Activity 1

HOW LEVEL IS SEA LEVEL? Part 1

Measuring differences in elevation of the ocean surface is a challenging task. Radar altimeters make it possible for oceanographers to determine the height of the ocean surface to within 4.2 cm. That's less than 2 inches!

Positioned aboard a satellite, a radar altimeter provides a measure of the apparent distance to the sea surface based on the return signal from a radar beam it sends downward. Determination of the height of the sea surface must take into account different effects, including those arising from the satellite's orbit, atmospheric variations, and tides. Variations in sea surface elevation are then compared to the reference "ellipsoid," a mathematical model of Earth's shape, to describe relative heights of the ocean surface.

The following activity uses data acquired by the Topex/Poseidon altimeter to investigate the relationship between the topography of a sea floor feature and the topography of the overlaying sea surface.

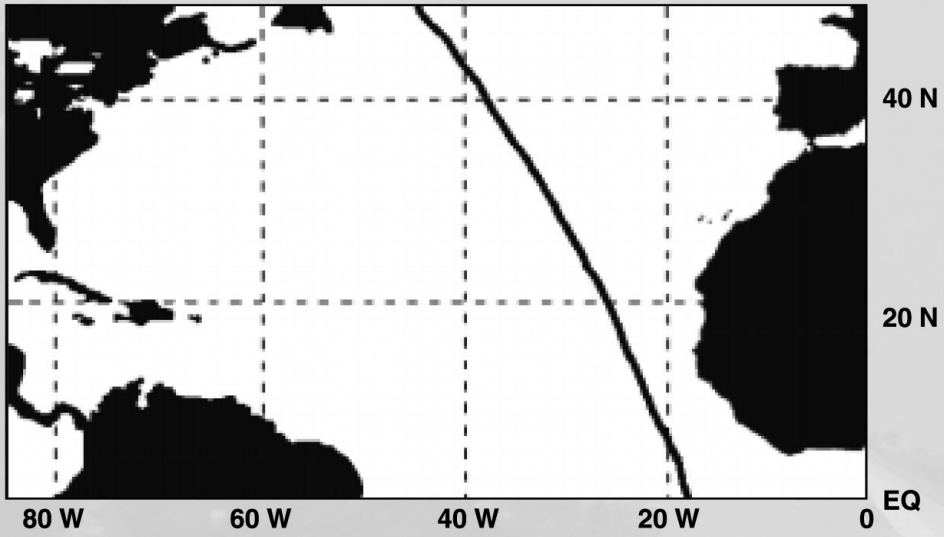
OBJECTIVES

After completing this investigation, you should be able to:

· Describe the use of a satellite radar altimeter to measure sea surface height.

· Describe the relationship between a sea floor ridge and the height of the overlying sea surface.

