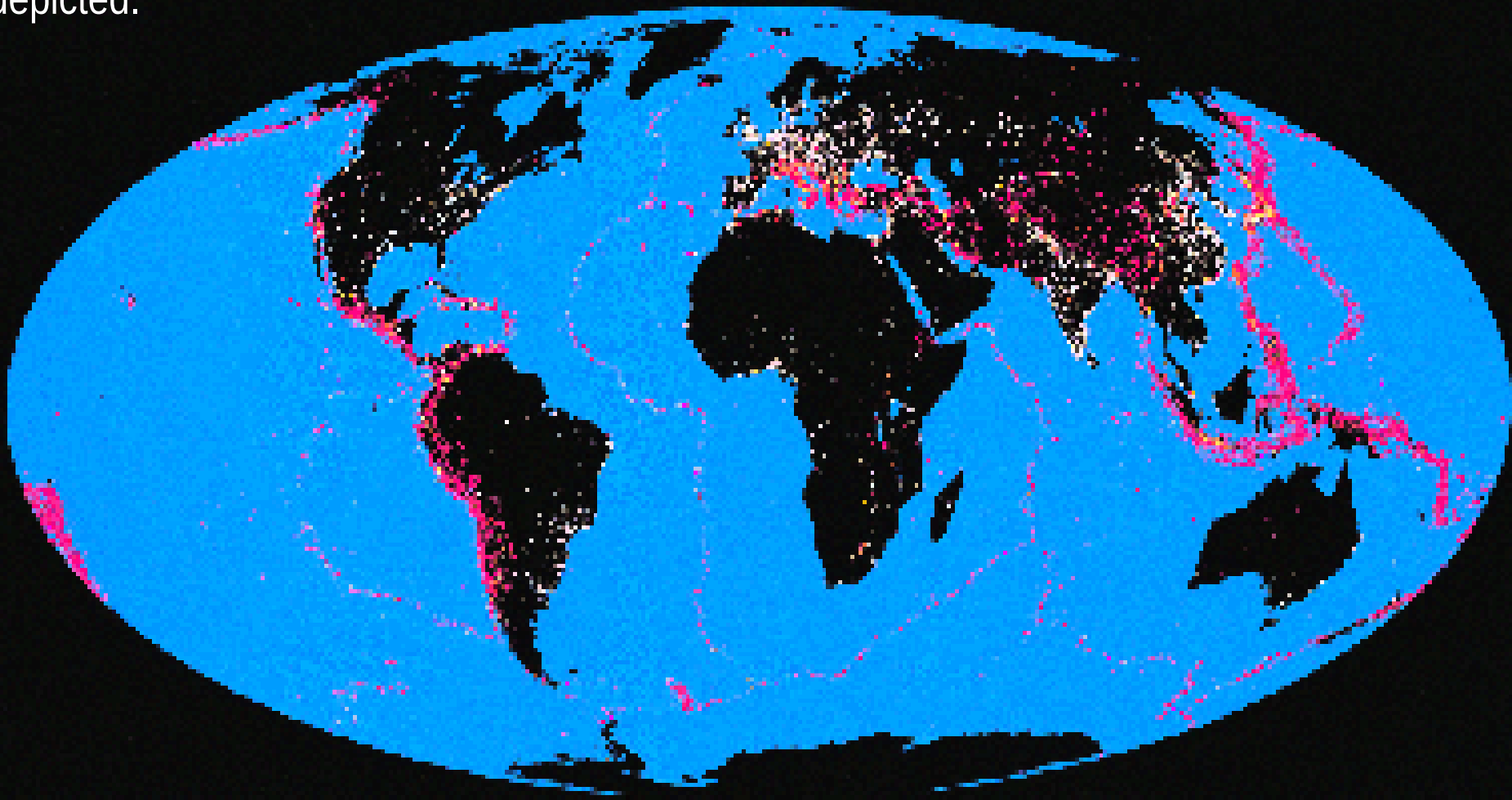
Global Seismicity and World Cities

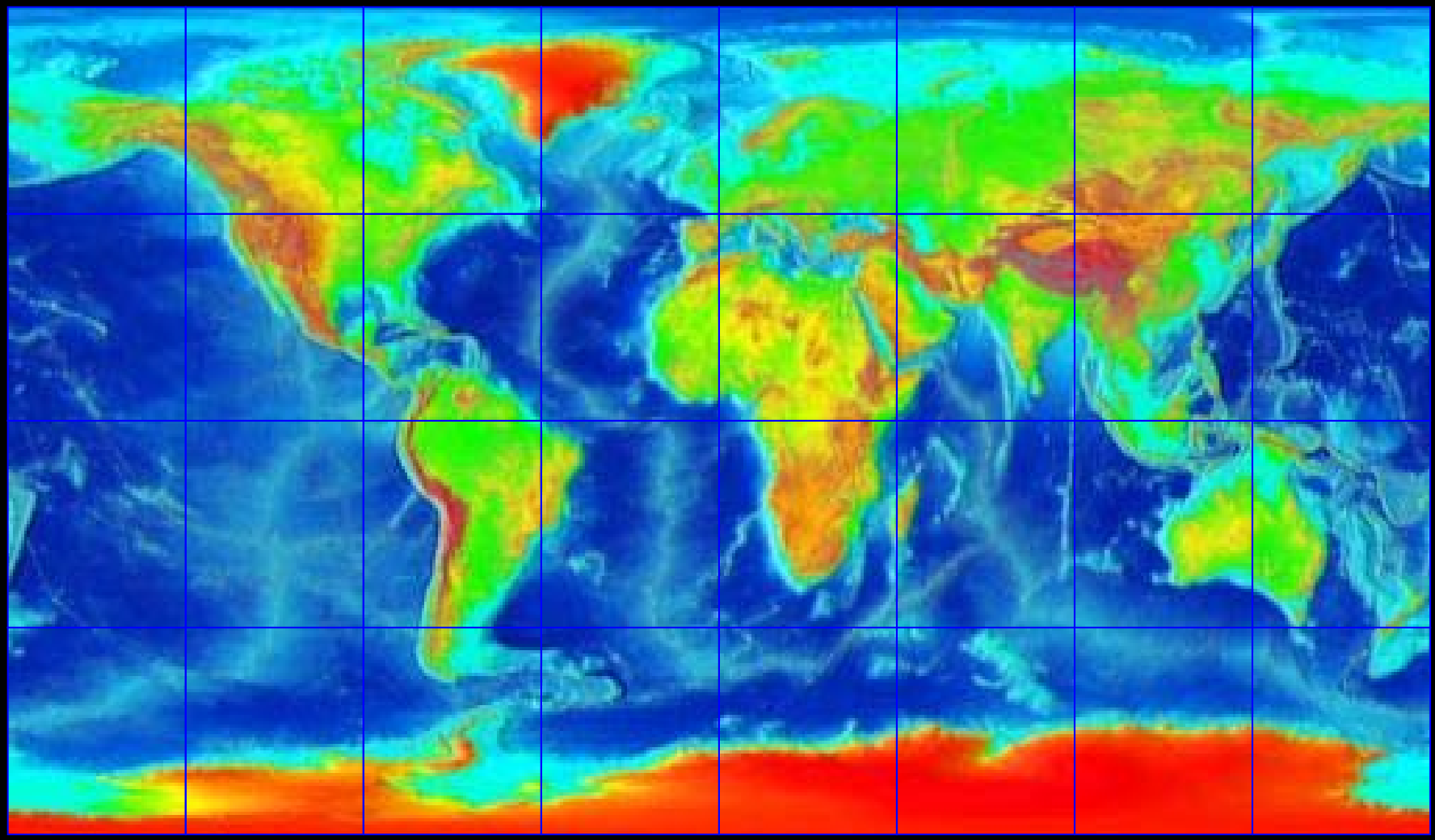
This map displays the worldwide hazard to cities by large earthquakes. When earthquakes occur near cities, the potential for damage is great. On this map, more than 39,000 epicenters (red dots) are shown and hundreds of cities (white dots) of various sizes are depicted.



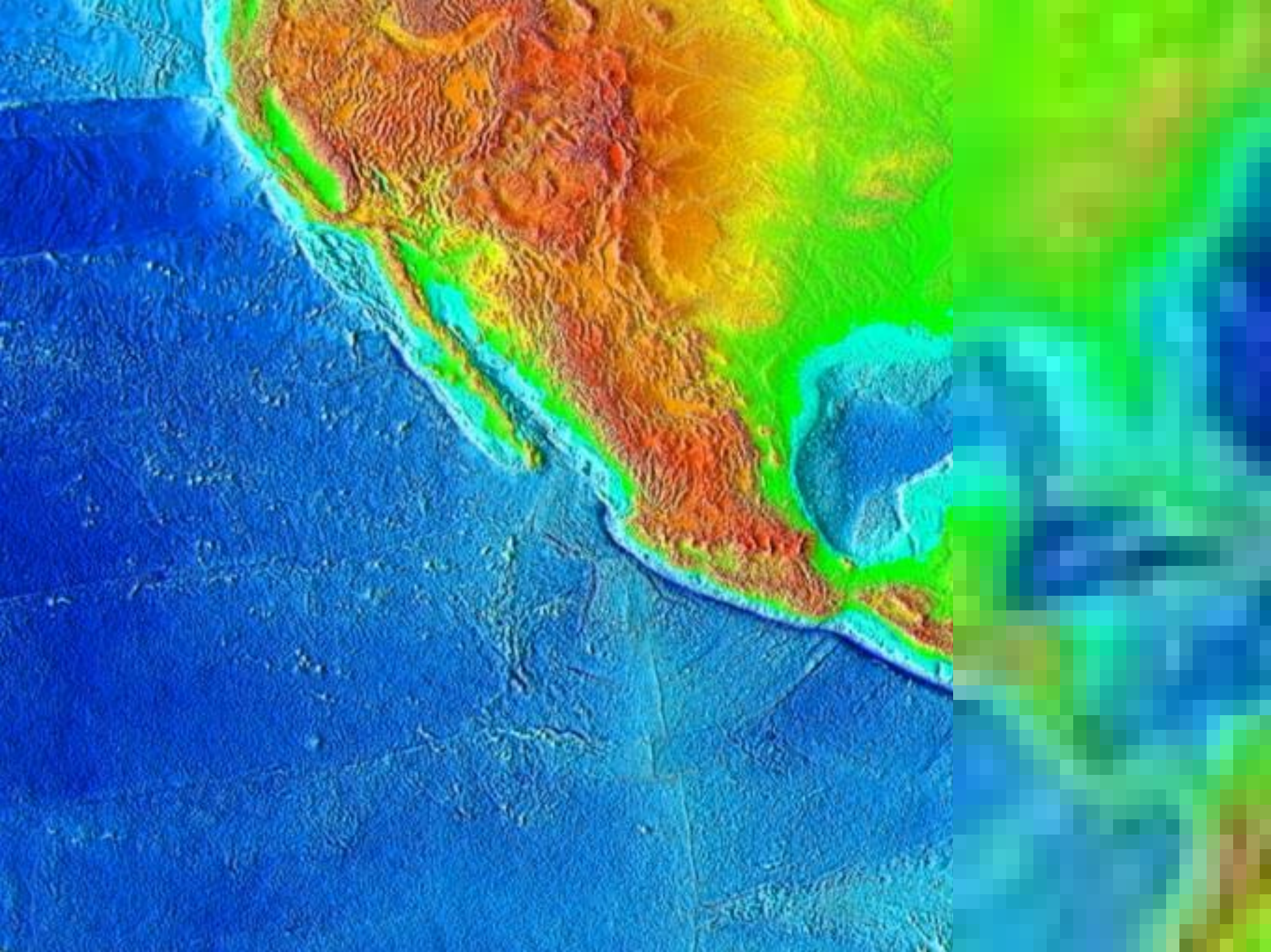
http://www.neic.cr.usgs.gov/neis/pANDs/global.html

