

# The Hudson River Canyon

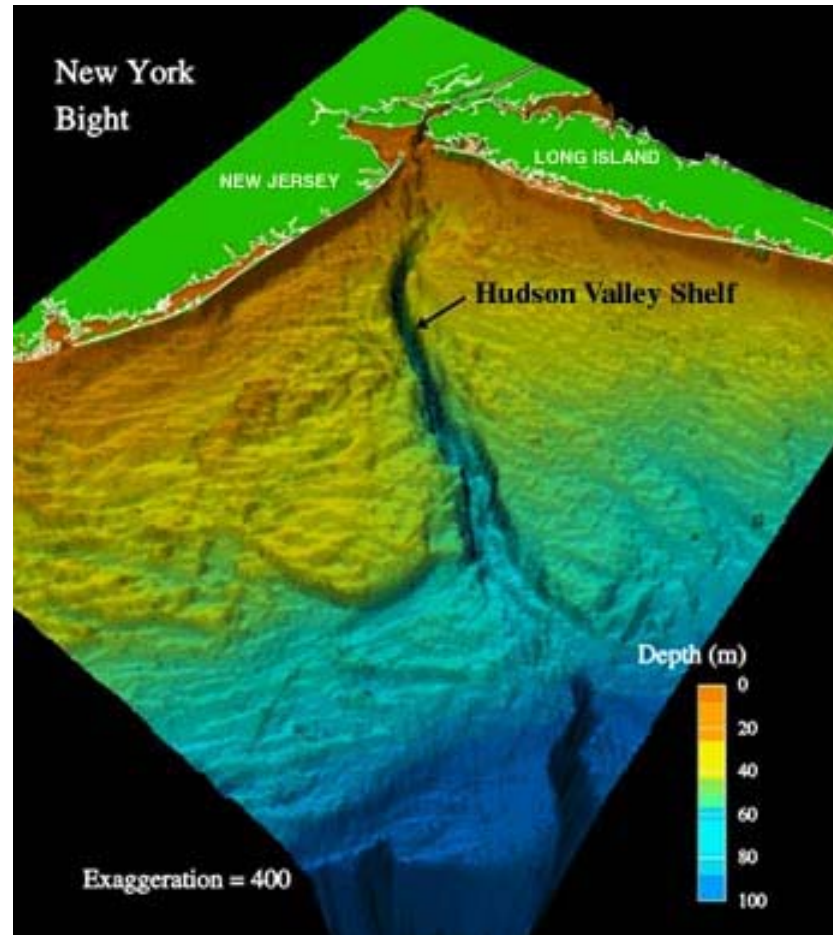
The Hudson River Canyon is perhaps the most comprehensively studied river in the world. Topics of study in art, history, engineering, economics, geology, oceanography, ecology and other areas have been documented and are widely available to students using the internet.

# The Hudson River Canyon

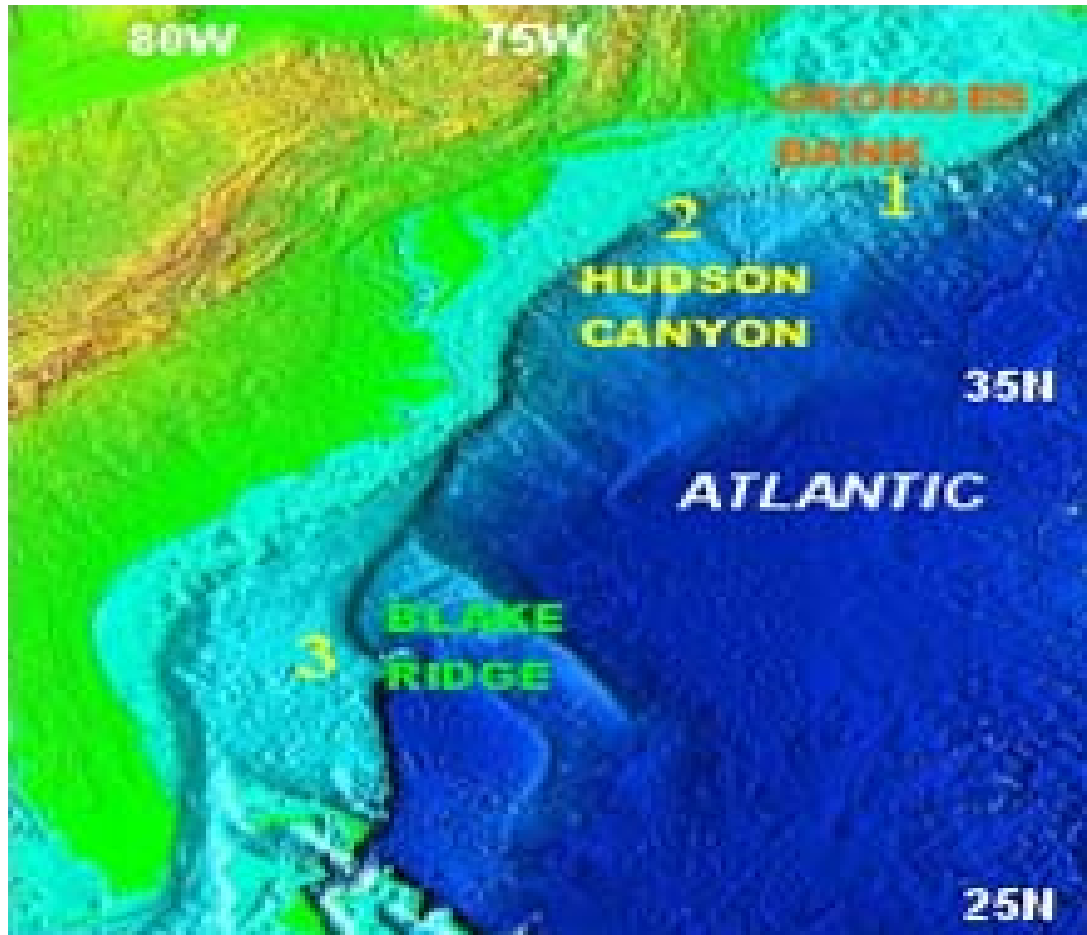
First, we will explore the current understanding and latest topographic data for the canyon. Students will build clay models of the Hudson River Canyon.

