

## Landslide Induced Earthquake in Greenland

**Source: TH** 

### Why in News?

Recently, scientists detected unusual <u>seismic waves</u> around the world caused due to <u>landslides</u> in Greenland that lasted nine days.

- Unlike typical earthquake signals (P and S waves), these waves exhibited a single frequency, suggesting a non-seismic origin.
- Seismologists initially labelled the phenomenon as a "USO" (Unidentified Seismic Object) due to its mysterious nature.

### What are the Key Facts About this Landslide-Induced Earthquake?

- Origin: By analysing seismic data, satellite images, water level monitors, and simulations, scientists discovered that a large landslide in <u>Dickson Fjord</u>, <u>Greenland</u>, triggered the event.
  - The collapse of Hvide Stovhorn peak led to a rock-ice avalanche, triggering a submarine landslide.
- Seiche Effect in the Fjord: In the confined fjord, waves bounce between its walls, creating a phenomenon known as a "seiche."
  - This **back-and-forth sloshing** persisted for over nine days, with **waves oscillating** every 90 seconds.
- Tsunami: The earthquake gave rise to a 200-metre-high mega-tsunami at an isolated place in the Arctic Ocean region. It didn't kill anyone but it damaged an unstaffed research facility on the island of Ella.
- Global Reverberations: The seiche waves sent seismic signals across the globe causing Earth's surface to vibrate.
  - This prolonged reverberation was detected on seismometers from the Arctic to Antarctica.
- Link to Climate Change: The landslide occurred because the glacier at the fjord's foot melted
  and retreated due to global warming, leaving the rocky slope unsupported and causing it to
  collapse.
  - It underscores the impact of <u>climate change</u> in polar regions, where warming accelerates ice melt, destabilising landscapes.

# EARTHQUAKE **ABOUT**

Shaking of the earth; caused due to release of energy, generating seismic waves in all directions

### **EARTHQUAKE WAVES**

- Body Waves: Move in all directions travelling through the body of the earth
  - OP Waves: Move faster, First to arrive at surface, Similar to sound waves, Travel through gaseous, liquid and solid materials
  - S Waves: Arrive at surface with some time lag, Travel only through solid materials
- Surface Waves: Last to report on seismographs, More destructive, Cause displacement of rocks
  - Love Waves: Same motion as S-waves (horizontal) without vertical displacement, Sideways motion perpendicular to the direction of propagation, Faster than Rayleigh waves
  - Rayleigh Waves: Cause the ground to shake in an elliptical pattern, Spread out the most of all seismic waves, Move vertically and horizontally in a vertical plane

### CAUSES OF EARTHQUAKES

- Release of energy along a Fault/Fault Zones (break in the crustal rocks)
- Movement of tectonic plates (most common)
- Volcanic eruption (stress changes in rockinjection/withdrawal of magma)
- Human activities (mining, explosion of chemical/nuclear devices etc.)

### MEASURING EARTHQUAKE

- Seismometers Megsures seismic waves
- Richter Scale Measures magnitude (energy released; range: 0-10)
- Mercalli Measures intensity (visible damage; range: 1-12)

### DISTRIBUTION

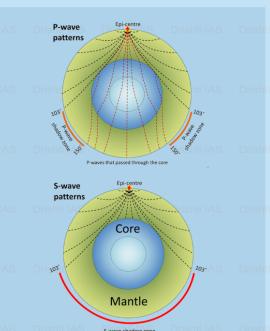
- Circum-Pacific Belt 81% of earthquakes
- Alpide Earthquake Belt 17% of the largest earthquakes
- Mid-Atlantic Ridge Mostly submerged underwater



### **HYPOCENTER**

Location where the earthquake starts (below earth's surface)

Location right above the Hypocenter (on the earth's surface)



### **EARTHQUAKE IN INDIA**

- India is one of the highly earthquake affected countries due to the presence of technically active mountains - the Himalayas.
- India has been divided into 4 seismic zones (II, III, IV, and V)





### What are Fjords?

- About: Fjords are elongated, deep, narrow steep-sided inlets of the sea that extend far
  inland and are formed due to the inundation of a glaciated valley.
  - Fjords are found in **mountainous areas** of both the **Northern and Southern Hemispheres,** particularly in the **higher latitudes** (up to about 800).
- **Formation of Fjords:** Fjords were formed during the **last Ice Age** by glaciers. As glaciers moved slowly, they carved out **deep valleys**, leading to the creation of fjords.
  - Fjords are deepest inland because the glacier's force was strongest there during glaciation.

