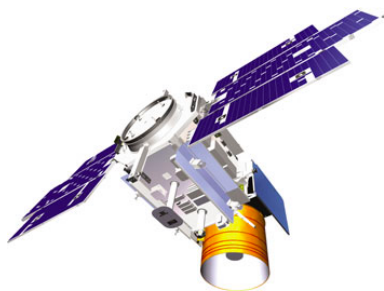


16 Years of Ice Loss from Greenland and Antarctica: A Comparison Activity

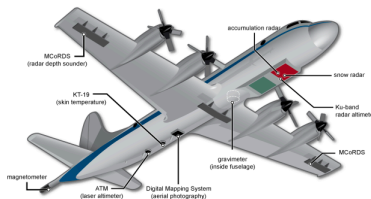


Background:

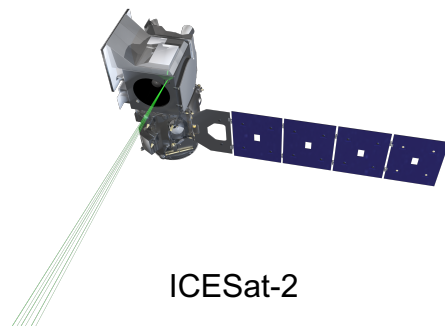
Since 2003, the ICESat Mission (2003-2009), Operation IceBridge Airborne Campaign (2009-2020), and ICESat-2 Mission (2018-present) have provided continuous height data on the ice sheets (land ice), of Greenland and Antarctica. This research allows for scientists and researchers to see just how much has been lost from these massive ice sheets.



ICESat

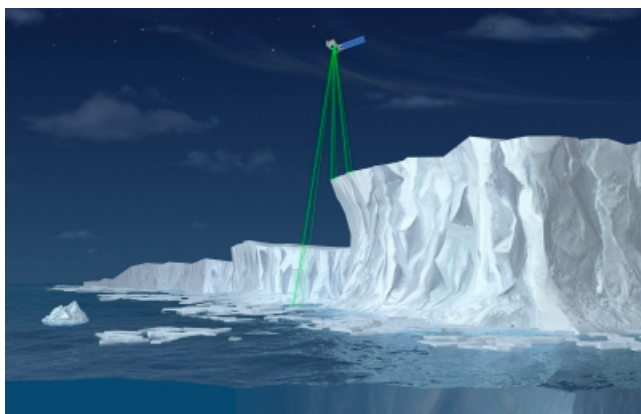


Operation IceBridge
P-3 Aircraft



ICESat-2

Did you know that each year, Greenland and Antarctica have lost 200 Gigatons (GT) and 118 Gigatons (GT) of ice, respectively, for the last 16 years? In this activity, you will calculate some comparisons between ice loss and the size of a local/favorite lake, as well as an Olympic-sized swimming pool. Plus, discover how many ice cubes it would take to equal the amount of ice lost, each year, and over 16 years, from Greenland and Antarctica.

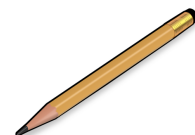


ICESat-2 using lasers to measure the height of ice sheets
(Artistic rendering ICESat-2/SCAD Collaborative Project)

Our planet's frozen and icy areas, called the cryosphere, are a key focus of NASA's Earth science research. ICESat-2 helps scientists investigate why, and how much our cryosphere is changing in a warming climate.

Materials:

- 1 ice cube
- Small scale with gram(g) units
- Pencil





Procedure: A few initial calculations and comparisons

Calculate how much ice each ice sheet has lost over the last 16 years

16-year cumulative ice lost from Greenland _____ GT

16-year cumulative ice lost from Antarctica _____ GT

Comparison to your local/favorite lake

A 1.00km^3 volume of ice weighs approximately 1.00GT. Research the volume(km^3) of a local/favorite lake and calculate how many of those lakes you could fill up with the amount of ice lost from Greenland and Antarctica each year.

Lake Name:

Lake Location:

Lake Volume (km^3):

Number of your lakes equaling the yearly ice lost from Greenland? _____

Number of your lakes equaling the yearly ice lost from Antarctica? _____

Number of your lakes equaling the 16-year combined ice lost? _____

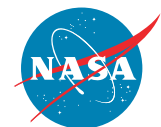
Comparison to an Olympic-sized swimming pool

A 1.00km^3 volume of ice weighs approximately 1.00GT. If an Olympic-sized swimming pool has a volume of 0.0000024km^3 , how many Olympic-sized swimming pools could you fill up with the amount of ice lost from Greenland and Antarctica each year?

Olympic-sized pools equaling yearly Greenland ice lost _____

Olympic-sized pools equaling yearly Antarctica ice lost _____

Olympic-sized pools equaling 16-year combined ice lost _____



Comparison to an ice cube

Weigh the mass of your ice cube in grams(g). Please do this quickly, as too much contact will cause the ice cube to melt rapidly

Mass of ice cube _____g

How many ice cubes equal 1 GT? (*Hint: 1 GT = 1.0E+15g or 1 GT = 1,000,000,000,000,000g)
_____ ice cubes

Using the mass of your ice cube and the following annual ice lost from the Greenland ice sheet (200 GT) and Antarctic ice sheet (118 GT), calculate how many of your ice cubes equal the yearly ice lost for each ice sheet.

Ice cubes equal to one year of ice mass loss from Greenland _____

Ice cubes equal to one year of ice mass loss from Antarctica _____

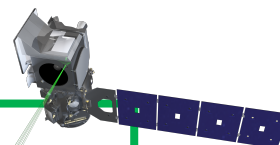
How many of your ice cubes equal the 16-year ice lost from Greenland and Antarctica?

Ice cubes equal to 16 years of ice mass loss from Greenland _____

Ice cubes equal to 16 years of ice mass loss from Antarctica _____

Extension Question

If 360GT of land ice lost equals 1mm of sea level rise, how many mm did sea level rise due to the total ice lost from Greenland and Antarctica over the last 16 years?



ICESat-2 Fun Fact

Did you know that ICESat-2 flies at 4.3 miles per second, relative to the ground. That's longer than 70 American football fields, put end-to-end, in one second