In addition, the forces that shaped the Hudson River Canyon will also be studied. Climate change, weathering and erosion, depositional processes and sea level changes will be explored.

# NOAA Ocean Explorer Investigation – The Hudson River Canyon



<http://oceanexplorer.noaa.gov/welcome.html>



<http://www.oceanexplorer.noaa.gov/explorations/deepeat01/background/plan/plan.html>

HUDSON CANYON EXPLORATION CRUISE 2002:  
VOYAGE OF DISCOVERY TO A  
DEEP SEA FRONTIER OFF THE EAST COAST



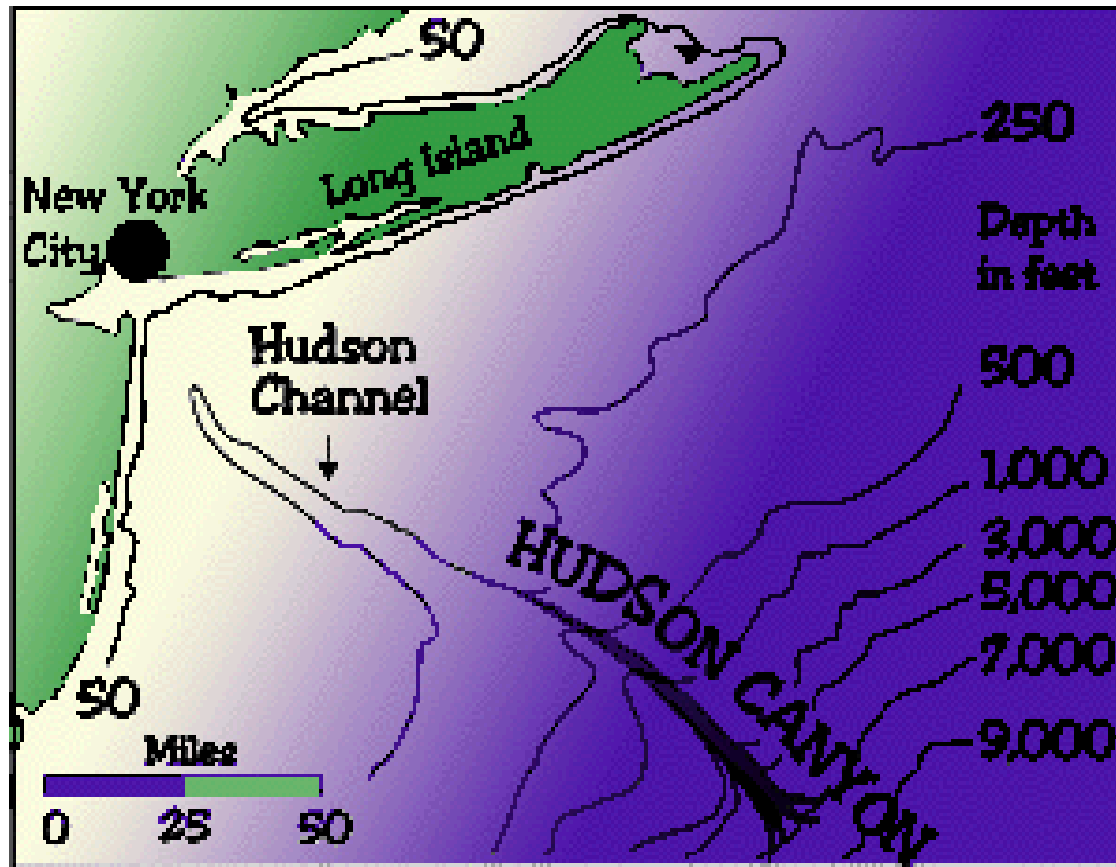
A Collaboration Between:  
Rutgers University  
U.S. Geological Survey  
SUNY/Stein Brook  
Woods Hole Oceanographic Institution