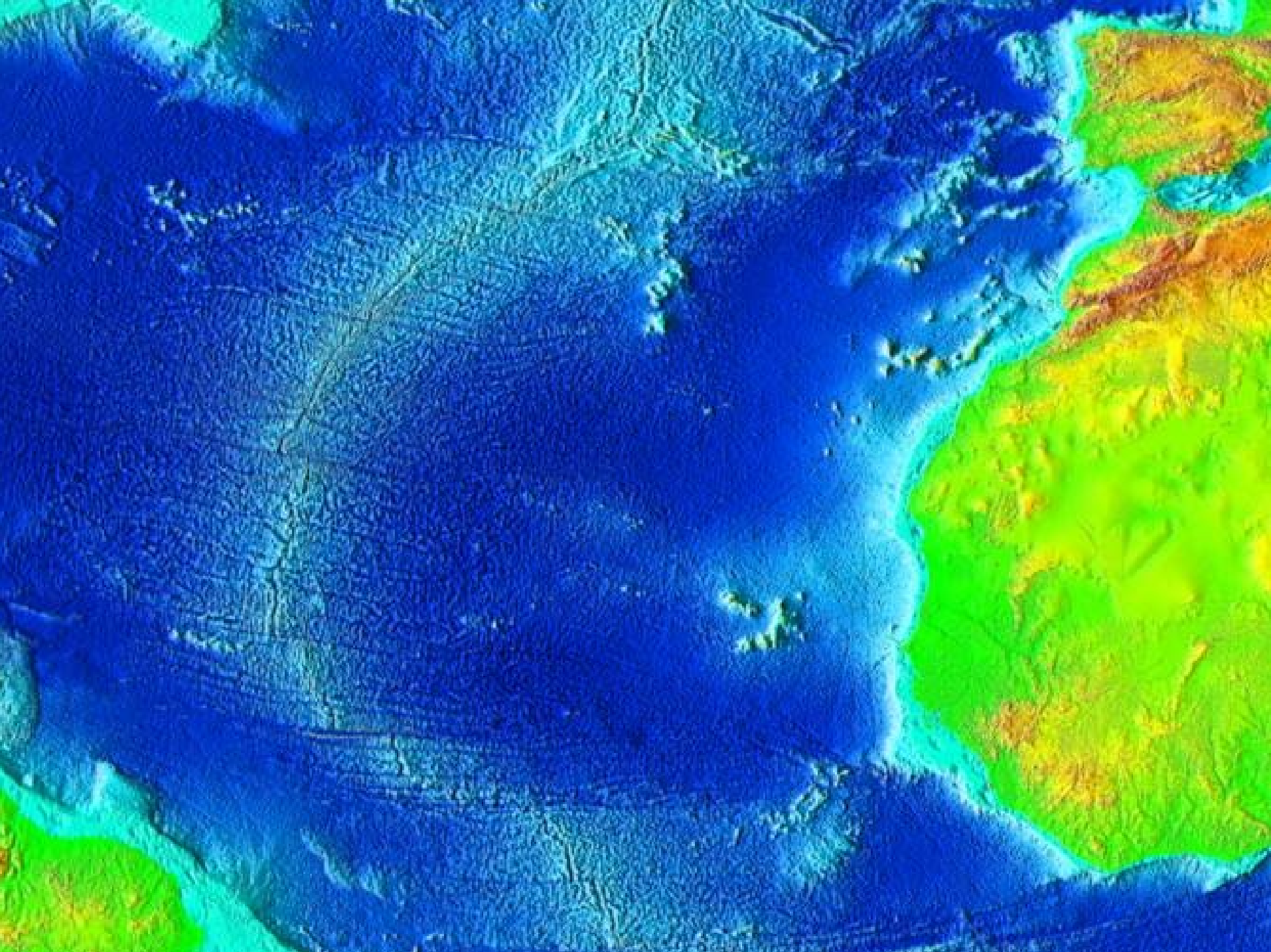

http://walrus.wr.usgs.gov/pubinfo/smokers.html

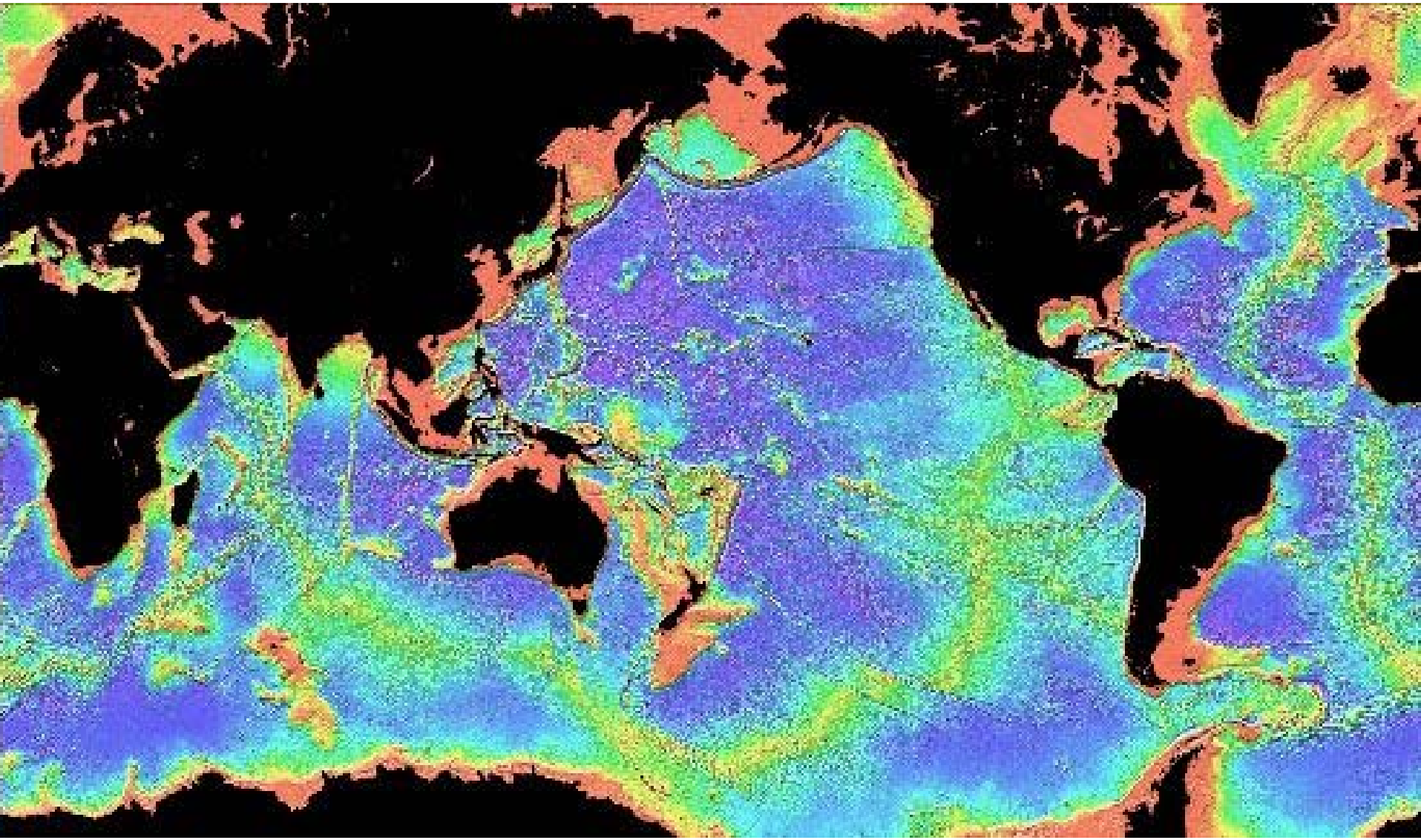
This is the relief map of the world. If you go to the URL below, you will be able to click on any of the 45°×45° grids here to view enlarged versions of them.

