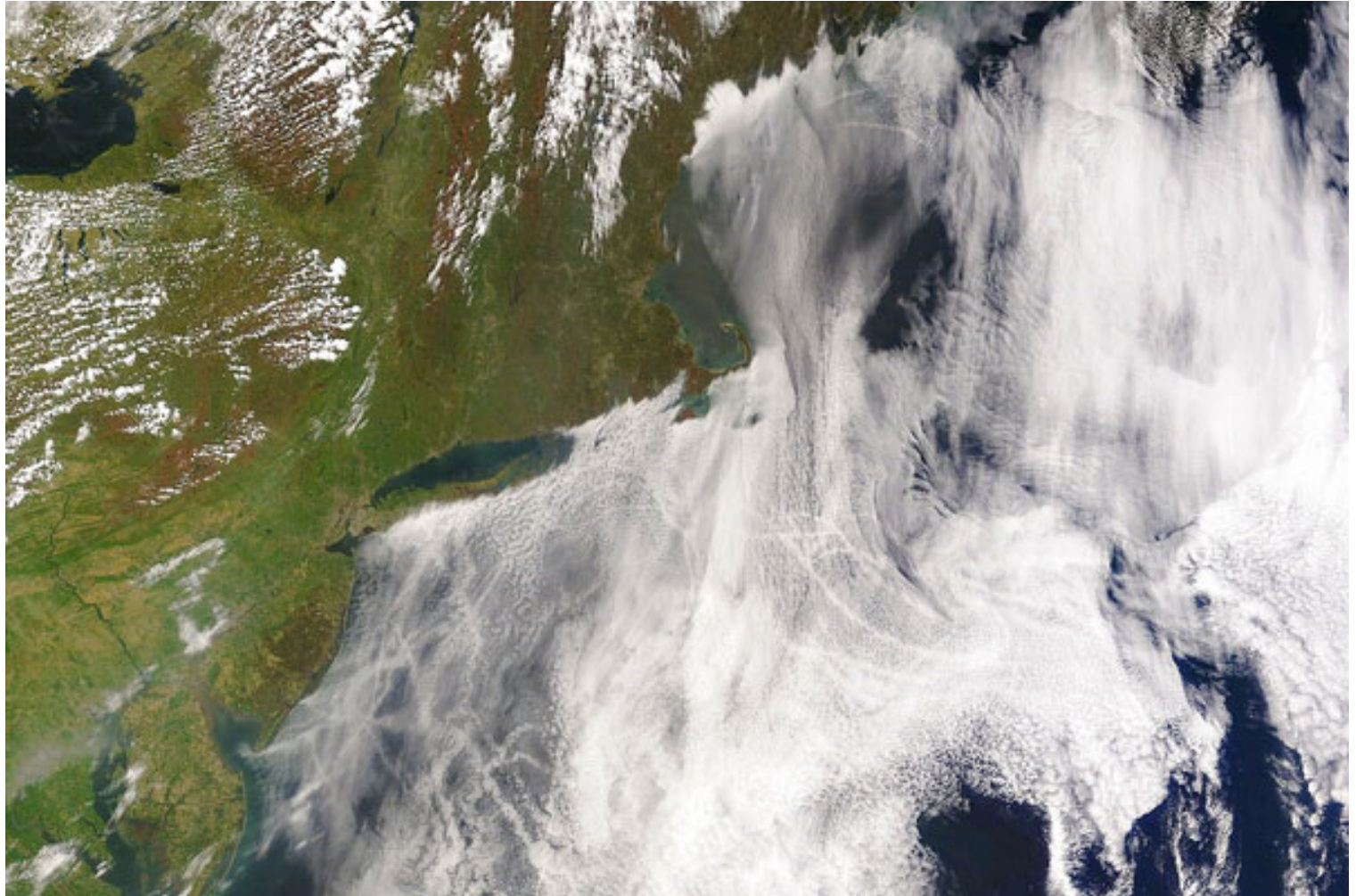


## Marine Cloud Brightening (MCB)

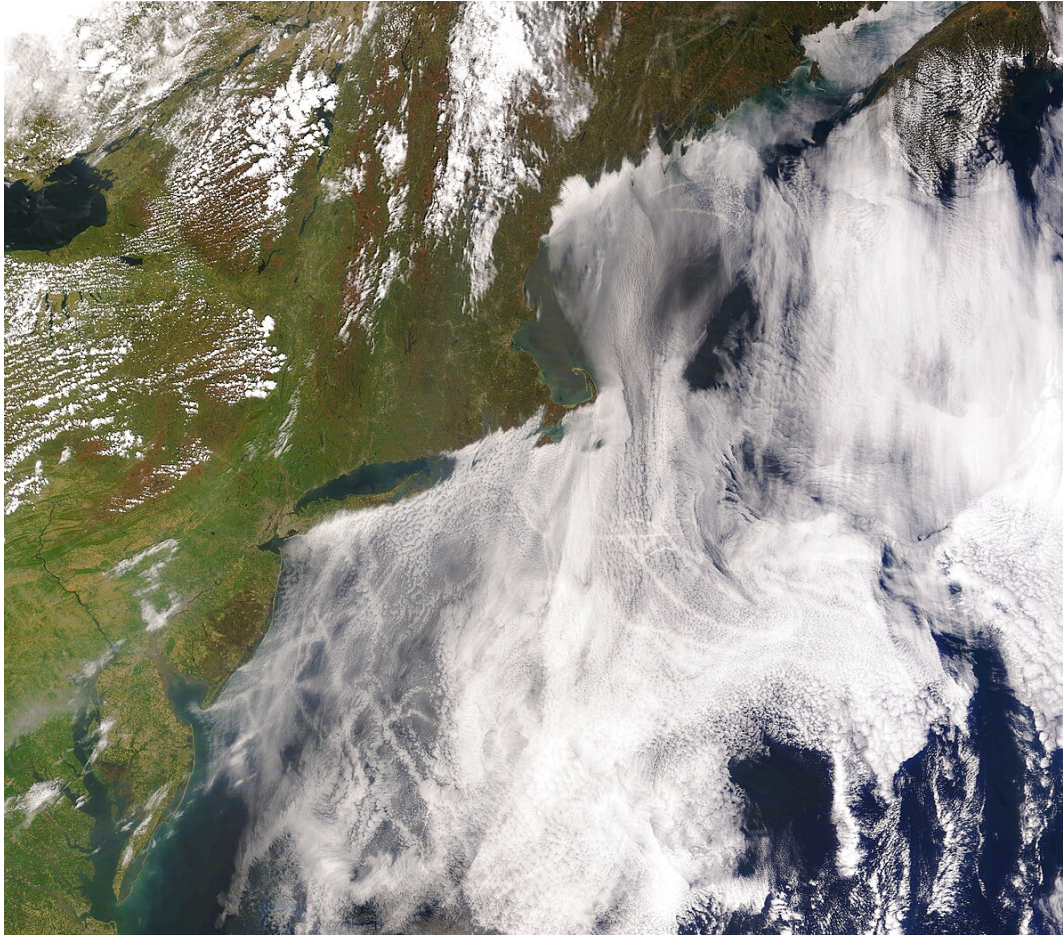
By IASToppers | 2024-04-23 15:40:00



### Marine Cloud Brightening (MCB)

Scientists are exploring a novel geoengineering technique called Marine Cloud Brightening (MCB), which is being researched by the Department of Atmospheric Sciences, University of Washington, USA, to counteract global warming.





[ref- wikipedia]

### **What is MCB?**

- MCB is a **geoengineering concept** aimed at **cooling the planet** by **increasing the reflectivity of clouds over the ocean**.
- This technique involves **spraying fine particles**, typically **sea salt**, into **low-lying marine clouds**.
- The **particles increase the clouds' albedo** (reflectivity) by creating more **cloud condensation nuclei**, which leads to **smaller and more numerous cloud droplets**.
- These **denser and whiter clouds reflect more sunlight back into space**, thereby reducing the amount of solar energy reaching the Earth's surface and potentially **cooling the planet**.

### **What is Geoengineering?**

- Geoengineering, also known as **climate engineering**, refers to the deliberate **large-scale intervention in the Earth's climate system**, with the aim of **combating or mitigating climate change**.
- The concept is based on **technological and scientific methods** intended to **directly alter the Earth's environment**, particularly to **reduce the effects of global warming** caused by **greenhouse gases**.

**Types of Geoengineering:**

[ref- britannica]

- **Solar Radiation Management (SRM):** Solar Radiation Management involves techniques aimed at **reflecting** a small percentage of the **sun's light and heat back into space** to reduce the **Earth's average temperature**. The main methods include:
  - **Marine Cloud Brightening:** Enhancing the **reflectivity of clouds** over the oceans by spraying sea salt particles into the atmosphere.
  - **Stratospheric Aerosol Injection:** Emulating volcanic eruptions by injecting sulfur dioxide or other reflective particles into the stratosphere to reflect sunlight away from Earth.
  - **Space-based Reflectors:** Proposing the placement of mirrors or other reflective objects in space to deflect sunlight.