Supported by NOAA's Office of Ocean Exploration

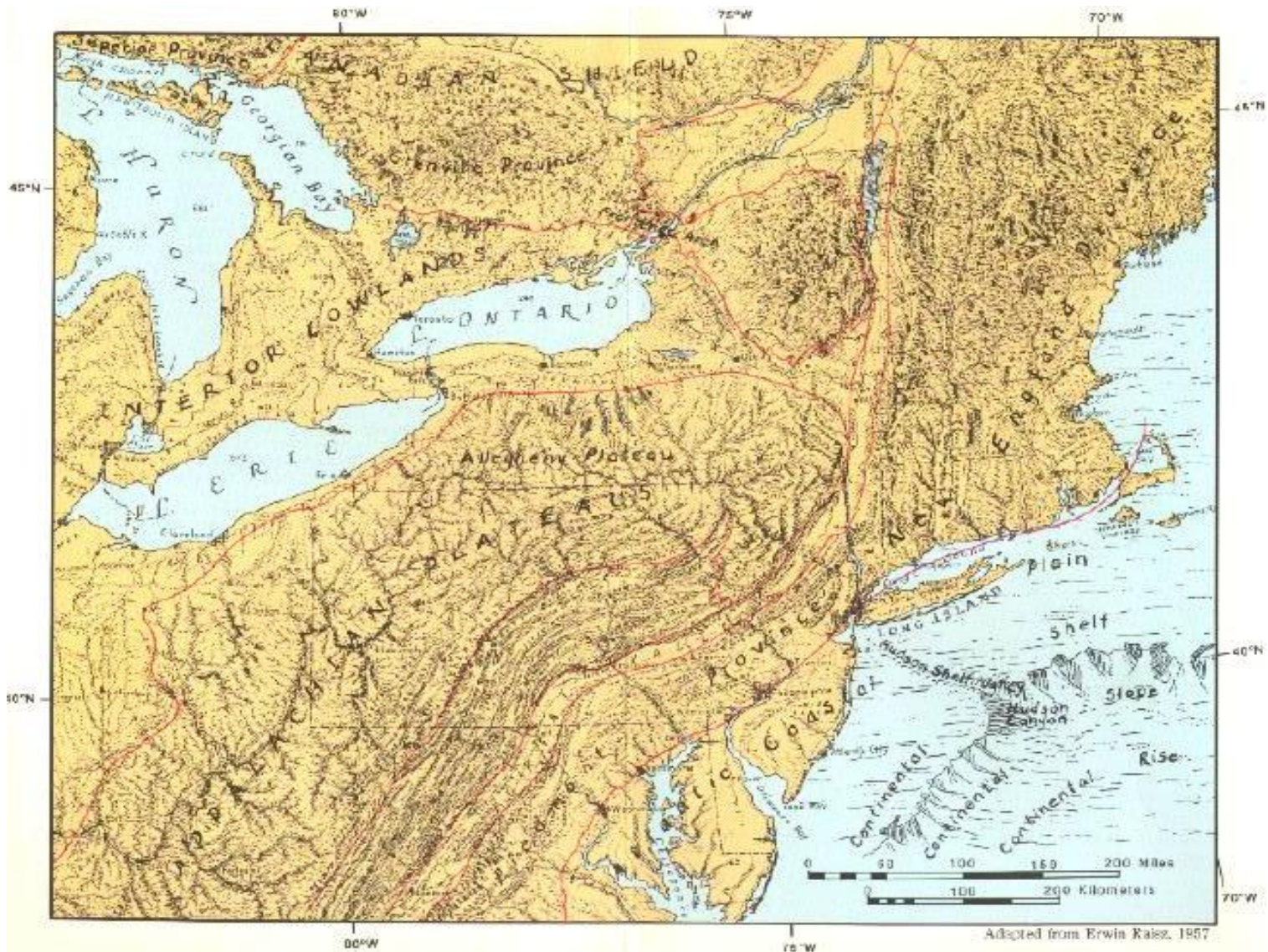
Map Image: Peter Sosa, NOAA/NOEC  
Layout: Mike Siegel, Peter Sosa, Rutgers University



[http://visibleearth.nasa.gov/data/ev60/ev6029\\_PIA02630\\_md.jpg](http://visibleearth.nasa.gov/data/ev60/ev6029_PIA02630_md.jpg)

