

GREENLAND ICE SHEET MELTING: GEOGRAPHY

NEWS: *How glacier ice algae accelerate Greenland ice sheet melting*

WHAT'S IN THE NEWS?

Impact of Dark-Pigmented Microalgae on the Greenland Ice Sheet Melting Context

- A **new study** has discovered that **dark-pigmented microalgae** growing on the **Greenland Ice Sheet** are **accelerating its melting**.
- These algae are **highly efficient in nutrient uptake**, allowing them to **rapidly colonize** newly exposed ice surfaces, intensifying **ice sheet darkening and melting rates**.

Key Findings of the Study

1. Nutrient Efficiency of Microalgae

- **Advanced single-cell imaging techniques** were used to analyze the **carbon, nitrogen, and phosphorus content** of these glacier ice algae.
- The study found that **these algae can survive in extremely nutrient-poor environments** by:
 - **Storing phosphorus internally**, allowing them to **persist in low-nutrient glacier conditions**.
 - **Maintaining high carbon-to-nutrient ratios**, which enhances their survival and adaptation to extreme conditions.
- This indicates that the algae have evolved a **highly efficient survival strategy**, allowing them to thrive in one of the most **hostile environments on Earth**.

2. Self-Sufficiency in Nutrient Uptake

- Unlike many other organisms, these algae **do not require large amounts of external nutrients** to grow.
- This **self-sufficiency allows them to spread rapidly**, particularly as **more bare ice is exposed** due to melting.
- Since they do not rely on external nutrient input, they can **continuously expand their colonization** as ice sheets melt, further **accelerating the melting process**.

3. Impact on Ice Sheet Melting

- The **dark pigmentation of these microalgae reduces the reflectivity (albedo) of the ice**, causing it to absorb more heat.
- Increased heat absorption **leads to faster melting**, creating a **positive feedback loop** where:
 - **More ice melts** → **More bare ice is exposed** → **More microalgae grow** → **More heat is absorbed** → **Even more melting occurs**.
- This process **significantly contributes to global sea-level rise** by accelerating the **rate of ice loss from Greenland**.



Greenland Ice Sheet: An Overview

1. Geographic Significance

- The **Greenland Ice Sheet** is the **largest glacier in the Northern Hemisphere**, covering **80% of Greenland**.
- It is the **second-largest ice sheet in the world** (after Antarctica) and spans **1.7 million square kilometers**.

2. Contribution to Global Sea Level Rise

- The melting of the Greenland Ice Sheet is **the largest contributor of freshwater to rising global sea levels**.
- Scientists estimate that if the **entire Greenland Ice Sheet melted**, it could lead to a **7-meter rise in global sea levels**, causing:
 - **Submergence of coastal cities and islands.**
 - **Increased coastal erosion and stronger storm surges.**
 - **Disruptions to ocean currents and global climate patterns.**

Implications of the Study

- **Reinforces the urgency of climate action** as rising global temperatures **accelerate ice sheet melting**.

- **Highlights the role of biological factors (microalgae) in climate change**, beyond just atmospheric and oceanic warming.
- Calls for **further research into controlling microalgae growth**, potentially slowing down ice loss.
- Demonstrates **how small ecological changes can have large-scale environmental impacts**.

This study underlines how biological processes, combined with climate change, **exacerbate environmental challenges** and emphasizes the need for **global efforts to combat glacial melting and rising sea levels**.

Source: <https://www.thehindu.com/sci-tech/how-glacier-ice-algae-accelerate-greenland-ice-sheet-melting/article69247457.ece#:~:text=Premium,-Published%20%2D%20February%202022&text=A%20new%20study%20reveals%20that,expanding%20areas%20of%20exposed%20ice>.