

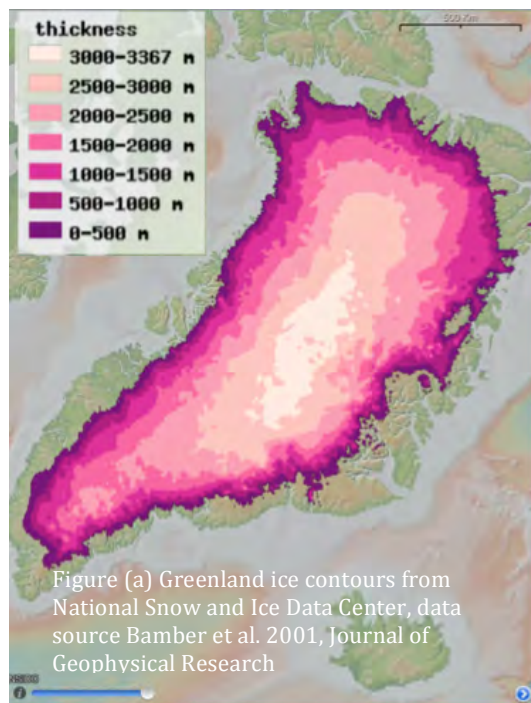


Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE
SL'ICE' of Science
Just how much ice is that anyway?

Introduction: Flying over the ice sheet, the IcePod project uses laser and radar to collect data on ice thickness. Ice thickness is an important measurement needed to calculate the overall amount of ice in the Greenland ice sheet. Over the years, scientists have been collecting this data from land traverses, satellites, and air flights. The IcePod flights will be contributing data to important studies like this.



The map in Figure (a) is made from data collected from these studies and merged to show how much ice is stacked on top of the land in Greenland. The map uses contours to show ice elevation (thickness), just as a topo map uses contours to show land elevation. These ice contours measure just the ice, not the land below. If the contour elevation is 500 meters, this means 500 meters of ice thickness.



(1) Calculate the median value for each contour (for 0-500 m the median would be 250 m etc.), and *label* each ice contour with its median thickness.

(2) Visually group the labeled contours into 3 main categories 0-1500 m, 1500-3000 m and > 3000 m. Estimate the average thickness of the Greenland ice sheet (in meters) using these groupings _____.

(3) Scientists calculate the total area of Greenland's ice sheet as 1.8 million km² or 1.8 X 10⁶ km². This is 695,000 mi², more than 2.5 times the size of Texas. They calculate the average ice sheet thickness as 1922 m. Use these two values to calculate the volume of the

Greenland ice sheet in km³ _____. This calculation is a rough estimate since we took only the average ice thickness to complete this calculation. Bamber and the scientists who created the map in Figure (a) calculated the ice volume of Greenland as 2.9 X 10⁶ km³. How close were you?_____

(4) The volume of ice on Greenland would raise global sea level by 7 m. What might this mean for the coastal communities of the U.S. Let's look at in interactive where you can remove ice from the Greenland ice sheet and see the impact on the NY city waterfront. Click on the ice contours to move the ice into the ocean.

<https://polarexplorer.ccnmtl.columbia.edu/water/>

(5) We can use topography (topo) maps to see what that would look like on the U.S. waterfront. Topo maps mark contours in ft. so you will so you will need to convert your 7 m of sea level rise to ft. Greenland has _____ feet of sea level rise in the ice sheet.

(6) Attached is a U.S.G.S. topo map of Lewes DE. Use a colored marker to outline those sections of the Lewes waterfront that would NOT be flooded by the amount of water in the Greenland ice sheet added to the ocean.

(7) Think about the impact. This Lewes DE waterfront community includes their historic downtown, the University of Delaware college of Marine Studies campus, a sewage treatment plant, and State Park land among other areas. What would be flooded?

(8) What do you think impact to this community would be from this change in sea level?

(9) Consider what type of jobs in Lewes DE would be interested in learning about the data IcePod is collecting on changes in the Greenland ice sheet?

References:

Bamber, J. L., R. L. Layberry, S. P. Gogineni, A new ice thickness and bedrock data set for the Greenland ice sheet, 1, Measurement, data reduction, and errors, J. Geophys. Res., 106(D24), 33773-33780, 2001.

Byrd Polar Research Center, Ohio State University Greenland Fact Sheet.

http://bprc.osu.edu/wiki/Greenland_Factsheet

Lewes Topo Map

http://ia600500.us.archive.org/5/items/usgs_drg_de_38075_g2/o38075g2.tif

Interactive from the Columbia PoLAR project

<http://thepolarhub.org>

<https://polarexplorer.ccnmtl.columbia.edu/water/>