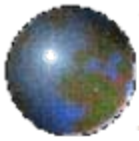


<http://pao.cnmoc.navy.mil/pao/Educate/OceanTalk2/indexunderwater.htm>

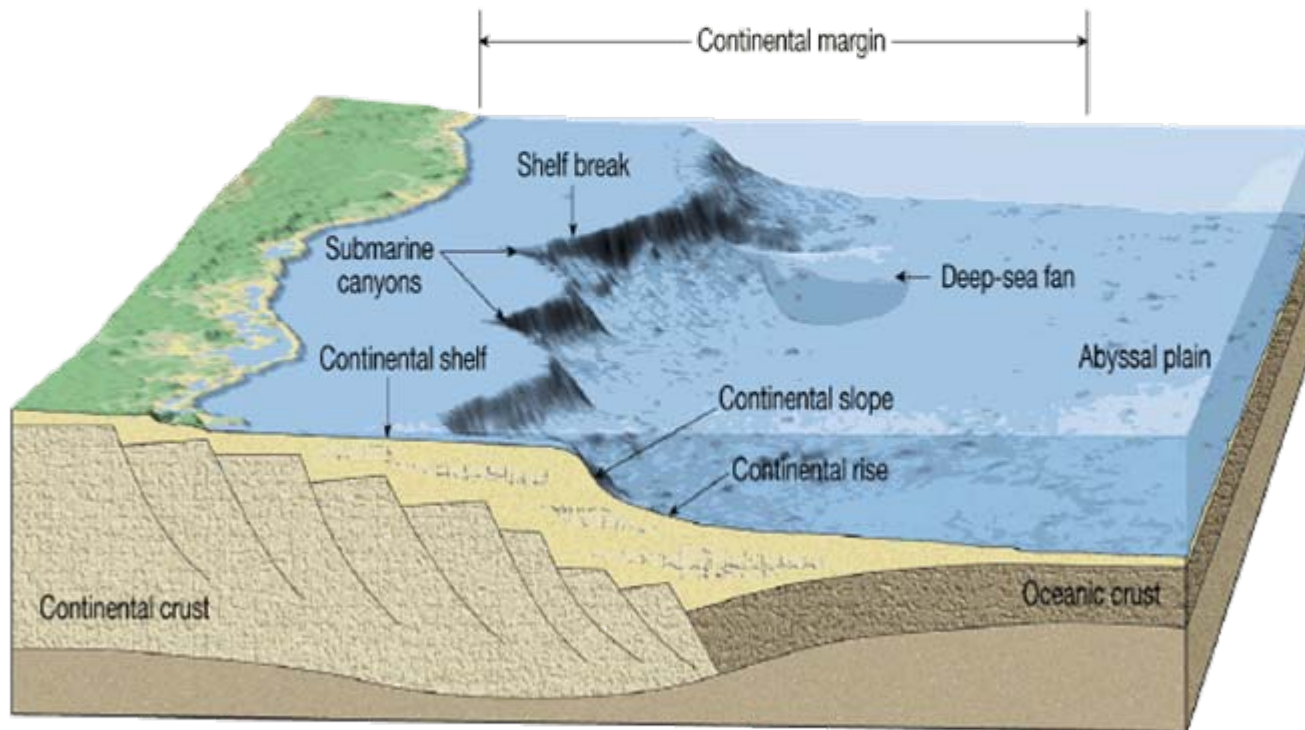


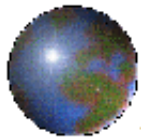
## PHYSIOGRAPHIC MAP

[http://gretchen.geo.rpi.edu/roecker/nys/nys\\_edu.pamphlet.html](http://gretchen.geo.rpi.edu/roecker/nys/nys_edu.pamphlet.html)



## A passive continental margin

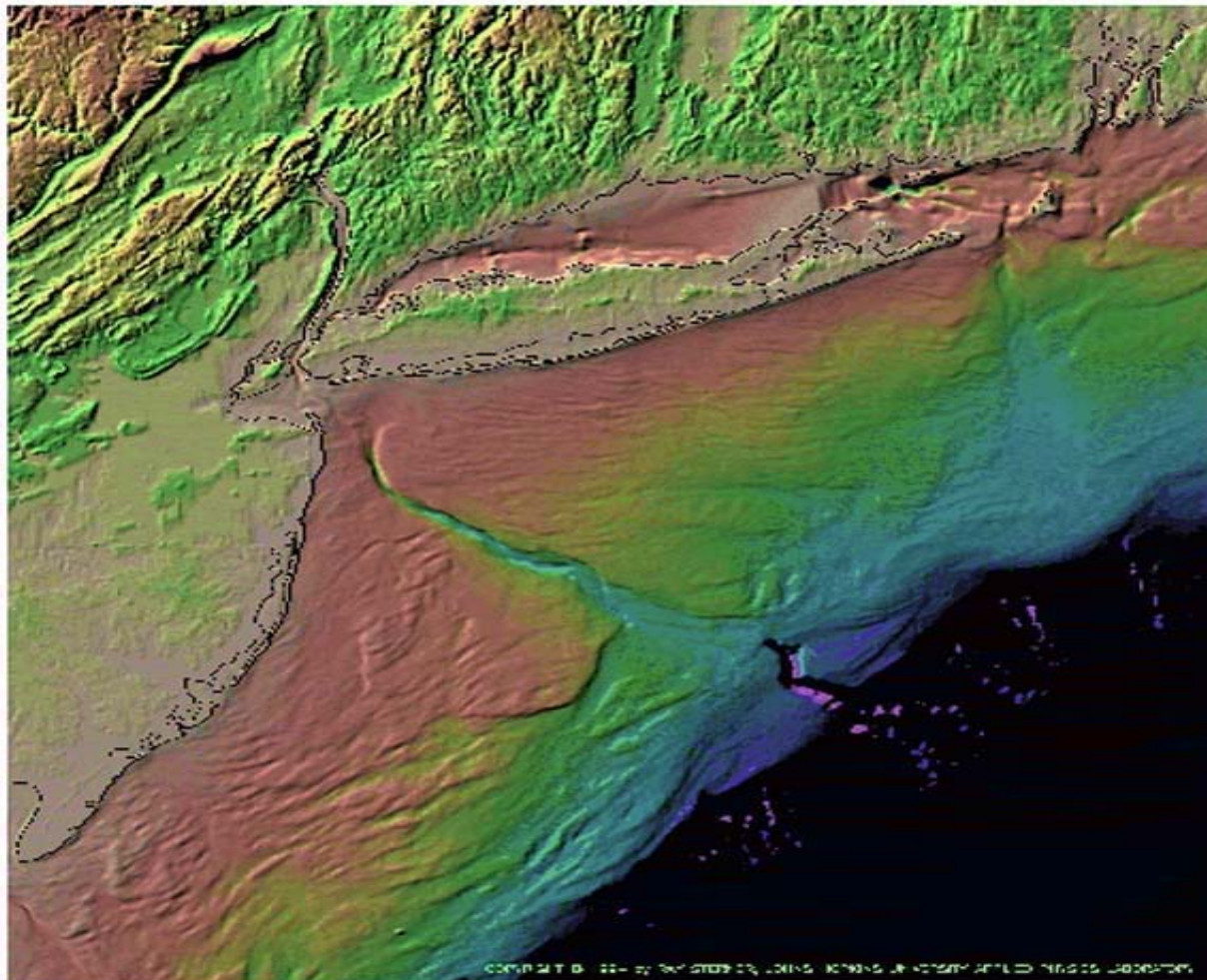




# **Submarine canyons and turbidity currents**

- **Submarine canyons**
  - **Deep, steep-sided valleys cut into the continental slope**
  - **Some are extensions of river valleys**
  - **Most appear to have been eroded by turbidity currents**

