare existence of critical minerals or extract the critical minerals associated with it such as Lithium, Beryl, etc. as their primary objective is to use these minerals as minor minerals for construction, glass / ceramic making, etc. Consequently, the critical minerals associated with these minerals are neither getting extracted nor reported.

Similarly, Baryte has various industrial applications which is used for oil and gas drilling, electronics, TV screens, rubber, glass, ceramics, paint, radiation shielding and medical applications. Baryte is used to make high density concrete to block x-ray emissions in hospitals, power plants, and laboratories. Baryte often occurs as concretions and vein fillings in limestone and dolostone. It is found in association with ores of Antimony, Cobalt, Copper, Lead, Manganese and Silver. Baryte with iron ore occurs in pocket type of deposit which cannot be mined in isolation. While mining either of the minerals, the production of associated mineral is inevitable.

In view of the importance of these minerals, the Inter-Ministerial Committee on Mines & Minerals Sector constituted under the chairmanship of Dr. V. K. Saraswat, Member NITI Aayog, recommended that these minerals be shifted from the list of minor minerals to the category of major minerals. Once categorised as major minerals, there would be an increase in exploration and scientific mining of these minerals which are an important source of many critical minerals.

Reclassification of minerals Barytes, Felspar, Mica and Quartz will not adversely affect the lease period of the existing leases. As major minerals, the leases for these minerals will get extended to a period of 50 years from the date of grant or till the completion of renewal period, if any, whichever is later as per section 8A of the MMDR Act, 1957.These mines will gradually register with the Indian Bureau of Mines and will be regulated as major minerals. A transition time of four months, that is, up to 30th June, 2025 has been provided. The revenue from mines of these minerals will continue to accrue to the State Government as earlier.

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# Reclassification of Major Minerals

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- Quartz, Felspar and Mica are found in pegmatite rocks, which are an important source of many critical minerals such as Beryl, Lithium, Niobium, Tantalum, Molybdenum, Tin, Titanium, Tungsten, etc.
- These minerals have vital role in various new technologies, in energy transition, spacecraft industries, healthcare sector, etc.

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