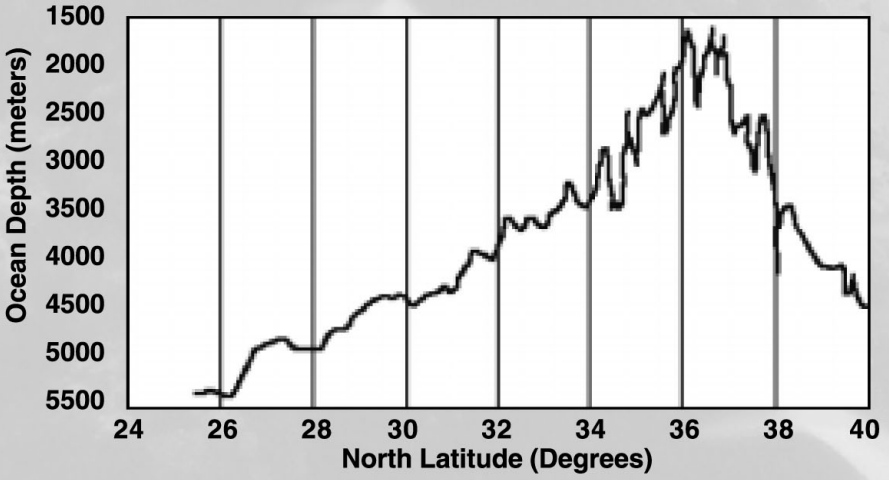
Map of North Atlantic Ocean



Sea Surface Height Table

Latitude (°N)	26	28	30	32	34	36
Height (m)	-2.8	-1.8	0.1	1.5	3.5	6.5

Ocean Depth Diagram



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Activity 1

HOW LEVEL IS SEA LEVEL? Part 2

INVESTIGATIONS

1. Examine the accompanying map of the North Atlantic Ocean, which shows part of the ground track of one orbit of the satellite carrying the Topex/Poseidon altimeter. The part of the ground track of interest for this activity is about 1,800 km in length between 26˚N and 40˚N Latitude. Mark with an (x) each end of this ground-track segment directly on the map.

In numbers 2 and 4-7, circle the correct answer.

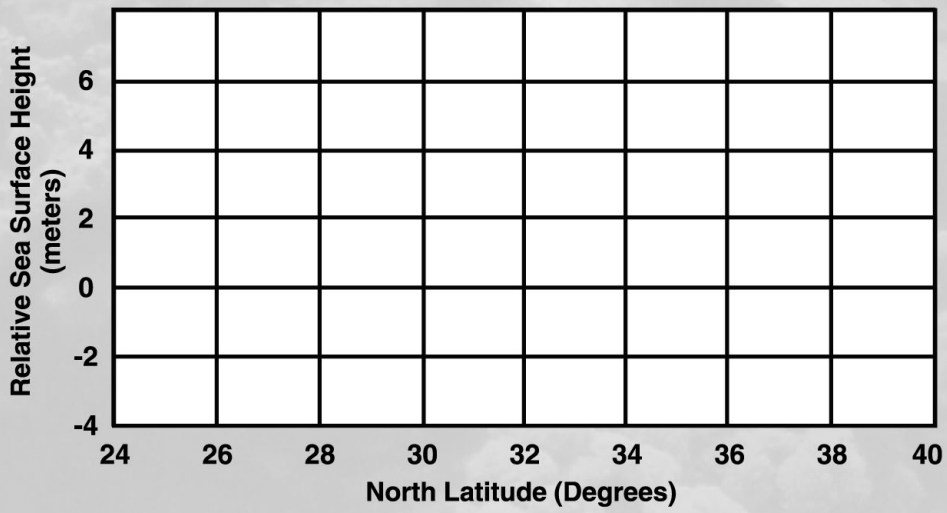
2. Turn to the Sea Surface Height Table. The sea surface heights appearing in the table are in meters above (positive numbers) or below (negative numbers) the reference ellipsoidal shape of the Earth's sea surface. The heights are listed at regular intervals (and at the location of maximum elevation) measured along the ground track of the altimeter. In the table, the highest sea surface is located near (26˚N) (32˚N) (36˚N) Latitude.

3. Plot the sea surface heights as reported in the table on the Sea Surface Height Diagram. Connect adjacent plotted points with solid straight lines.

4. On the Ocean Depth Diagram, the depth of water to the ocean bottom measured by direct soundings from ships is plotted vertically in meters. The rise and fall of the ocean bottom along the satellite ground track reveals a mid-ocean ridge with its highest point located near (26˚N) (32˚N) (36˚N) Latitude.

5. Although different in scale, the shapes of the relative sea surface height and the ocean bottom curves in the two diagrams indicate that the sea surface elevation is highest in the region where the elevation of the ocean bottom is (highest) (lowest).

Sea Surface Height Diagram



6. Research indicates that, in the absence of all other effects, the topography of the sea surface generally mimics the shape of the underlying ocean bottom. Hence, over depressions of the sea bottom, such as trenches, the height of the relative ocean surface is (lowered) (elevated).

7. Variations in sea surface height are governed by numerous factors. Density differences within the Earth's interior can result in sea surface height changes as great as a hundred meters. Ocean currents and seasonal changes can result in variations of a meter or so. From this activity, you have seen that features such as sea-floor ridges might result in variations of sea surface height approaching (one) (ten) (one hundred) meters.

SOURCE

The Maury Project, American Meteorological Society

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