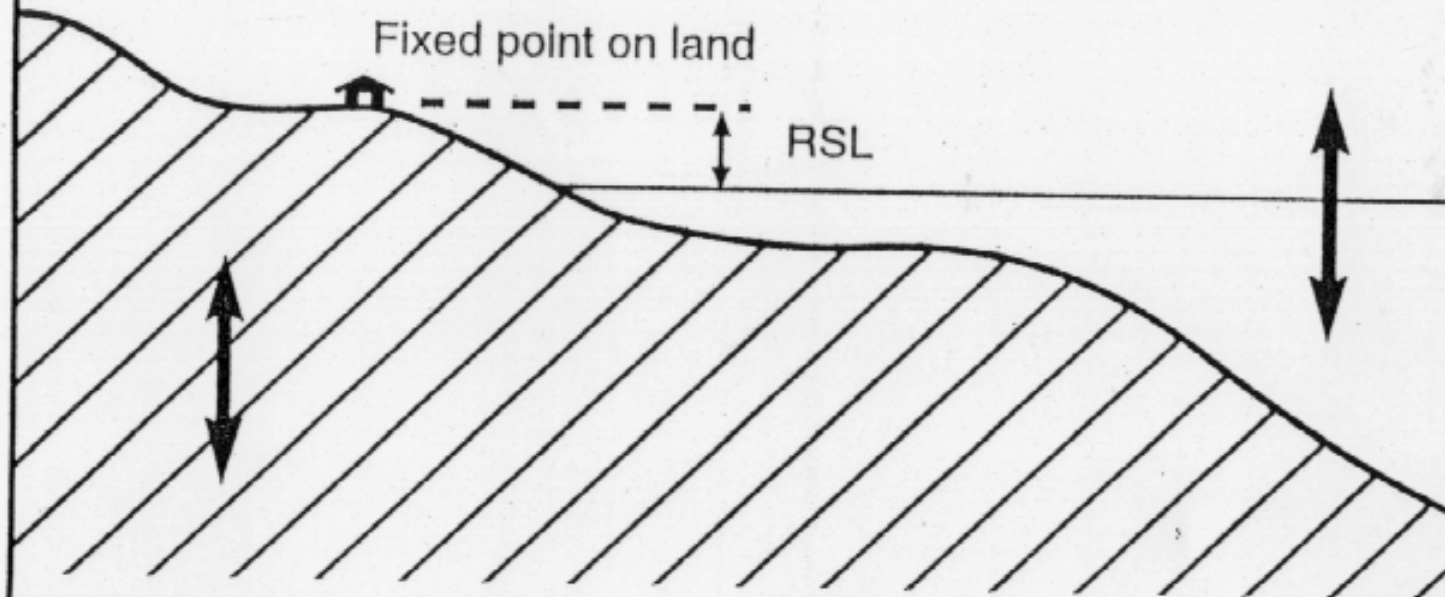
# Hudson Canyon



# The Hudson River Canyon

This Earth Science presentation includes lesson plans, activities and resource links to aid teachers. Based on recently discovered measurements of the Hudson Canyon, students will explore the mapping of the land, surface and subsurface.