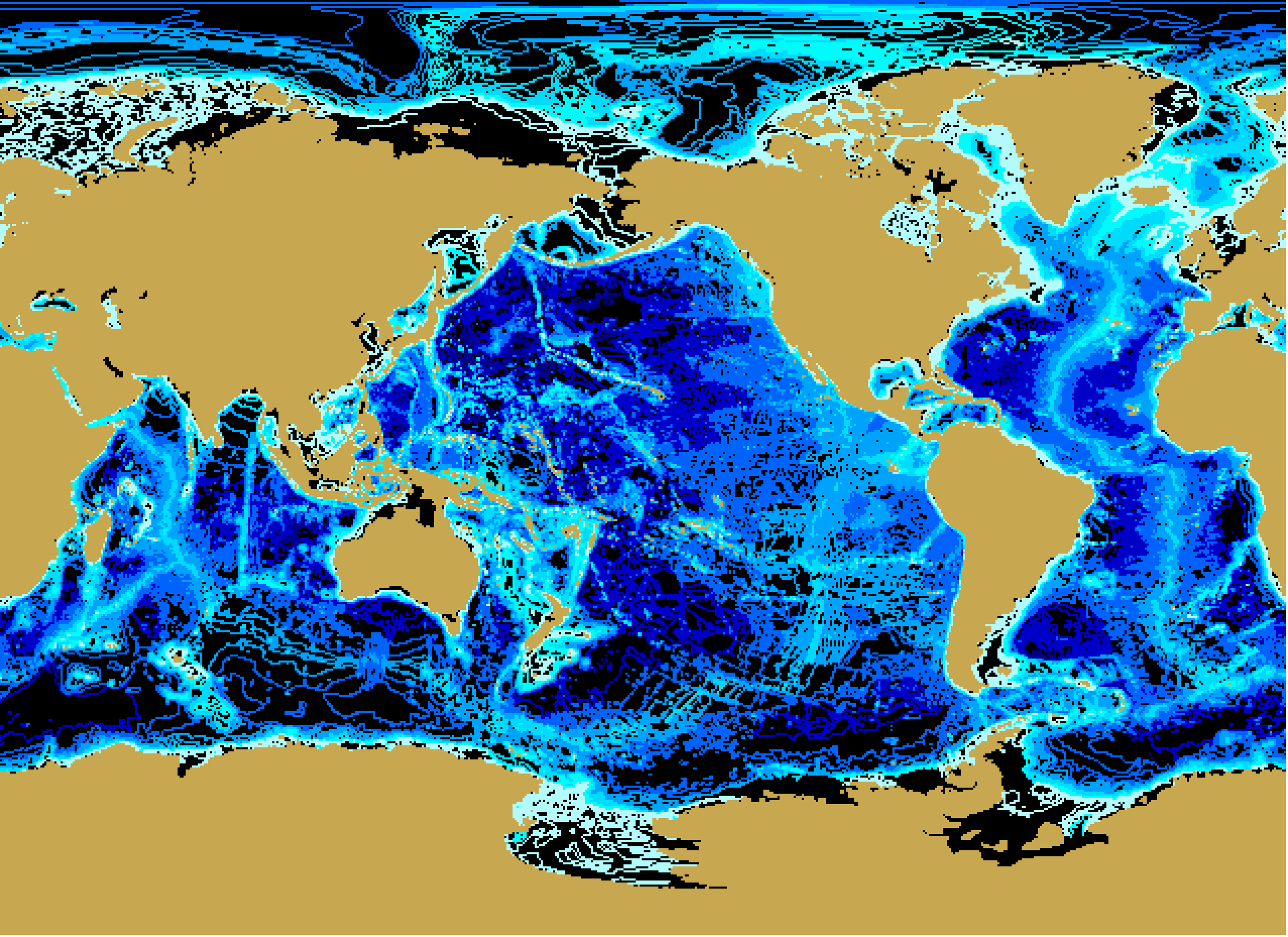


http://www.ngdc.noaa.gov/mgg/image/2minrelief.html

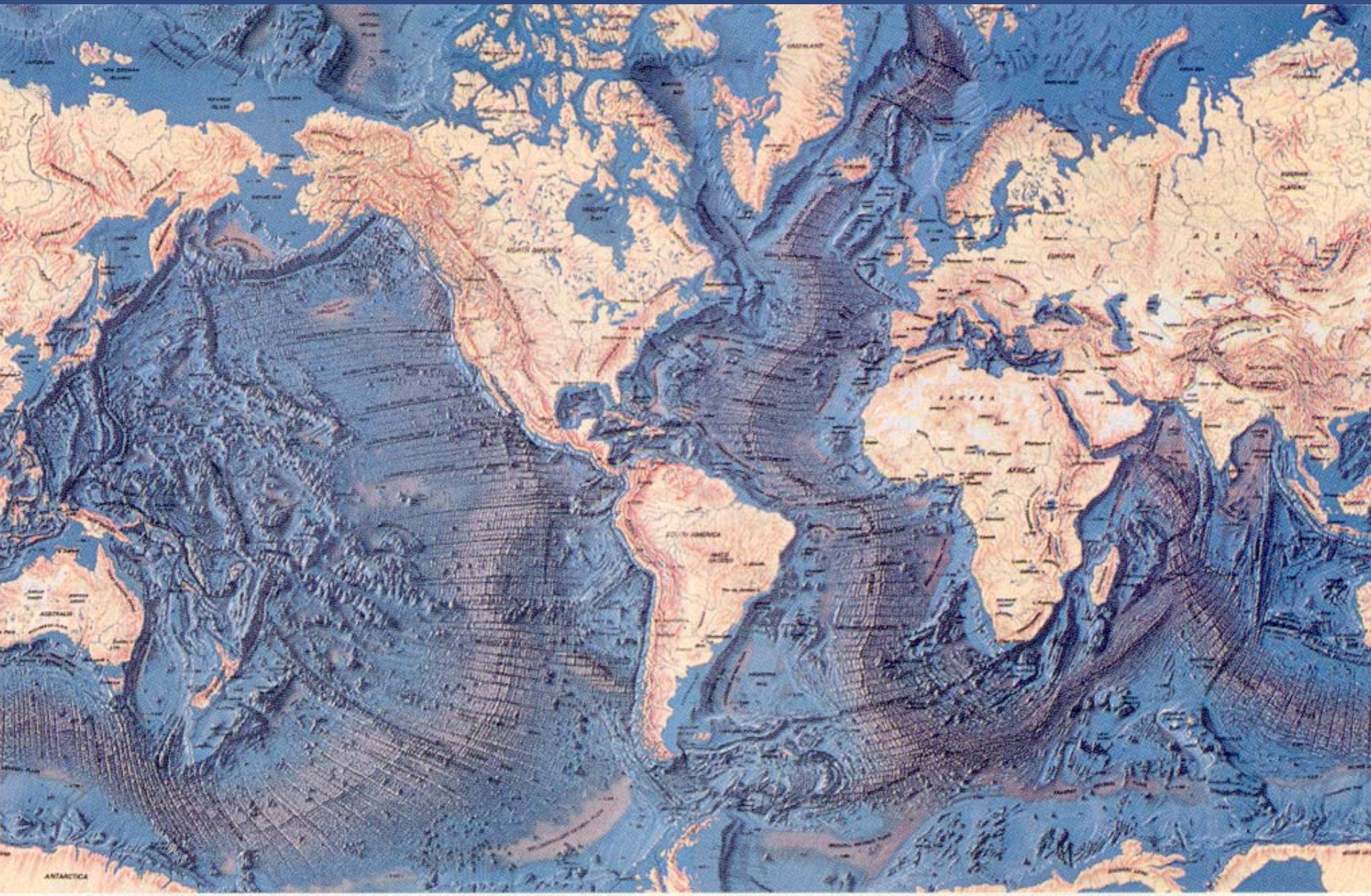


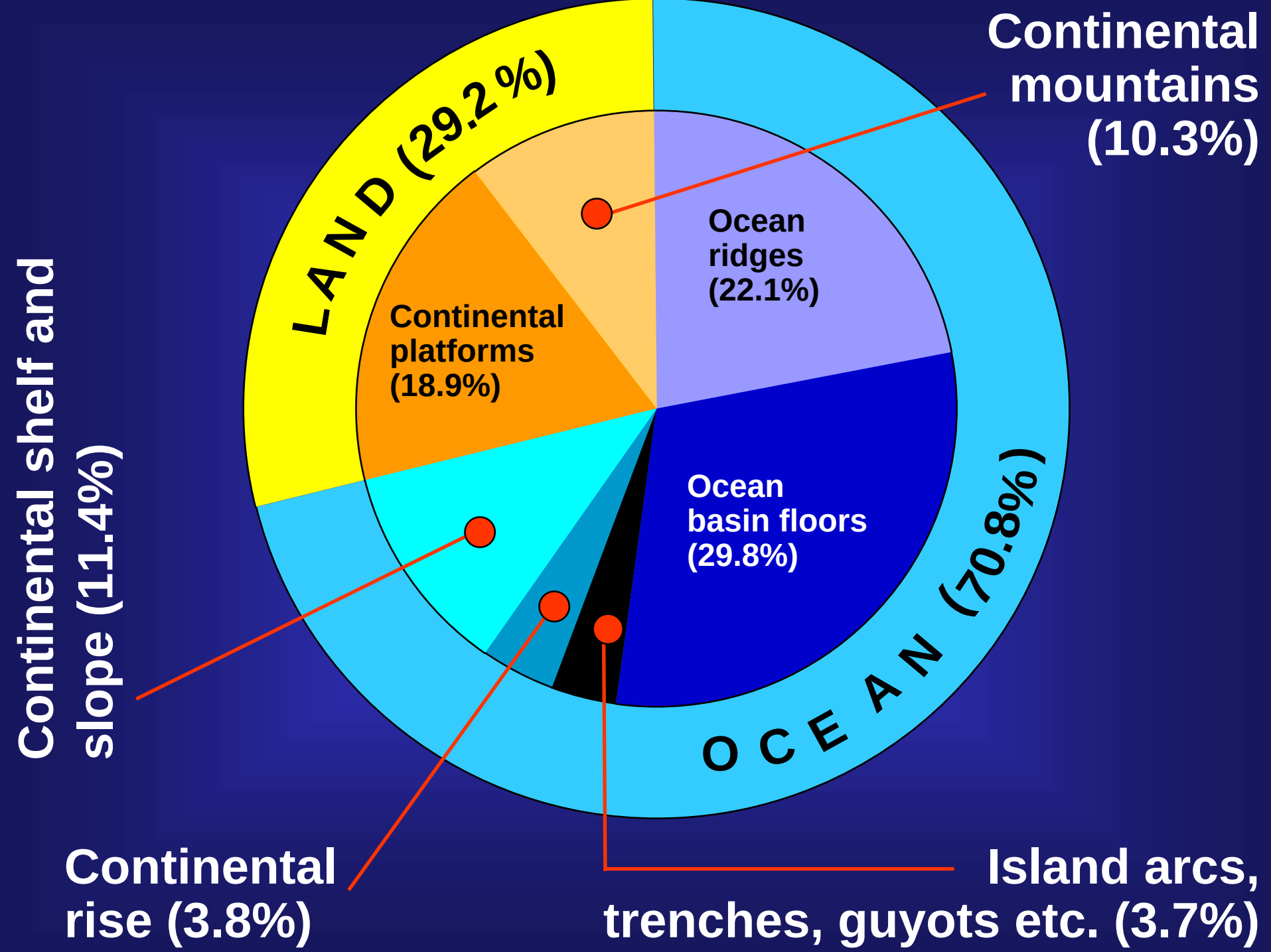


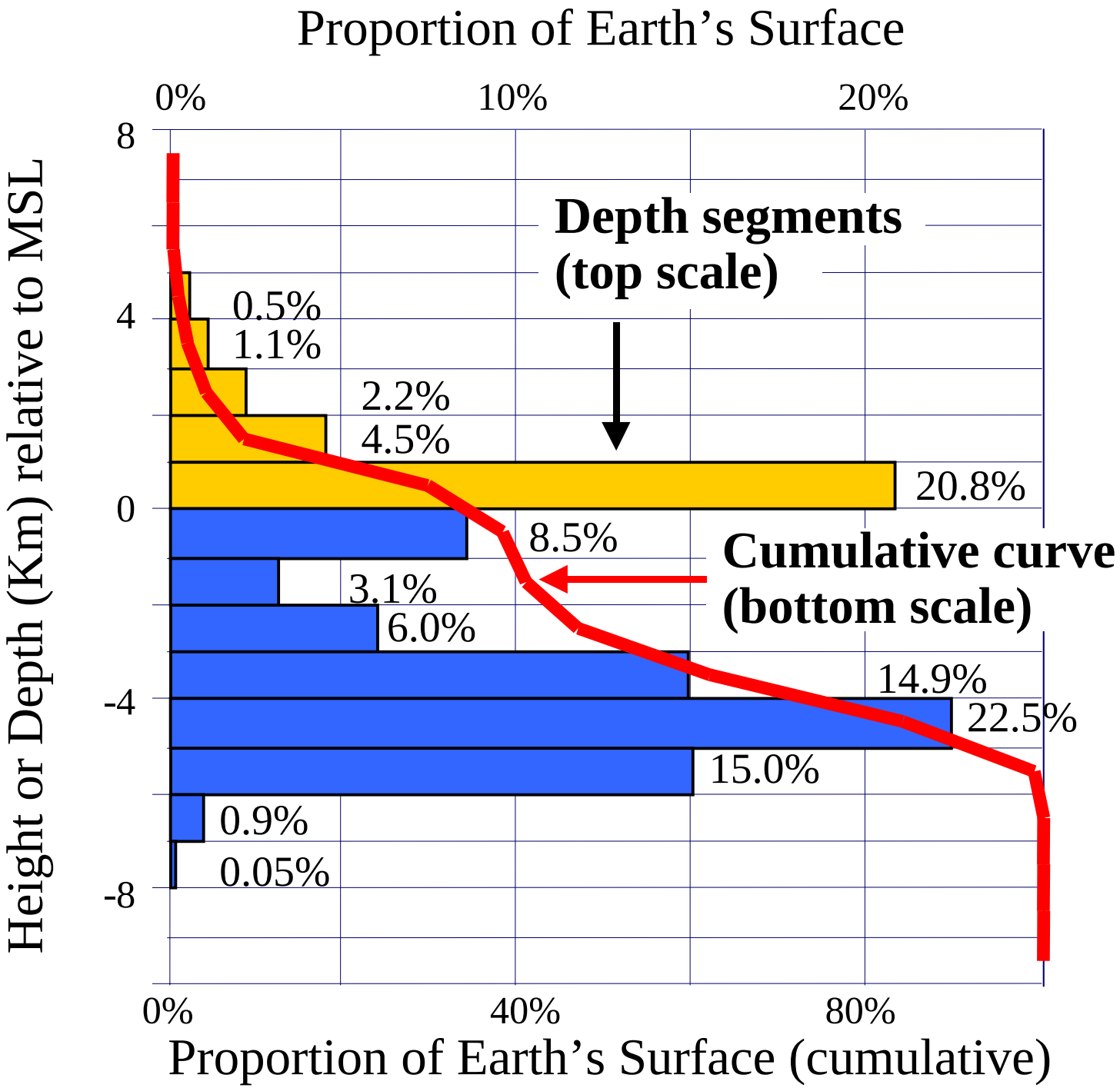


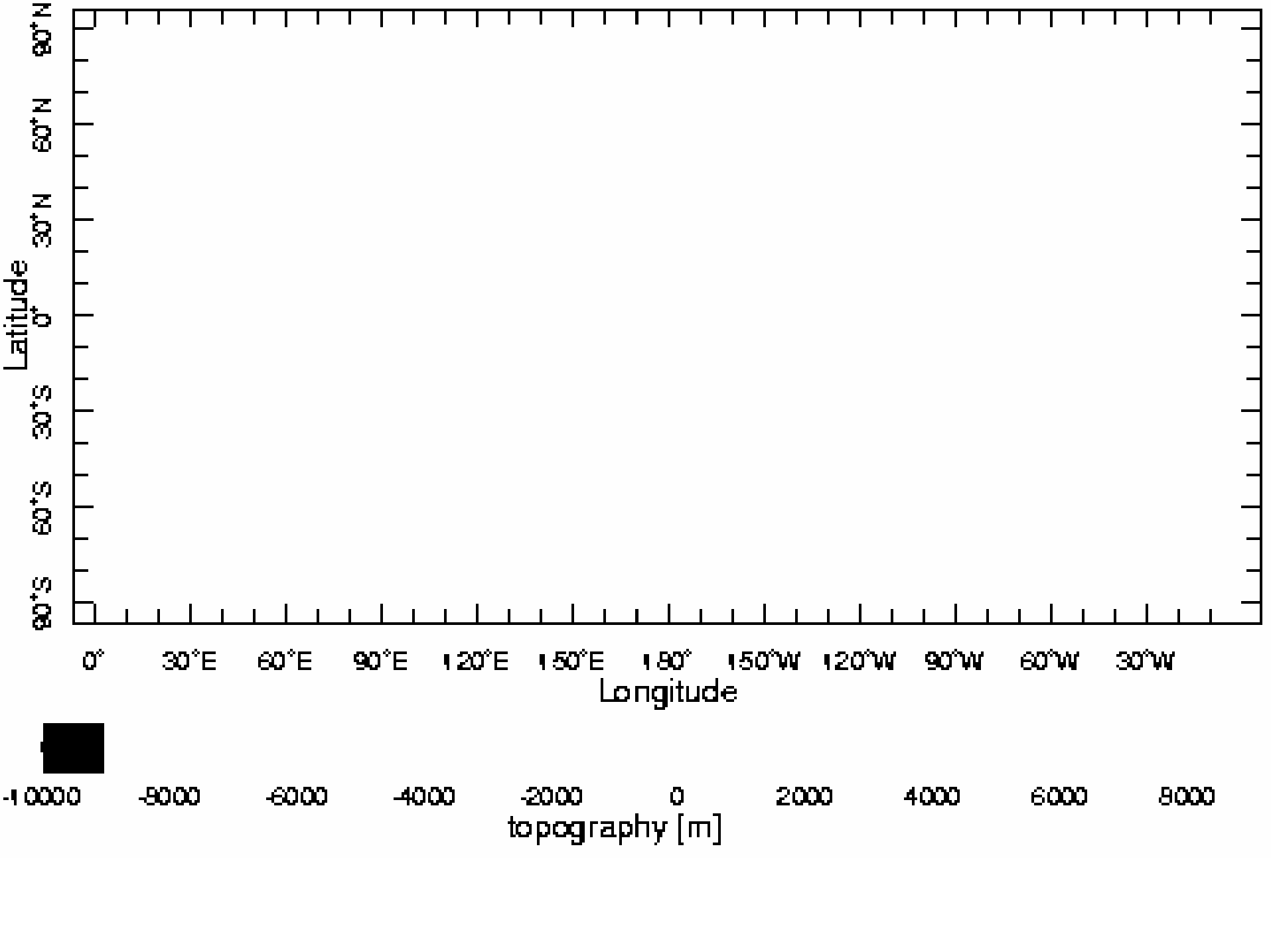


Bathymetry of the world's oceans displayed from the GEBCO Digital Atlas


AFRICA
SOUTH AMERICA
AUSTRALIA
ANTARCTICA


LAND (29.2%)
OCEAN (70.8%)
Continental platforms (18.9%)
Ocean ridges (22.1%)
Ocean basin floors (29.8%)
Continental mountains (10.3%)
Continental shelf and slope (11.4%)
Continental rise (3.8%)
Island arcs, trenches, guyots etc. (3.7%)


Proportion of Earth's Surface
0%
10%
20%
8
4
0
-4
-8
Height or Depth (Km) relative to MSL
Depth segments
(top scale)
0.5%
1.1%
2.2%
4.5%
20.8%
8.5%
3.1%
6.0%
14.9%
22.5%
15.0%
0.9%
0.05%
Cumulative curve
(bottom scale)
0%
40%
80%
Proportion of Earth's Surface (cumulative)


