



Landslide Induced Earthquake in Greenland

[Source: TH](#)

Why in News?

Recently, scientists detected unusual [seismic waves](#) around the world caused due to [landslides](#) 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 [Dickson Fjord, Greenland](#), 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 [climate change 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**

HYPOCENTER

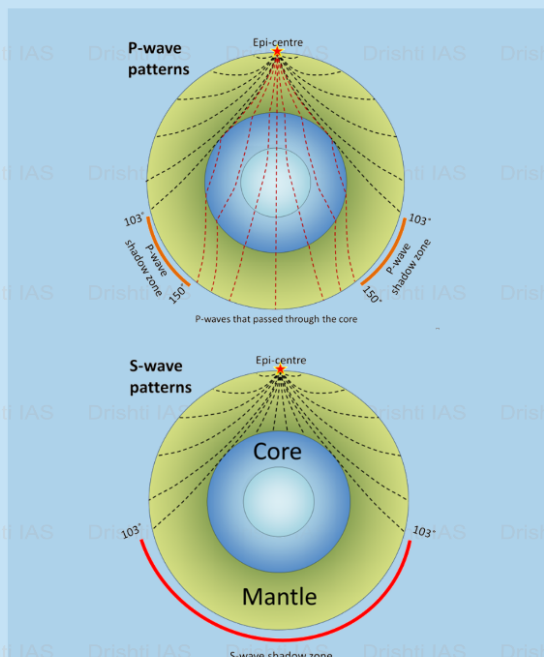
- Location where the earthquake starts (below earth's surface)

EPICENTER

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

EARTHQUAKE WAVES

- Body Waves:** Move in all directions travelling through the body of the earth
 - P 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 rock-injection/withdrawal of magma)
- Human activities** (mining, explosion of chemical/nuclear devices etc.)

MEASURING EARTHQUAKE

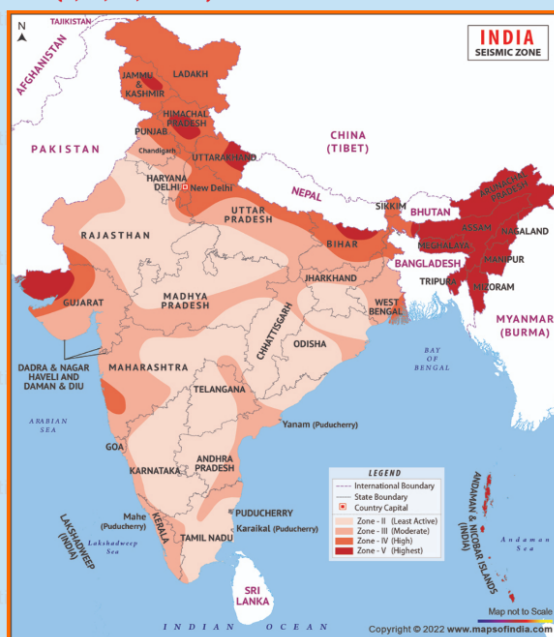
- Seismometers** - Measures seismic waves
- Richter Scale** - Measures magnitude (energy released; range: 0-10)
- Mercalli** - Measures intensity (visible damage; range: 1-12)

DISTRIBUTION

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

EARTHQUAKE IN INDIA

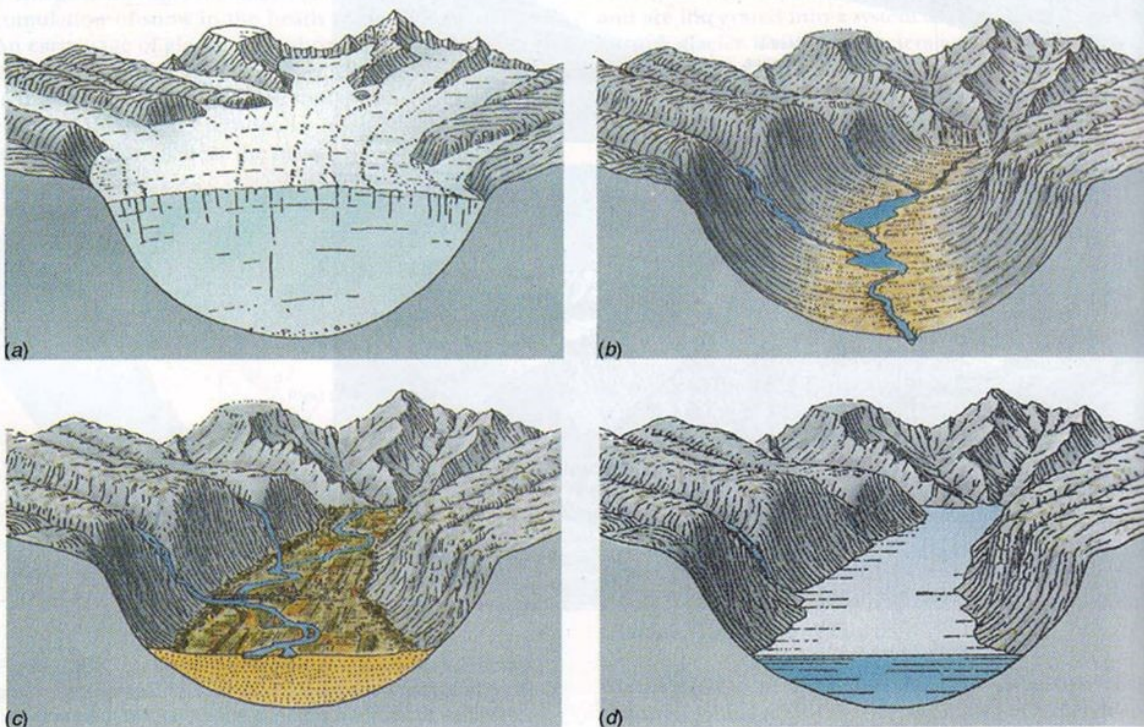
- India is **one of the highly earthquake affected countries** due to the presence of technically active mountains - the Himalayas.
- India has been divided into **4 seismic zones (II, III, IV, and V)**



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 80°).
- **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 Reference URL: <https://www.drishtiias.com/printpdf/landslide-induced-earthquake-in-greenland>