## CAUSES OF RELATIVE SEA-LEVEL CHANGE

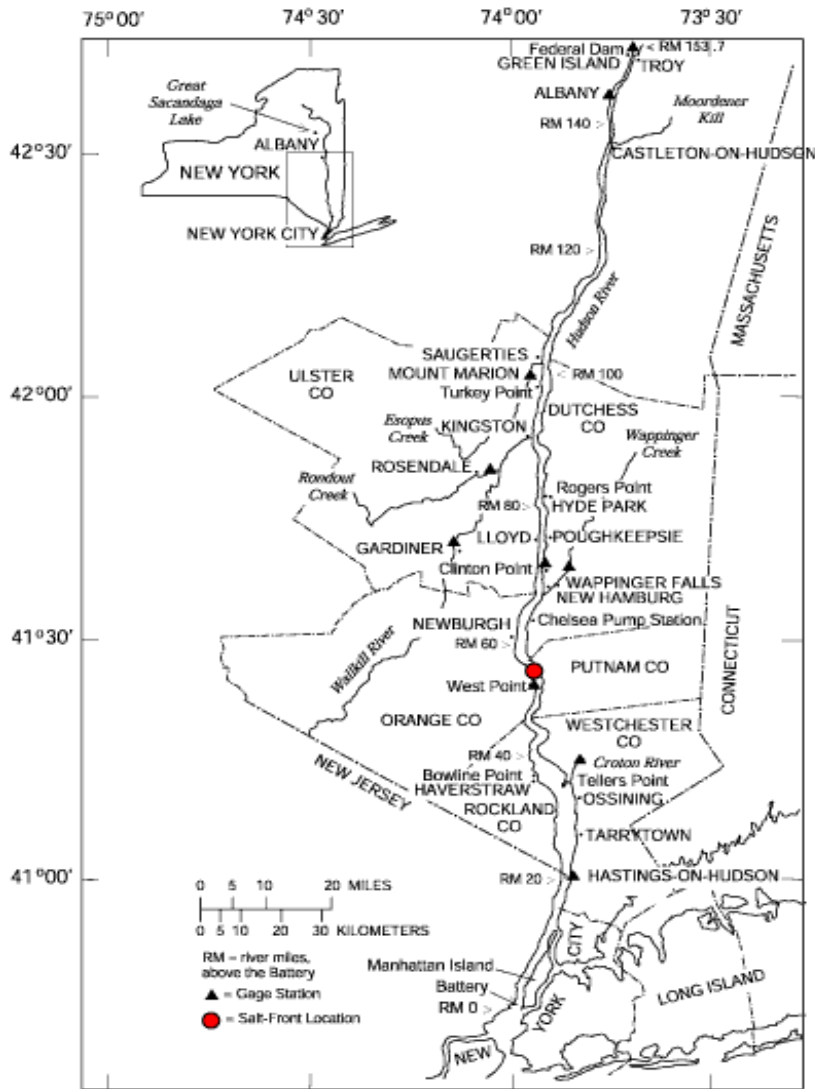


### Vertical Land Movement:

- isostatic adjustments
- tectonic effects
- sedimentation
- human factors (groundwater and oil extraction)

### Changes in Level of Ocean Surface:

- glaciers, ice sheets
- ocean currents, tides
- hydrologic cycle changes
- expansion or contraction (steric effects)



Base from U.S. Army Corps of Engineers, 1962

U.S. Geological Survey Hudson River salt-front data--  
 Yesterdays salt-front location at high-slack tide was  
 55 river miles above the Battery at New York City.

## U.S. Geological Survey Hudson River salt-front

Location at high-slack  
 Tide was 55 river  
 miles  
 Above the Battery at  
 New York City.

Source: *URL:*  
[http://ny.water.usgs.gov/projects/dialer\\_plots/saltfront.html](http://ny.water.usgs.gov/projects/dialer_plots/saltfront.html)

**Earth Institute News** posted 01/04/01 2:00 P.M. EST

## **Mud Yields Ghosts of Hudson River's Past**

By Kirk Johnson, New York Times

aboard the R. IAN FLETCHER, off Nyack, N.Y.

About a thousand years ago, a hurricane of cataclysmic proportions swept up the Hudson River. Or perhaps it was the mother of all northeasters. No one knows. What is clear, however, is that the force of the storm was beyond any recorded or remembered human experience. Great swaths of the river bottom were scraped up and moved about in one ferocious flood.

### Homework Assignment

{Read this article by going to the website below. Write one page about this story.}

[http://www.earthinstitute.columbia.edu/news/story1\\_1\\_01.html](http://www.earthinstitute.columbia.edu/news/story1_1_01.html)

# The Hudson River Salt Wedge

## Earth Institute News

posted 01/04/01 2:00 P.M. EST **Mud Yields Ghosts of Hudson River's Past**

By Kirk Johnson, New York Times

aboard the R. IAN FLETCHER, off Nyack, N.Y.

### Part 2

"It's clear that there are storms that go through and erode sediments," Dr. Bell said. "Stuff moves." ...

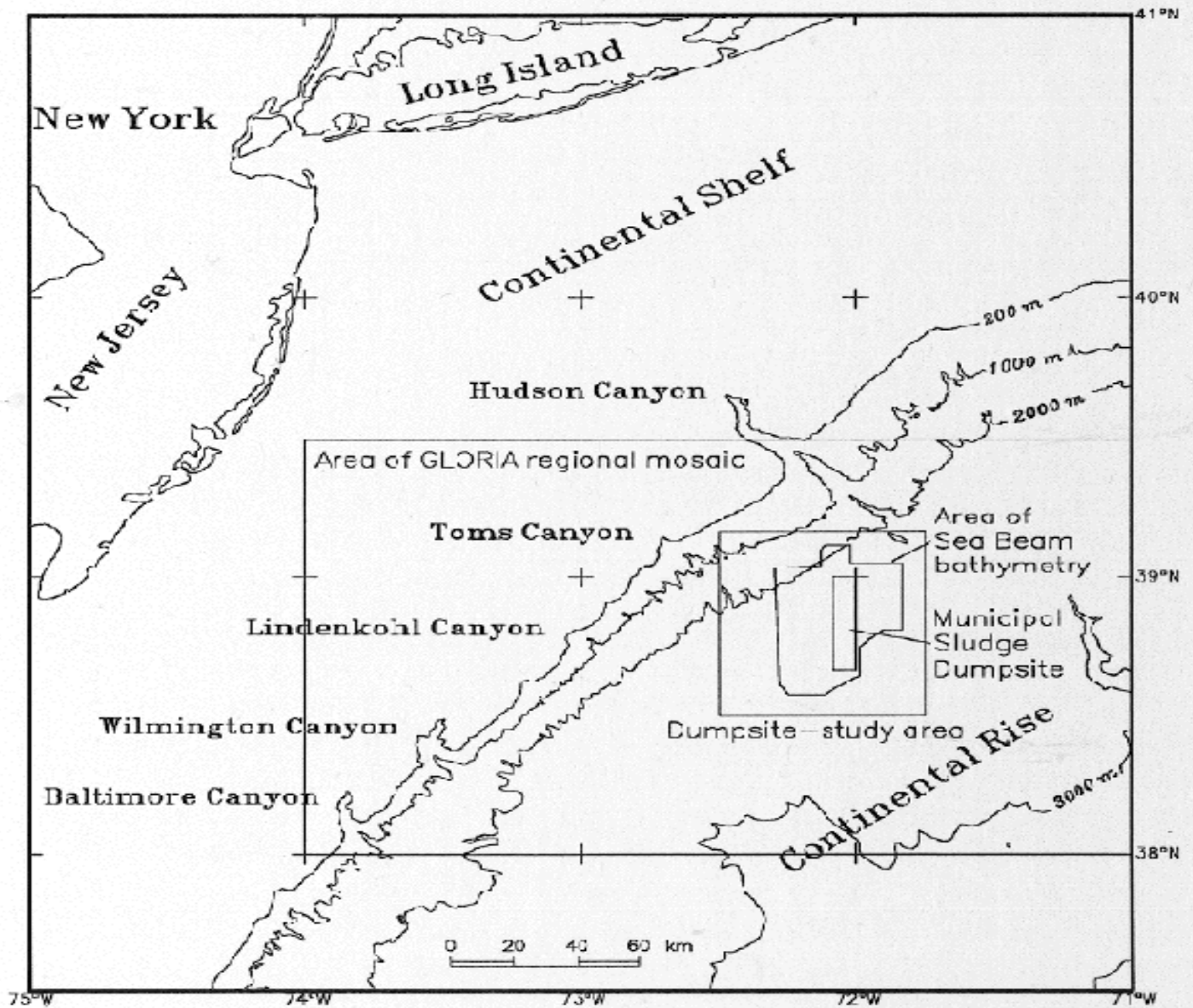
Other wonders of the river, like the salt wedge, are invisible.