90°N
60°N
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90°S
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120°E
150°E
180°
150°W
120°W
90°W
60°W
30°W
Longitude
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-4000
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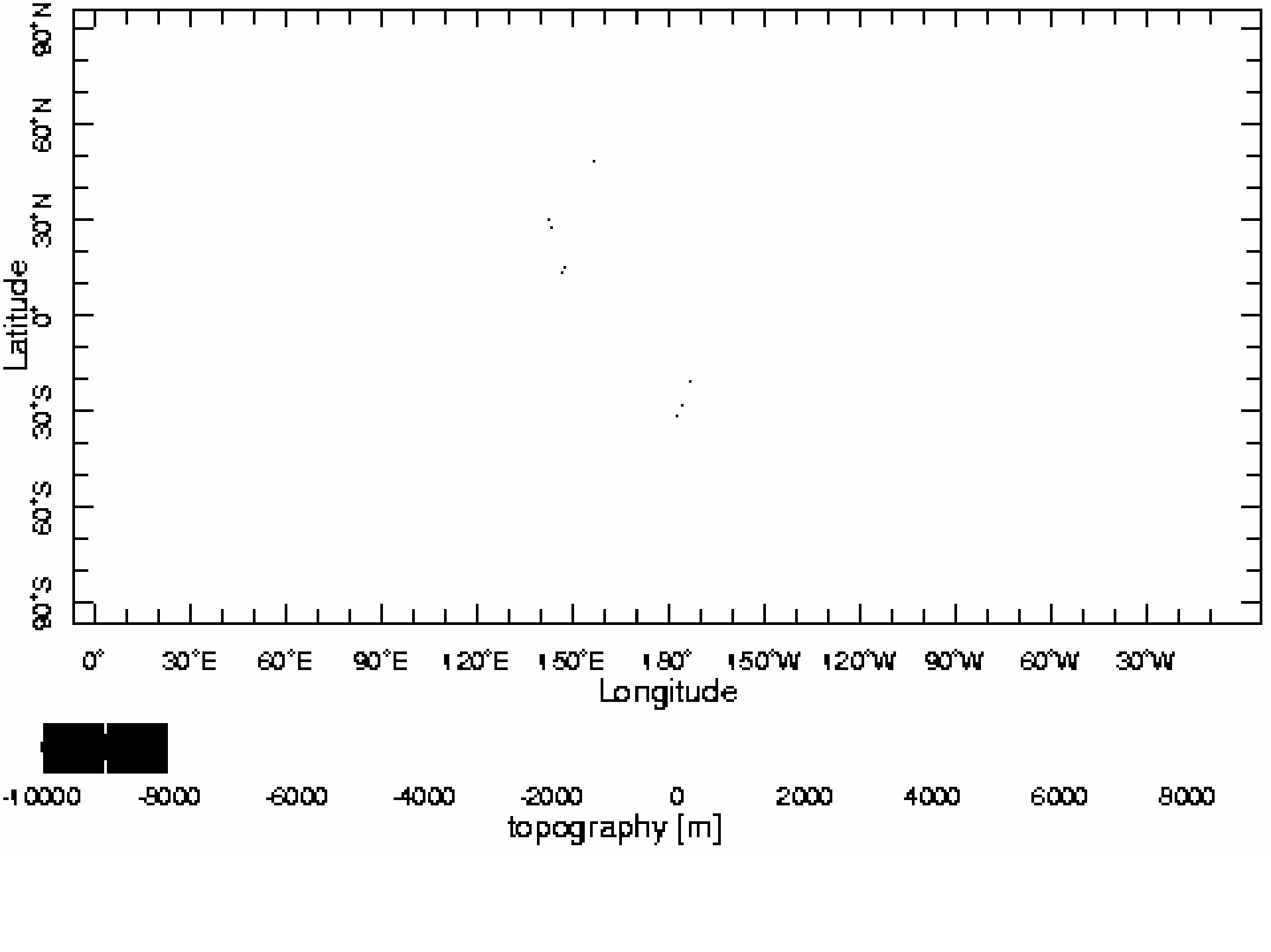
topography [m]