  - **High-albedo Crops and Buildings:** Modifying the surfaces of roofs, pavements, and crops to reflect more sunlight.
  - **Earth Radiation Management (ERM):** Allowing heat to escape into space to offset the negative effects of climate change by **thinning cirrus clouds**.
- **Carbon Dioxide Removal (CDR):** Carbon Dioxide Removal focuses on techniques that reduce the atmospheric concentration of CO<sub>2</sub> by **removing CO<sub>2</sub> from the atmosphere and storing it**. The primary techniques include:
  - **Ocean Fertilization:** Adding nutrients like iron or phosphorus to the ocean to boost phytoplankton growth, which absorbs CO<sub>2</sub> through photosynthesis.
  - **Afforestation and Reforestation:** Planting new forests and restoring old ones to absorb CO<sub>2</sub> through photosynthesis.
  - **Bioenergy with Carbon Capture and Storage (BECCS):** Combining biomass energy generation with carbon capture and storage technologies.
  - **Direct Air Capture (DAC):** Using chemical solutions to directly absorb CO<sub>2</sub> from the ambient air and subsequently sequester it.

#### Concerns associated with Geoengineering:

- **Unintended Consequences:** Large-scale alterations may lead to unforeseen and harmful impacts

on weather, ecosystems, and agriculture.

- **Ethical and Governance Issues:** Geoengineering raises questions about **decision-making, risk distribution, and equity**, with concerns over **who decides and who bears the consequences**.
- **Moral Hazard:** Depending on geoengineering could **reduce efforts to cut emissions**, diverting attention from necessary climate action.
- **Geo-Political Tensions:** Implementing geoengineering could spark **conflicts over control, access, and liability** among nations with differing interests.
- **Long-term Impacts and Irreversibility:** Geoengineering interventions may have **irreversible effects on the planet's systems**, with **consequences for future generations**.
- **Uncertainty and Risk:** The effectiveness and **side effects of geoengineering methods are uncertain**, posing risks to climate, ecosystems, and societies.
- **Social Acceptance and Perception:** Public skepticism and concerns about large-scale manipulation of nature raise questions about governance, trust, and social acceptance of geoengineering.