***The salt wedge is the layer of ocean water that moves upriver with the tide.*** Because it is denser than fresh water, the wedge slides underneath the river's surface as it plows north, adding its own layer to the "cake." But the salt layer also creates a band of turbulence that can distort a sonar image, so it too must be understood so scientists can read the map results.

### Homework Assignment

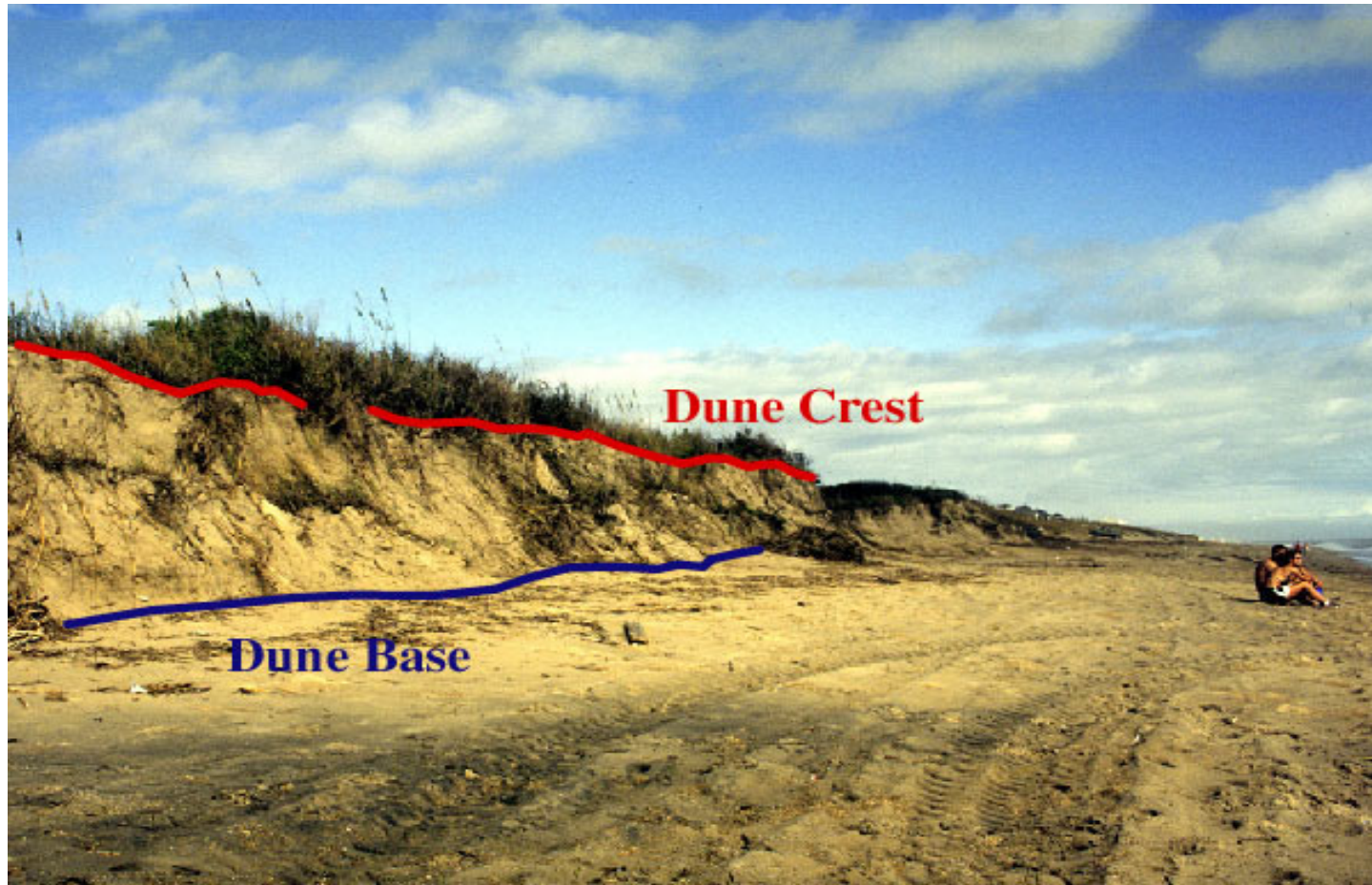
Read about the "Salt Wedge" on the Hudson River. Write one page about your ideas and reactions.