90°N
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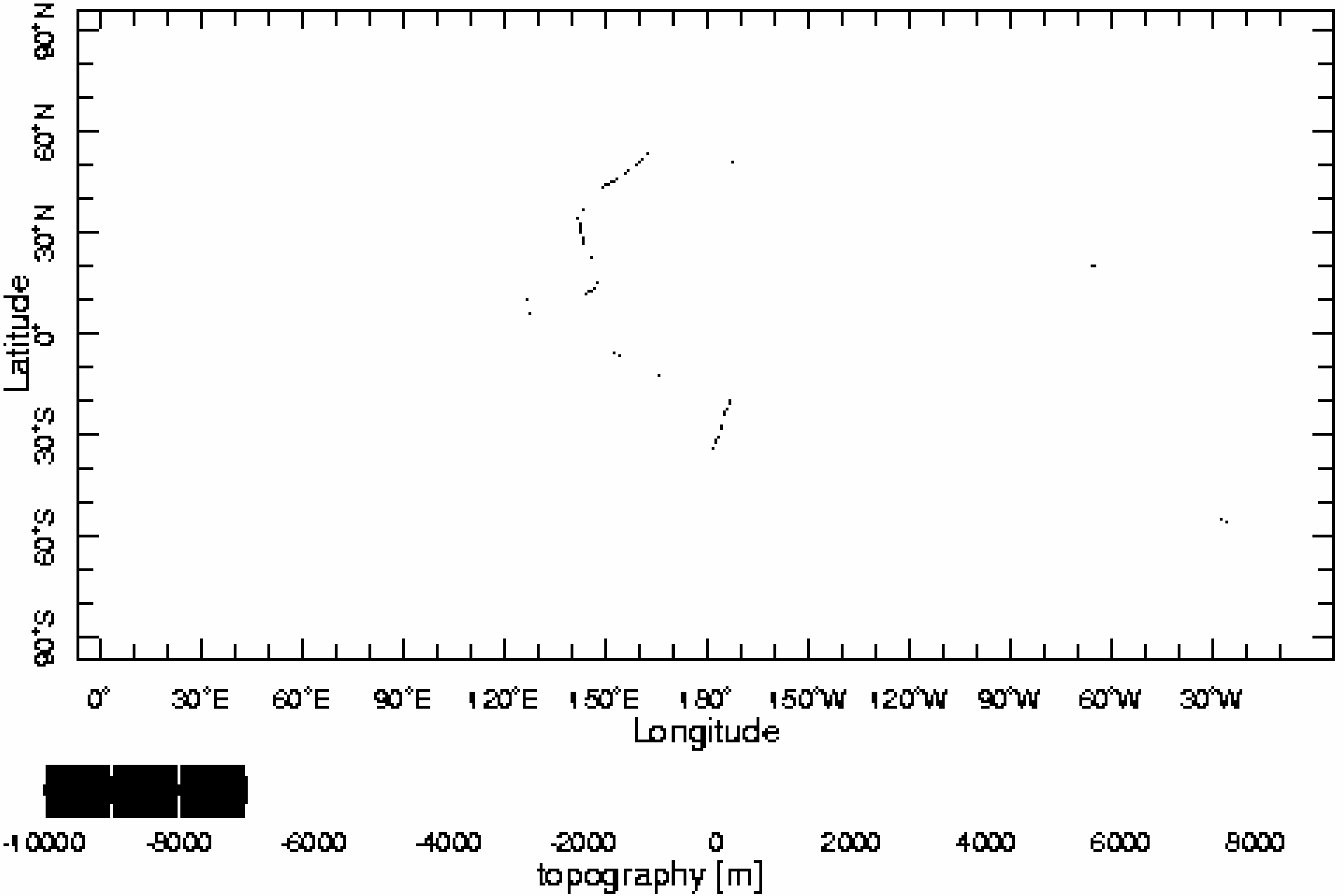
topography [m]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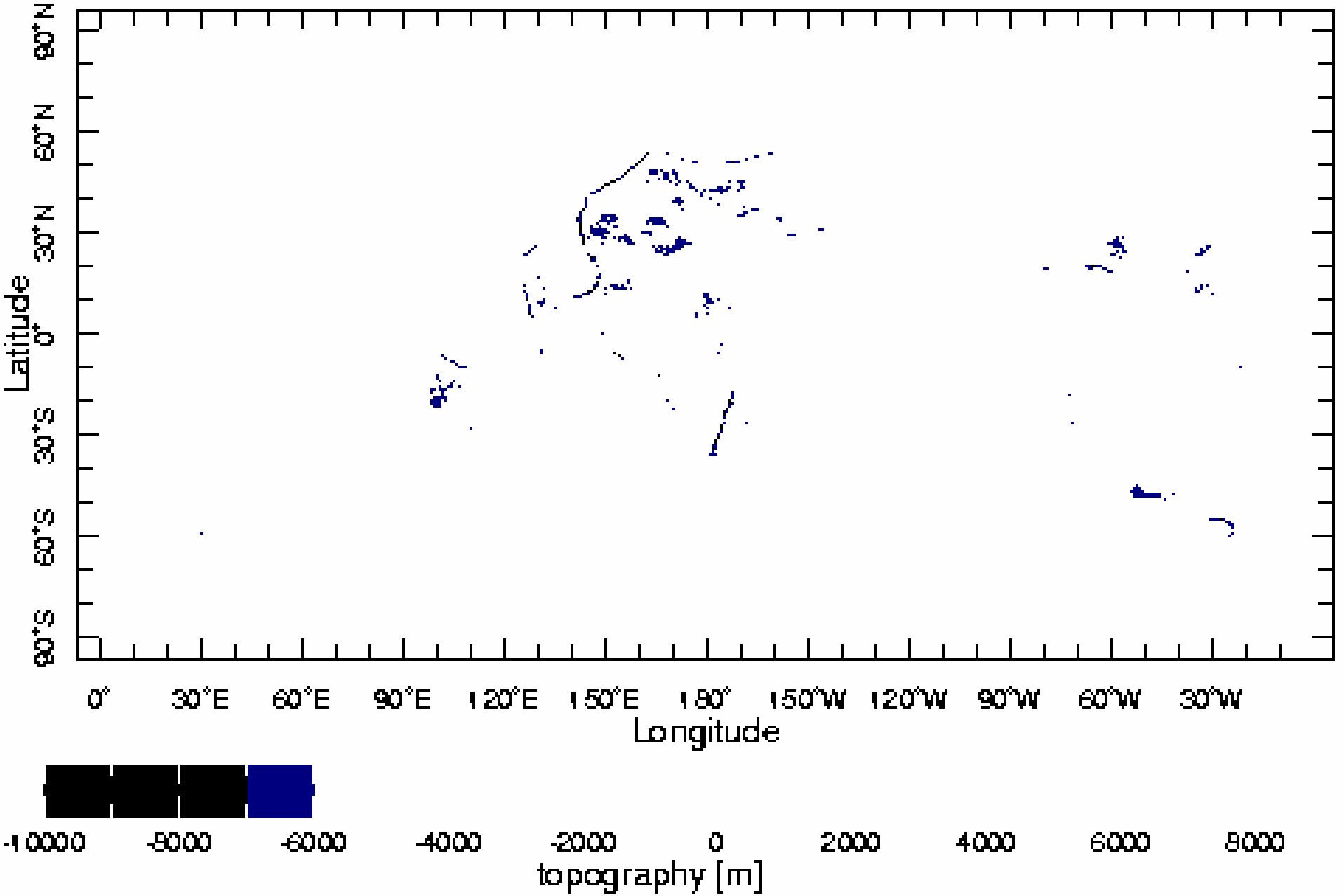
topography [m]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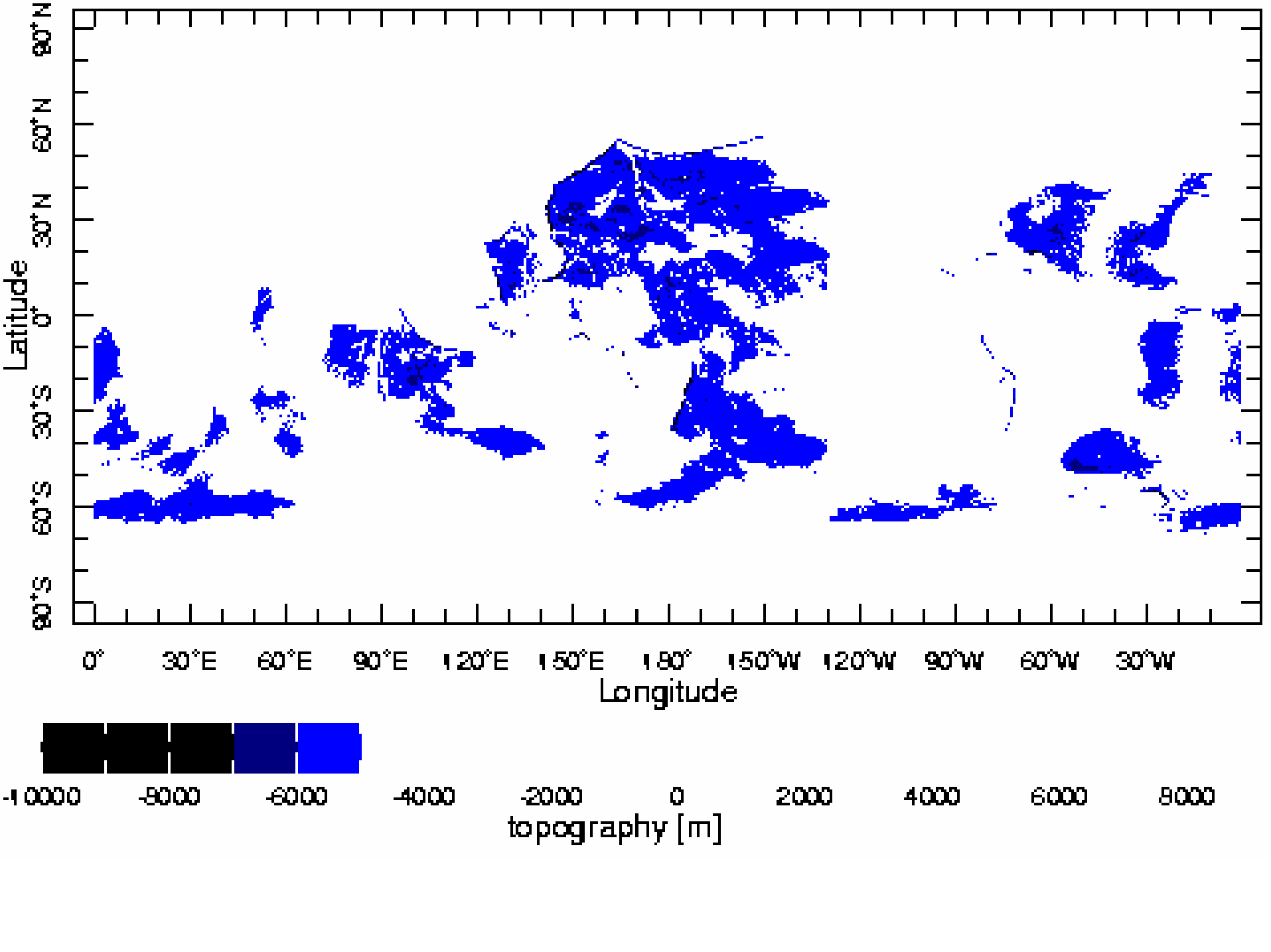
topography [m]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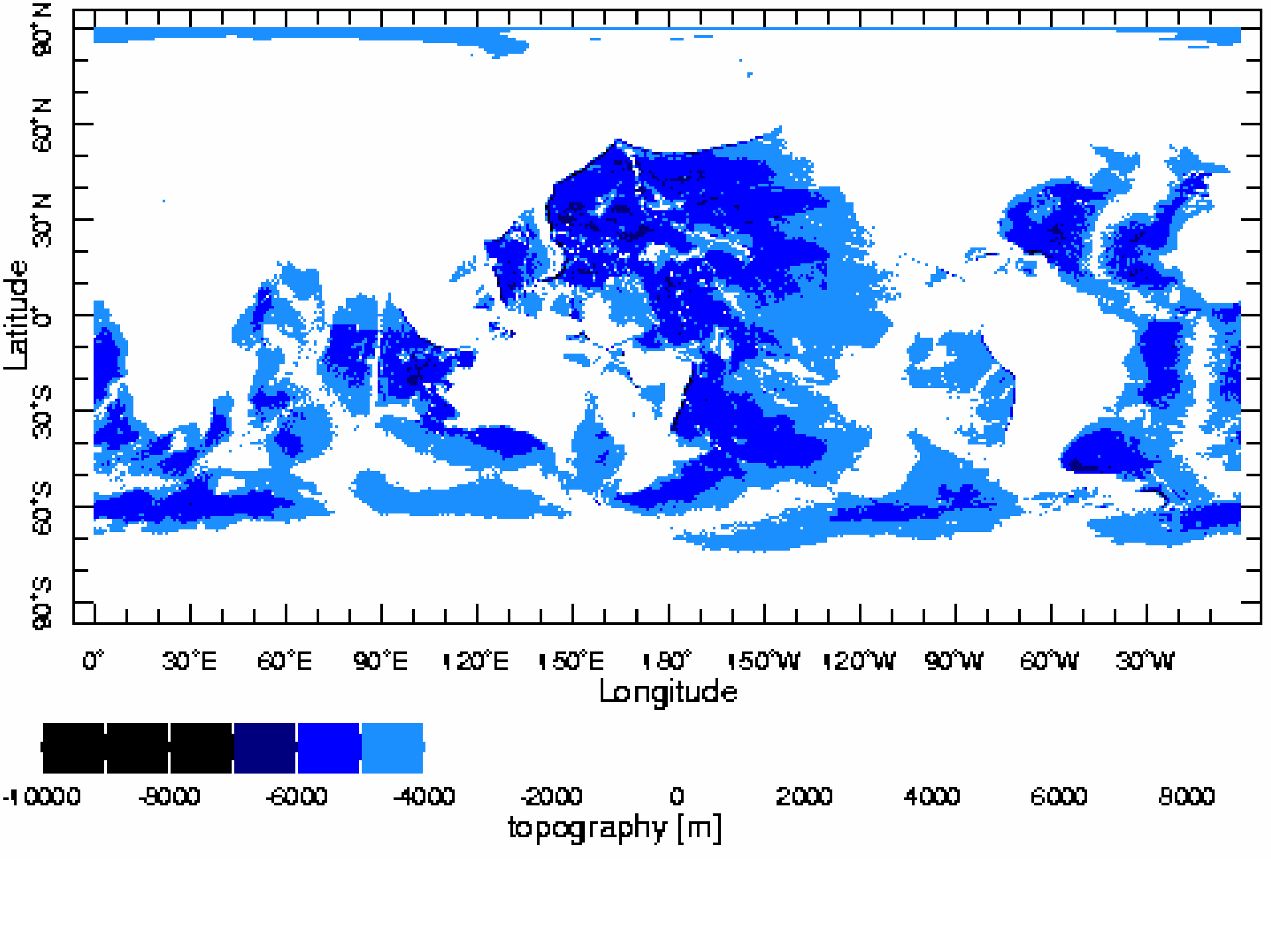
topography [m]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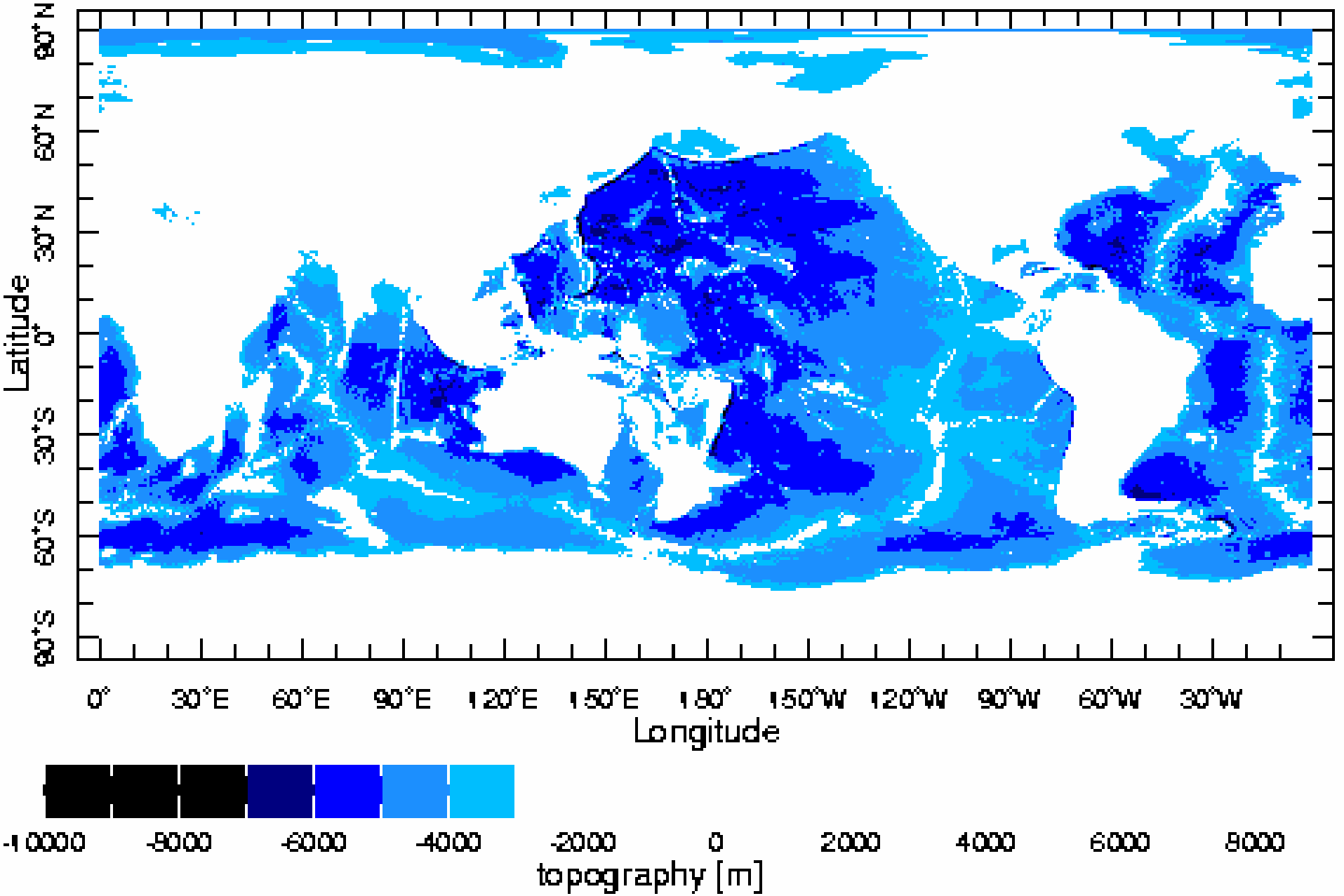
90°N
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Latitude
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150°E
180°
150°W
120°W
90°W
60°W
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Longitude
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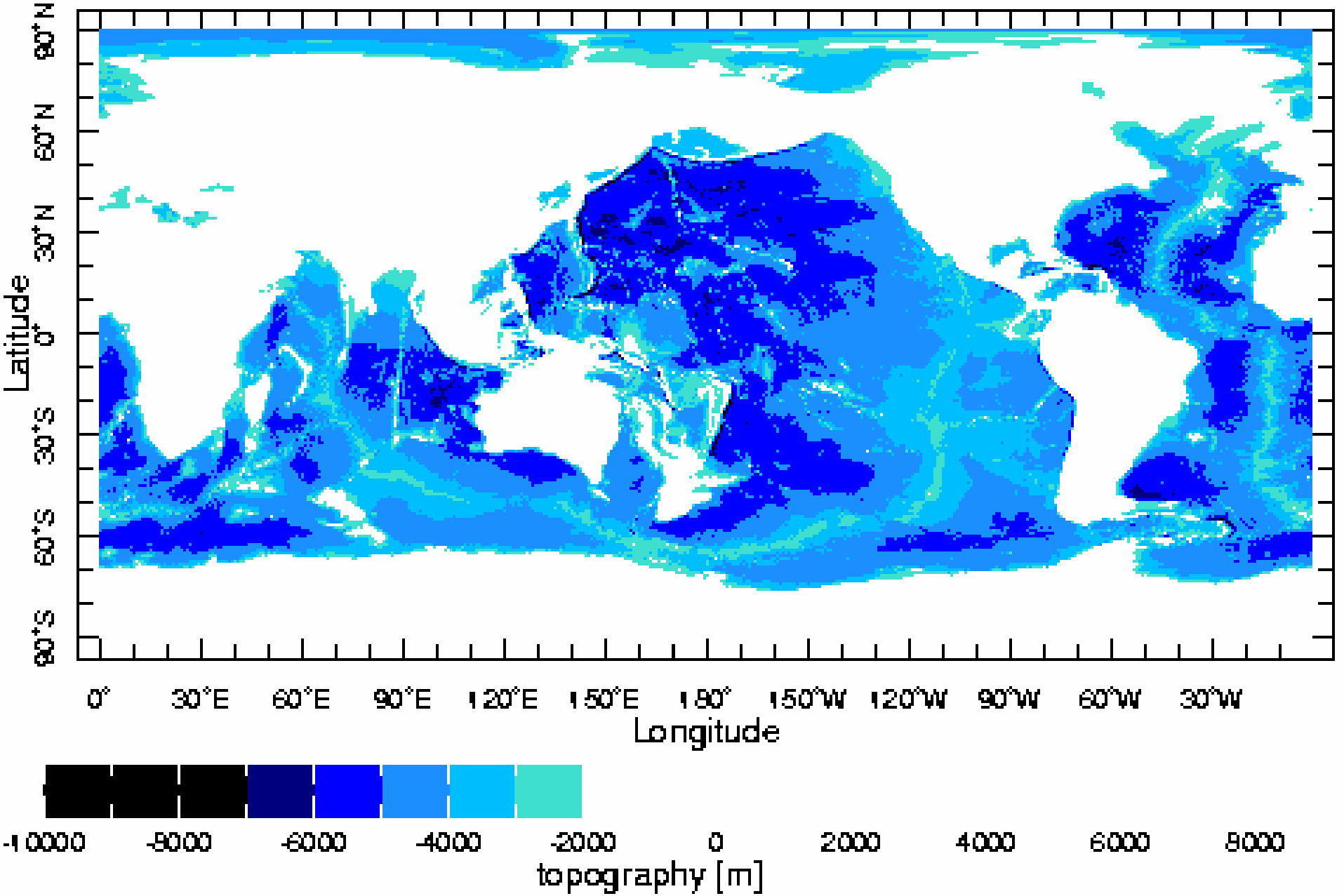
8000
topography [m]


90°N
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60°S
90°S
Latitude
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150°E
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90°W
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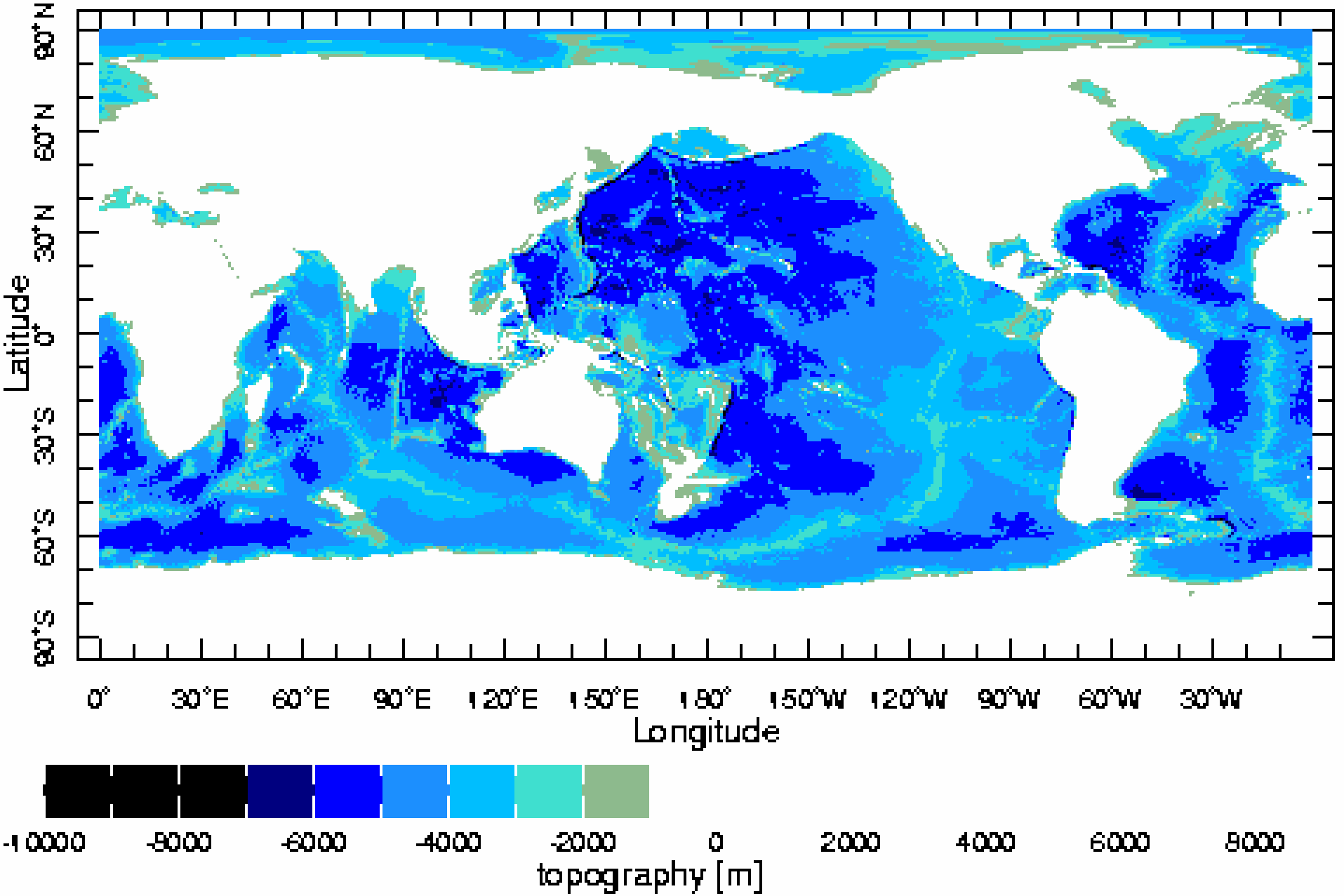
topography [m]