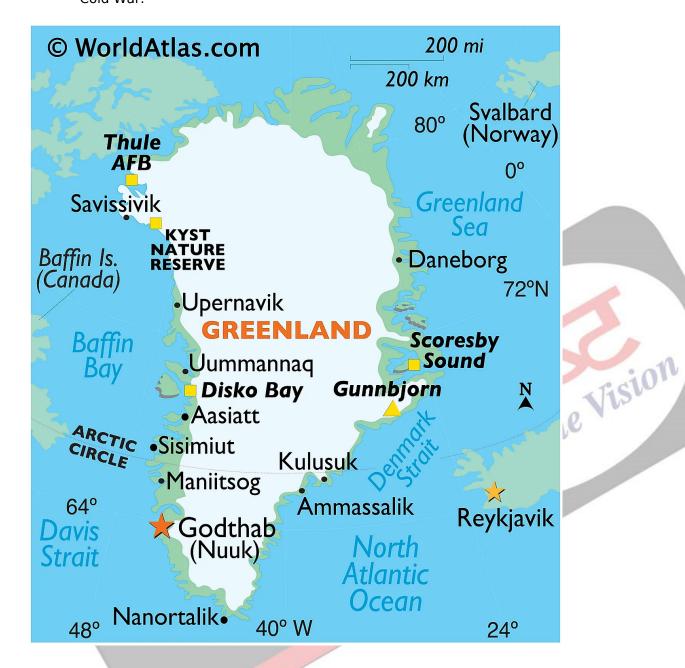
# Glacial valley & Fjord formation

- Geographic Distribution of Fjords: Fjords are primarily found in Norway, Chile, New Zealand, Canada, Greenland, and Alaska.
- Coral Reefs in Fjords: Some fjords, particularly in Norway, host deep cold-water coral reefs, which support various marine species like fish, plankton, and sea anemones.
  - These cold-water reefs thrive in **complete darkness and under extreme pressure**, unlike their tropical counterparts.
- Skerries (Rocky Islands): Skerries are small rocky islands found around fjords, formed by glaciation. They are common along the Scandinavian coastline.
- **Fjords as Calm Harbours:** Despite the rocky islands or skerries that can make navigation difficult, fjords are generally **calm and protected.** This makes them **ideal harbours** for ships due to their tranquil waters.

### Greenland

- Largest Island: Greenland is recognised as the world's largest island and functions as an autonomous Denmark territory.
  - Geographically, it is a part of the North American continent.

- Climate: Greenland experiences perpetual daylight for two months each year due to its high latitude.
- Strategic Importance: The United States established a radar base at Thule at the start of the Cold War.



### **UPSC Civil Services Examination, Previous Year Question (PYQ)**

### Prelims

- Q. With reference to the water on the planet Earth, consider the following statements: (2021)
  - 1. The amount of water in the rivers and lakes is more than the amount of groundwater.
  - 2. The amount of water in polar ice caps and glaciers is more than the amount of groundwater.

Which of the statements given above is/are correct?

(a) 1 only **(b)** 2 only (c) Both 1 and 2 (d) Neither 1 nor 2 Ans: (b) Q.Which of the following phenomena might have influenced the evolution of organisms? (2014)1. Continental drift 2. Glacial cycles Select the correct answer using the code given below: (a) 1 only **(b)** 2 only (c) Both 1 and 2 (d) Neither 1 nor 2 Ans: (c) PDF Refernece URL: https://www.drishtiias.com/printpdf/landslide-induced-earthquake-in-greenland