[http://www.earthinstitute.columbia.edu/news/aboutStory/about1\\_1\\_01.html](http://www.earthinstitute.columbia.edu/news/aboutStory/about1_1_01.html)



<http://www.oceanexplorer.noaa.gov/explorations/deepest01/background/plan/media/sludge.html>

# Sand Dunes



<http://coastal.er.usgs.gov/hurricanes/mappingchange/>

Topsail Island, North Carolina  
July 1996 – Before Hurricane Fran



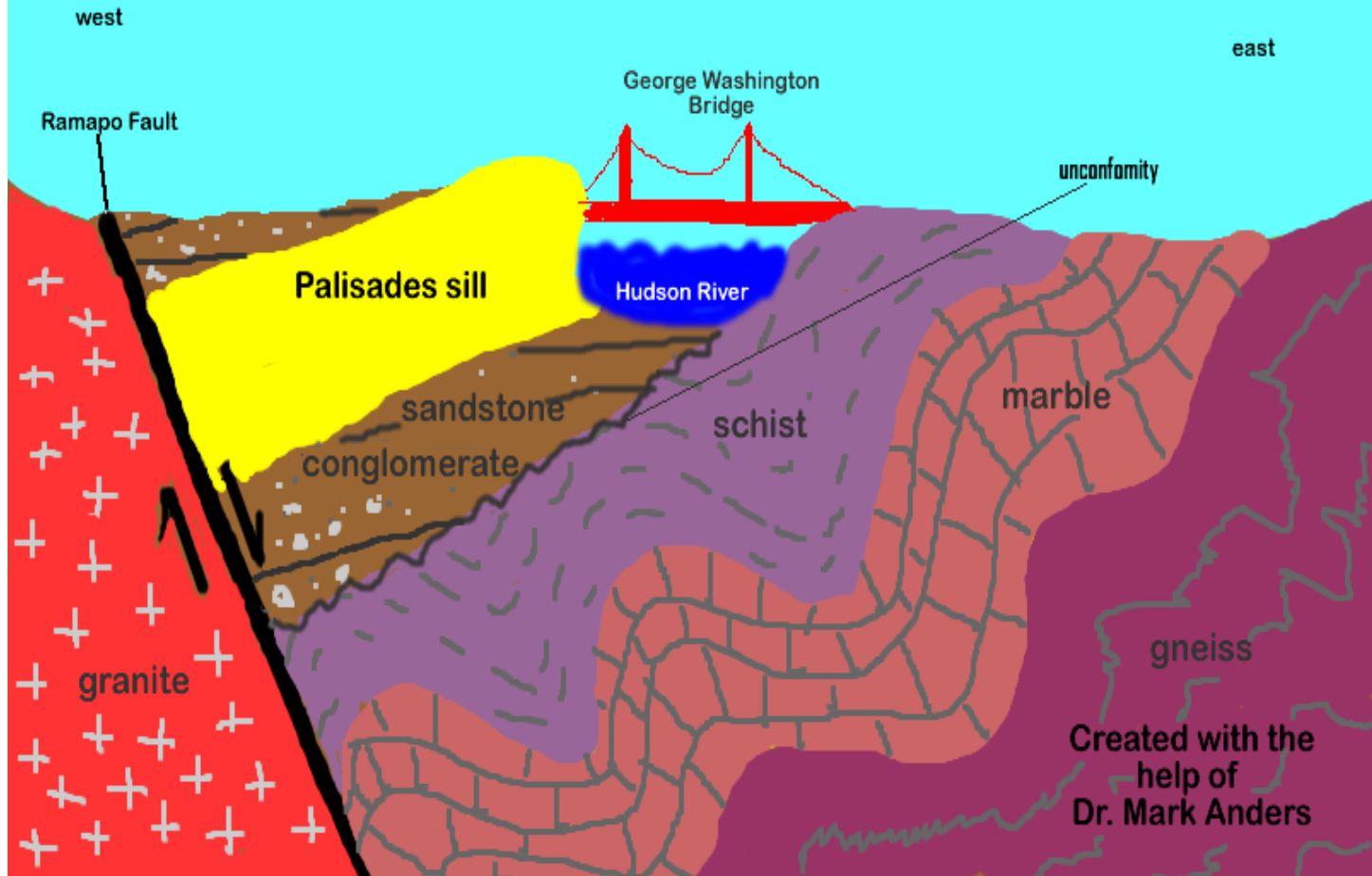
<http://coastal.er.usgs.gov/hurricanes/mappingchange/photos.html>

Topsail Island, North Carolina  
September 1996 –After Hurricane Fran



<http://coastal.er.usgs.gov/hurricanes/mappingchange/photos.html>

# Geologic Cross Section of the George Washington Bridge area New York, USA



## Today I'm Going Yesterday

“Today I'm going yesterday  
As quickly as I can,  
I'm confident I'll do it,  
I've devised a clever plan,  
it involves my running backward  
at a constant rate of speed  
if I'm mindful of my timing,  
I'll undoubtedly succeed.” – Jack Prelutsky

From: “Something Big Has Been Here”, 1990, Prelutsky, Greenwillow  
Brooks, p. 72