90°N
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180°
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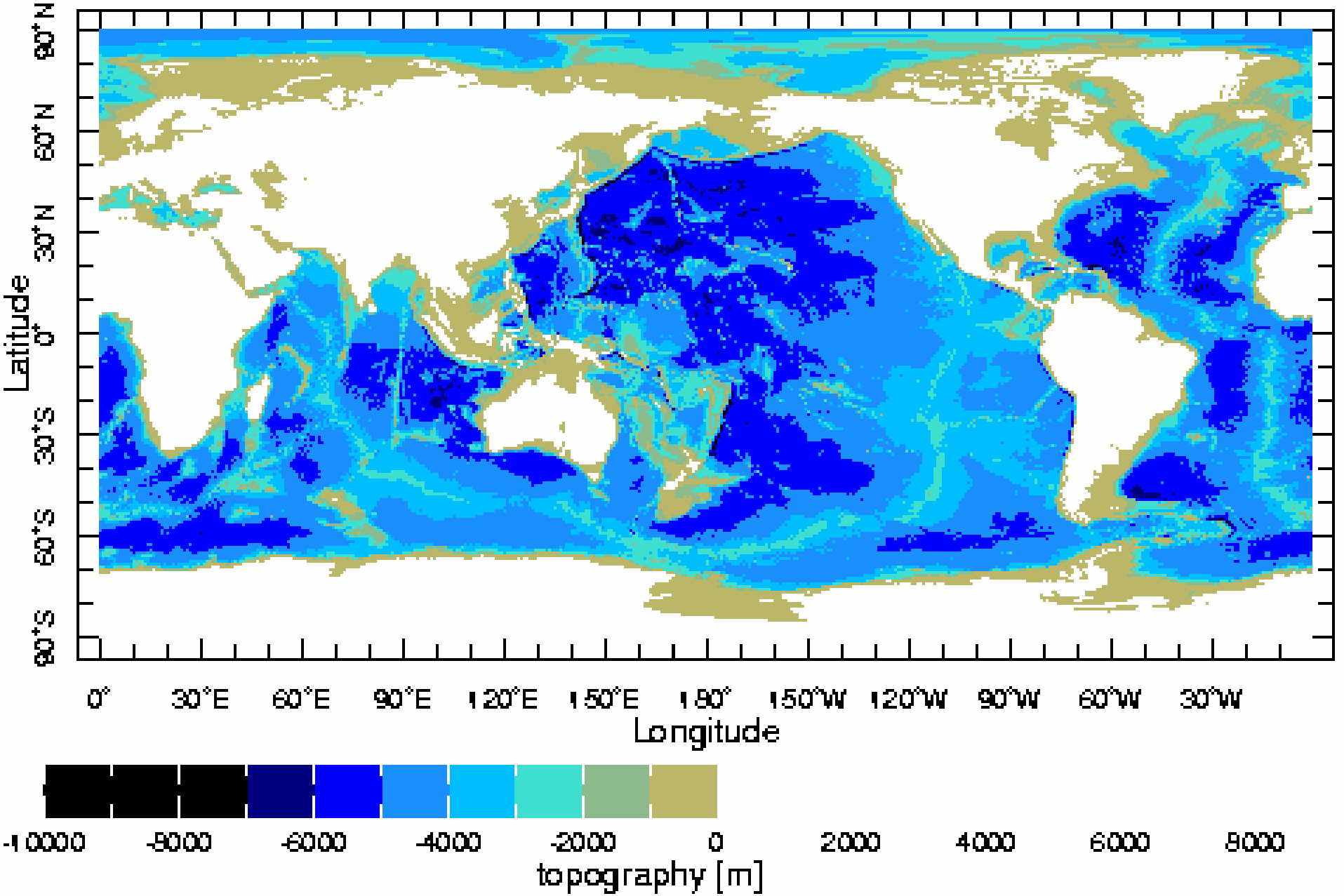
90°N
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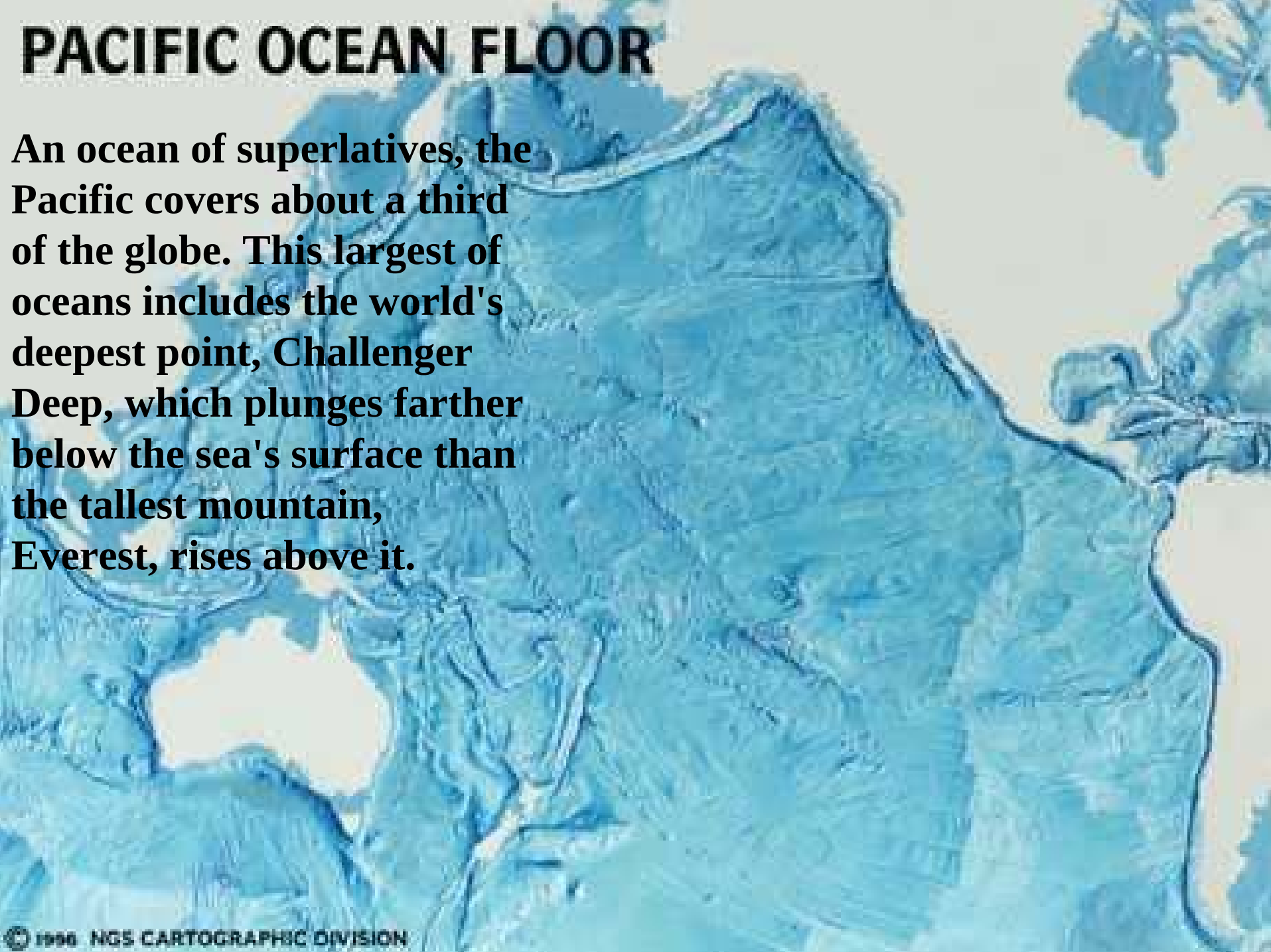
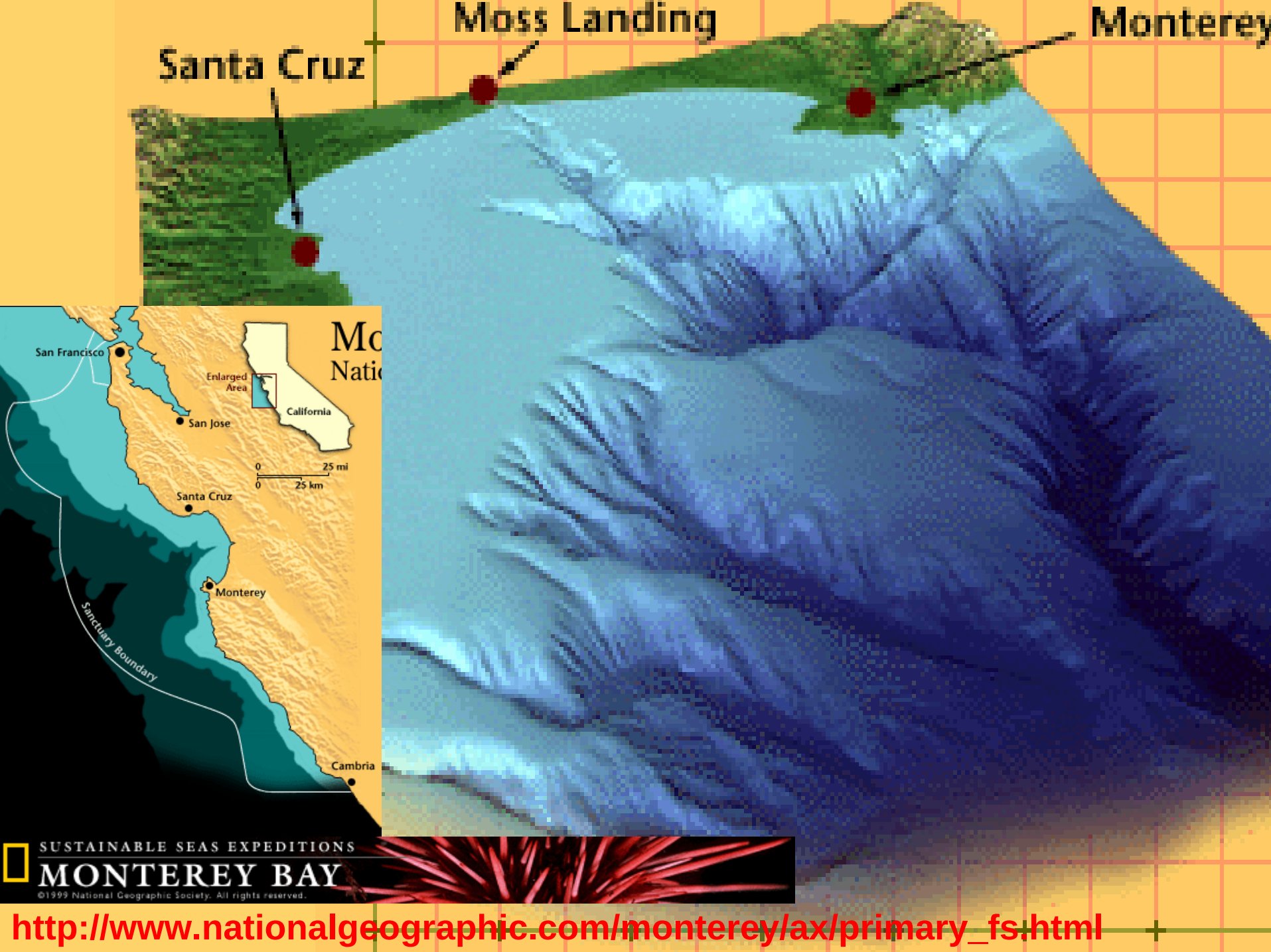
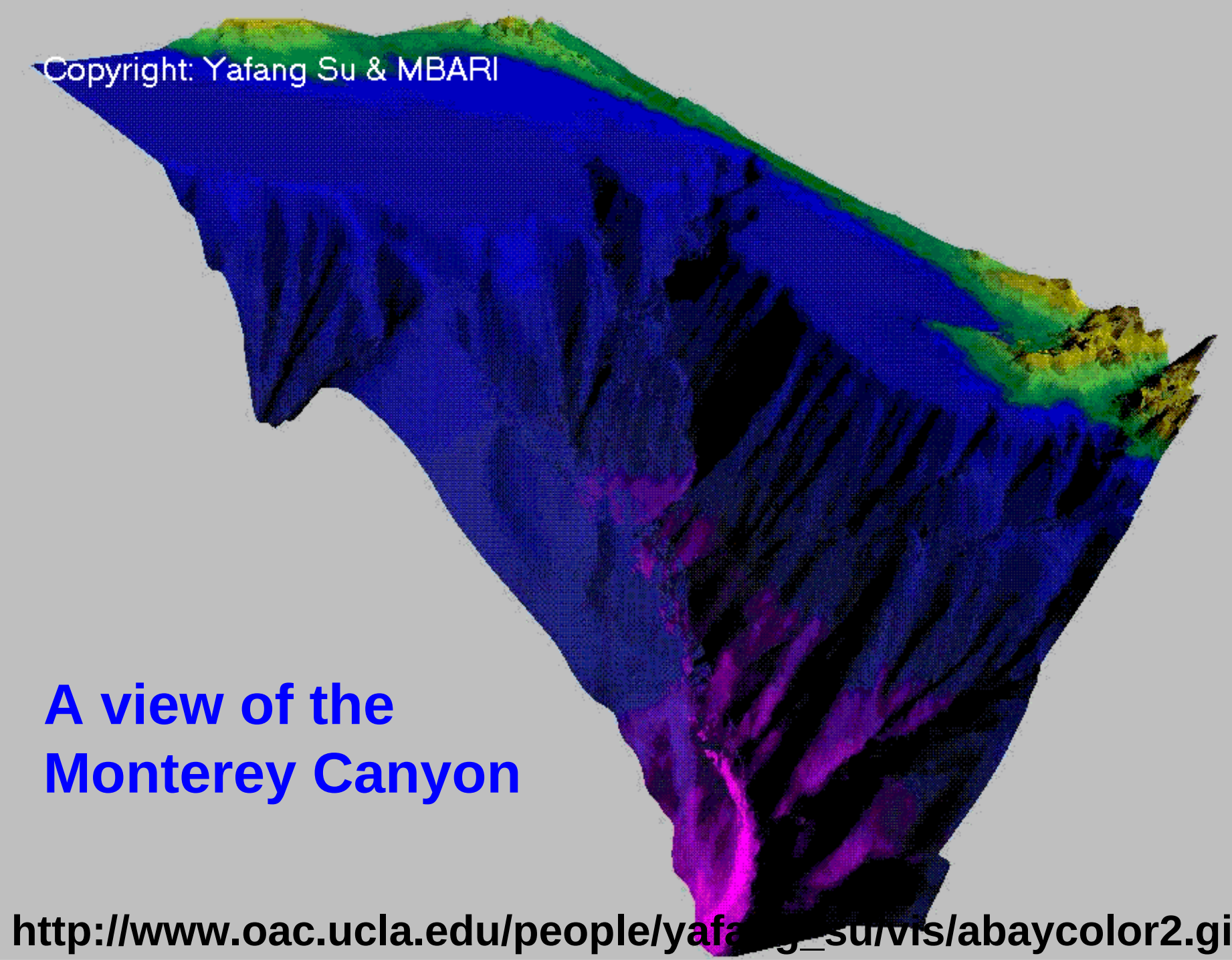
topography [m]


PACIFIC OCEAN FLOOR
An ocean of superlatives, the Pacific covers about a third of the globe. This largest of oceans includes the world's deepest point, Challenger Deep, which plunges farther below the sea's surface than the tallest mountain, Everest, rises above it.
© 1996 NGS CARTOGRAPHIC DIVISION

Just more than half the size of the Pacific, the Atlantic is the second largest ocean. Its central underwater mountain range, the Mid-Atlantic Ridge, was not directly seen or explored until 1973.

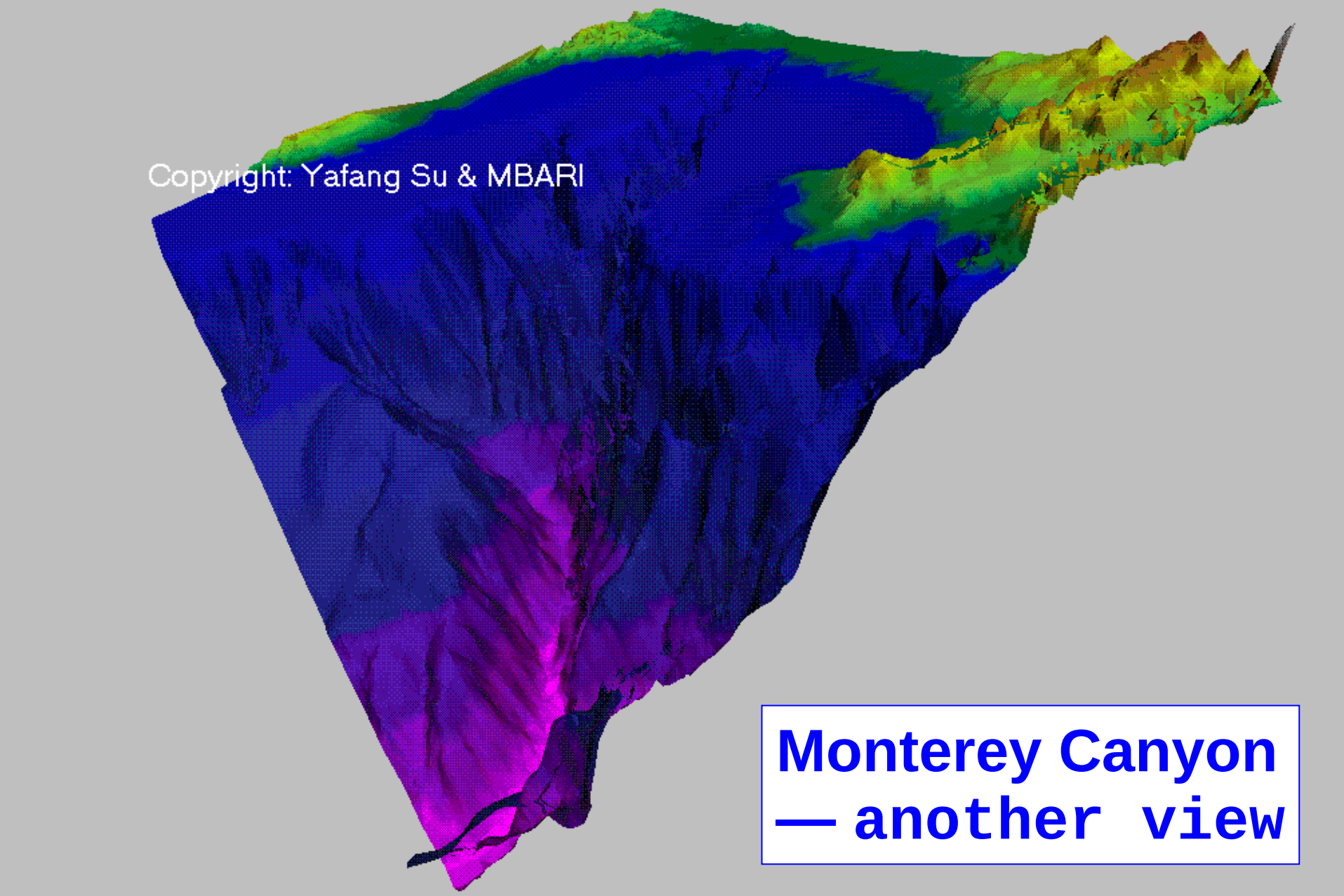


http://www.nationalgeographic.com/monterey/ax/primary_fs.html



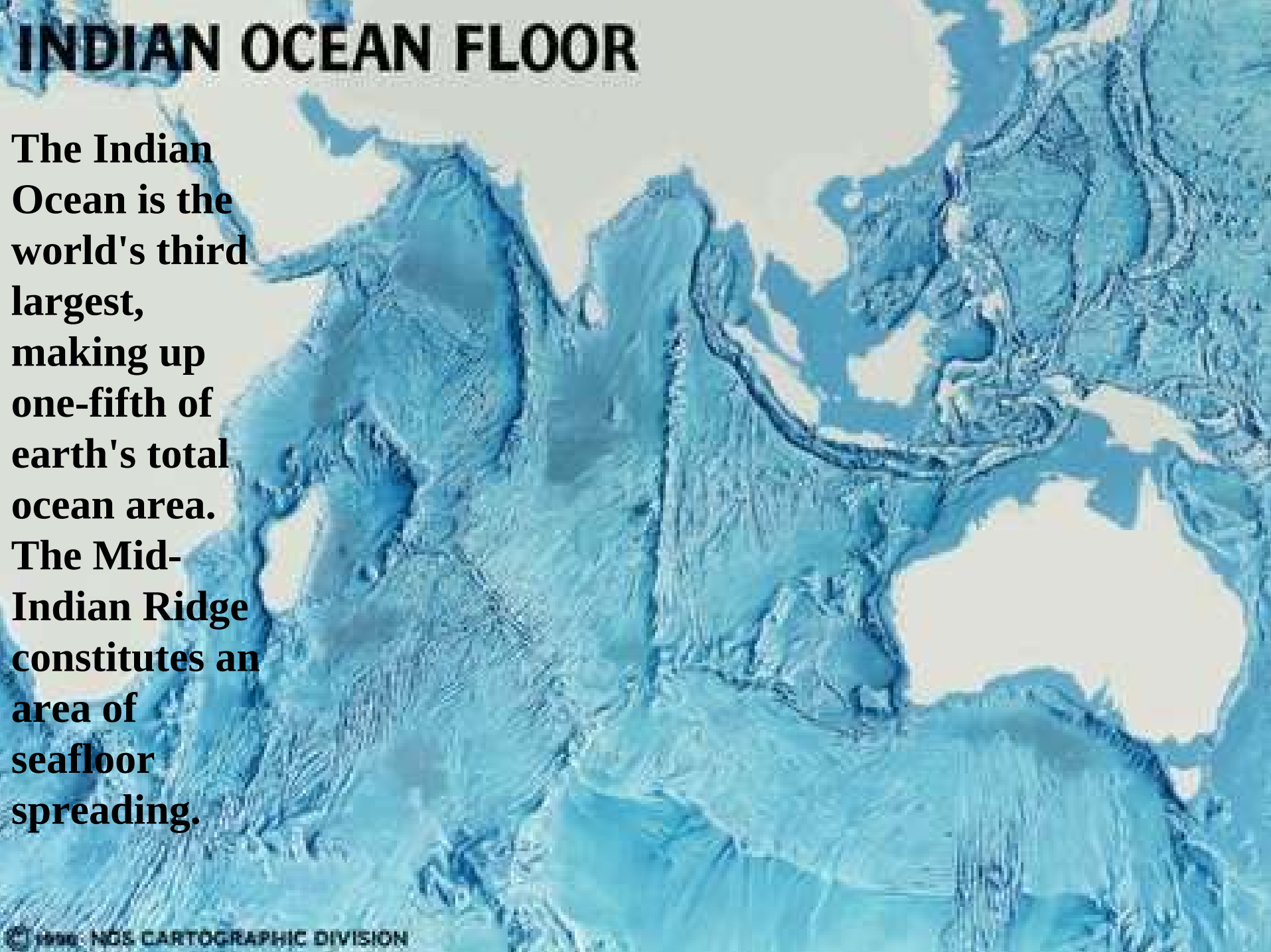
A view of the Monterey Canyon

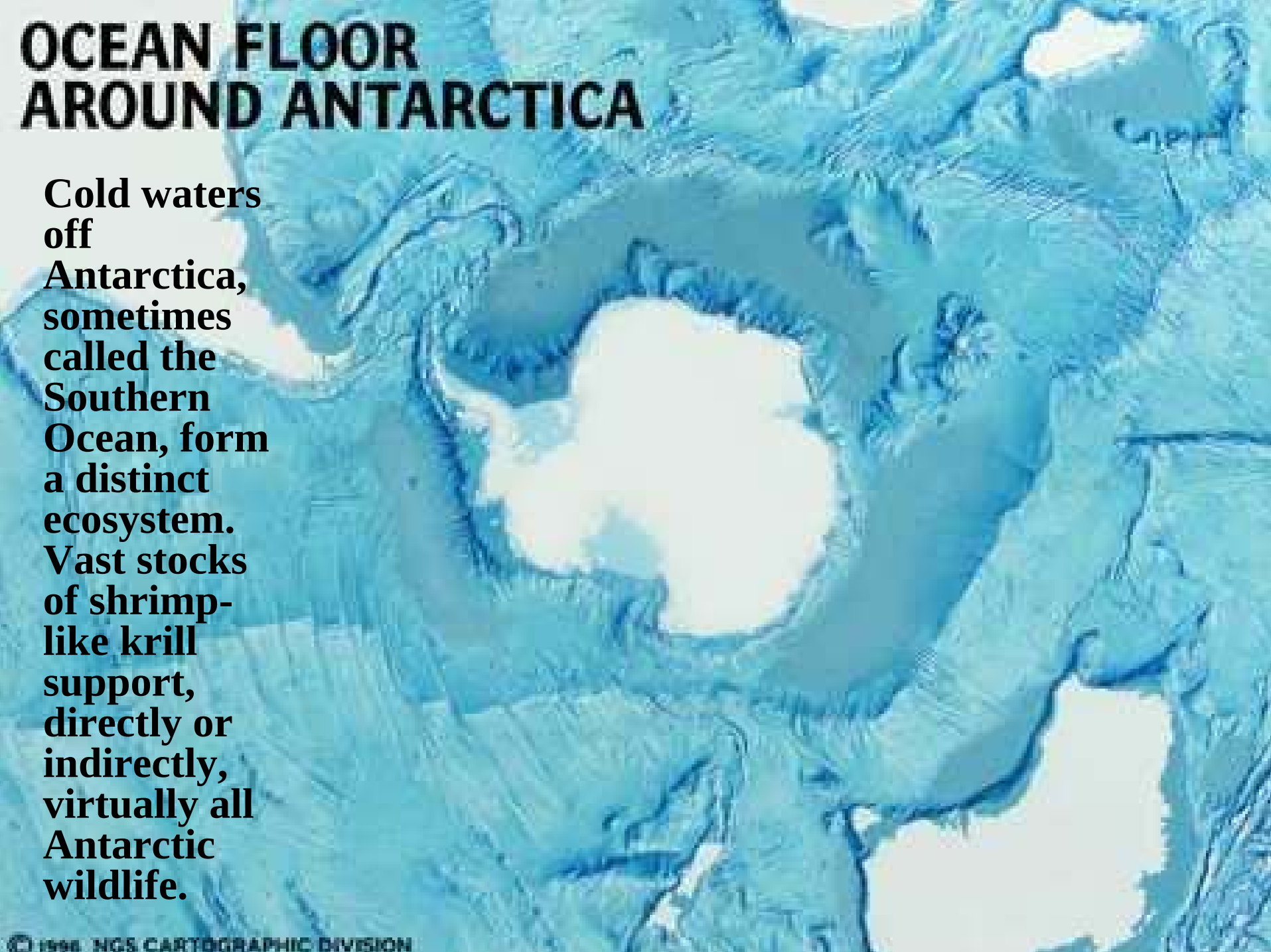
http://www.oac.ucla.edu/people/yafang_su/vis/abaycolor2.gif



Monterey Canyon — another view

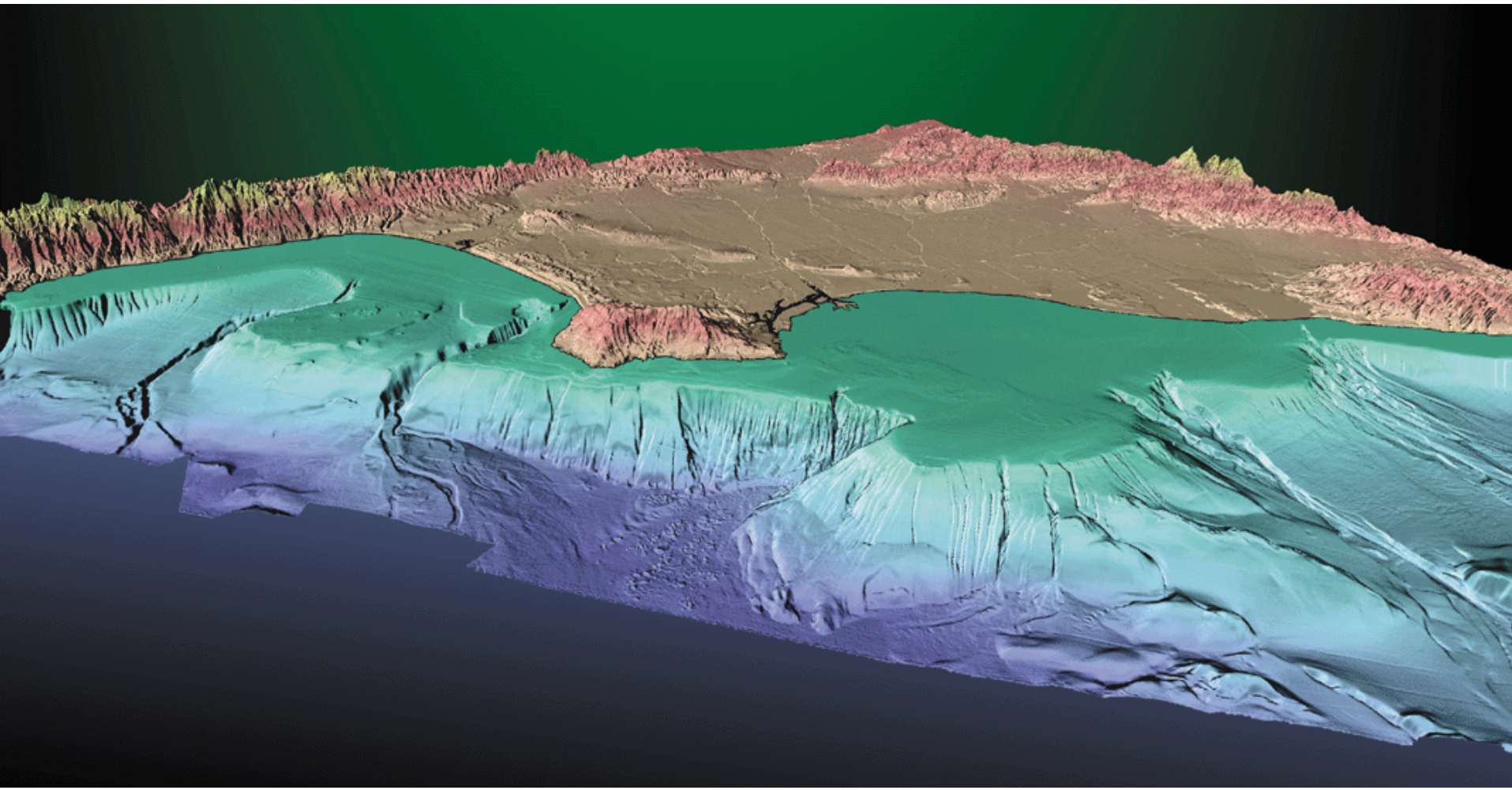
http://www.oac.ucla.edu/people/yafang_su/vis/abaycolor.gif


INDIAN OCEAN FLOOR
The Indian Ocean is the world's third largest, making up one-fifth of earth's total ocean area. The Mid-Indian Ridge constitutes an area of seafloor spreading.
1996 NGS CARTOGRAPHIC DIVISION


OCEAN FLOOR
AROUND ANTARCTICA
Cold waters off Antarctica, sometimes called the Southern Ocean, form a distinct ecosystem. Vast stocks of shrimp-like krill support, directly or indirectly, virtually all Antarctic wildlife.
© 1996 NGS CARTOGRAPHIC DIVISION

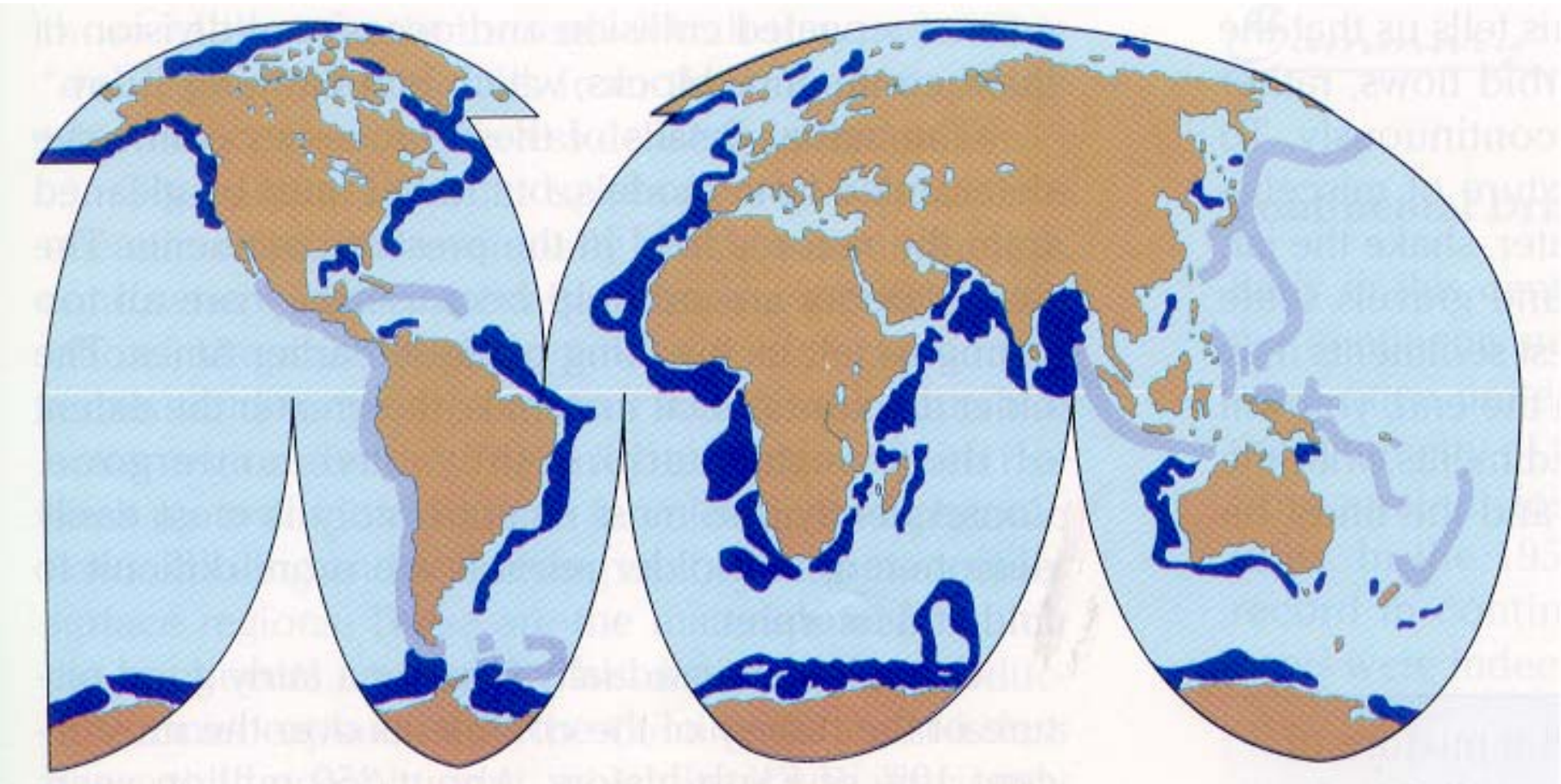

The world's widest continental shelves create relatively shallow seas around the rim of the Arctic. Below pack ice, pushed by wind and currents, ocean floor depths plunge almost three miles.
© 1998 NGS CARTOGRAPHIC DIVISION

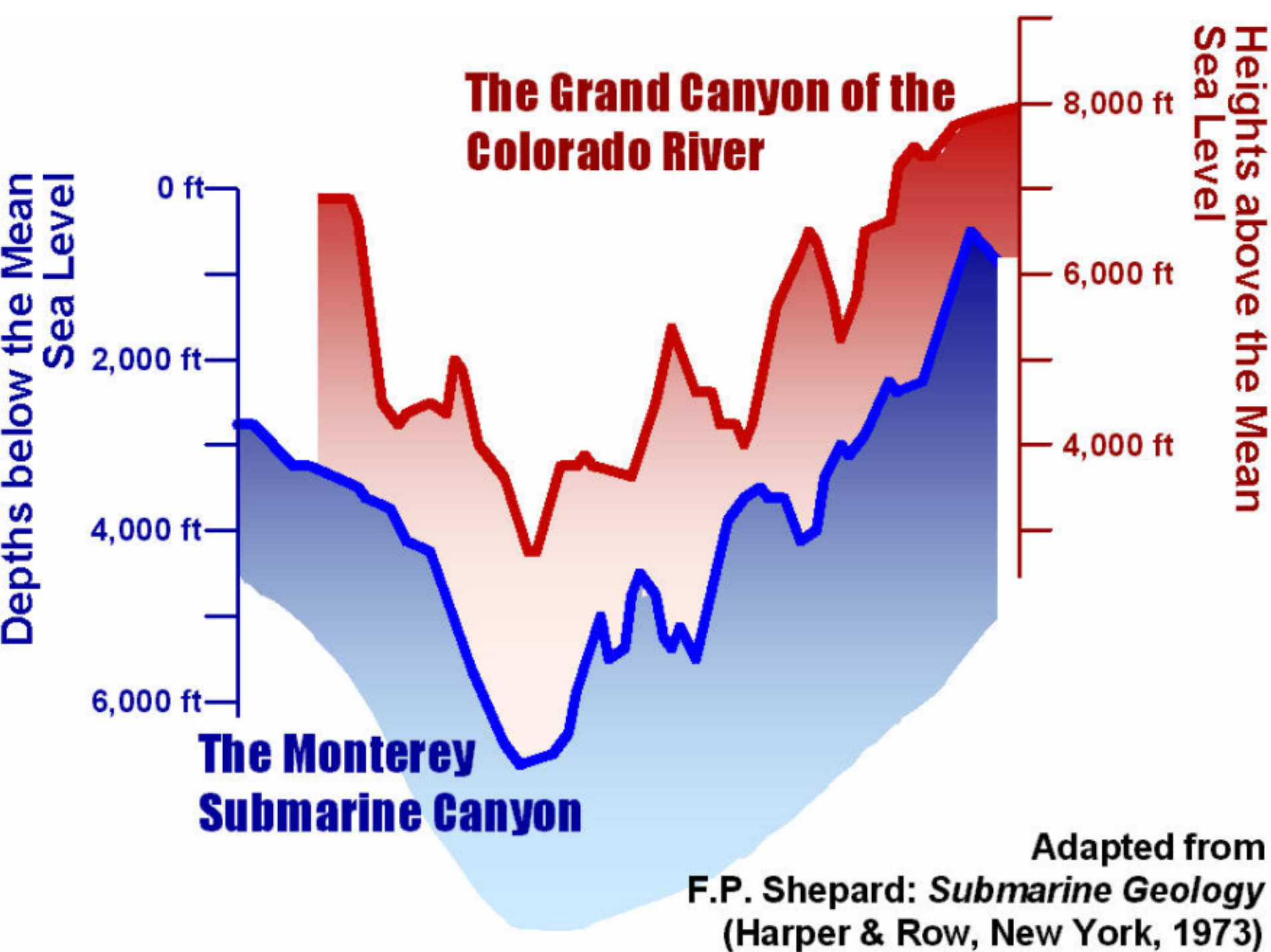
Perspective is looking northeast from the Pacific Ocean towards Los Angeles and Palos Verdes.



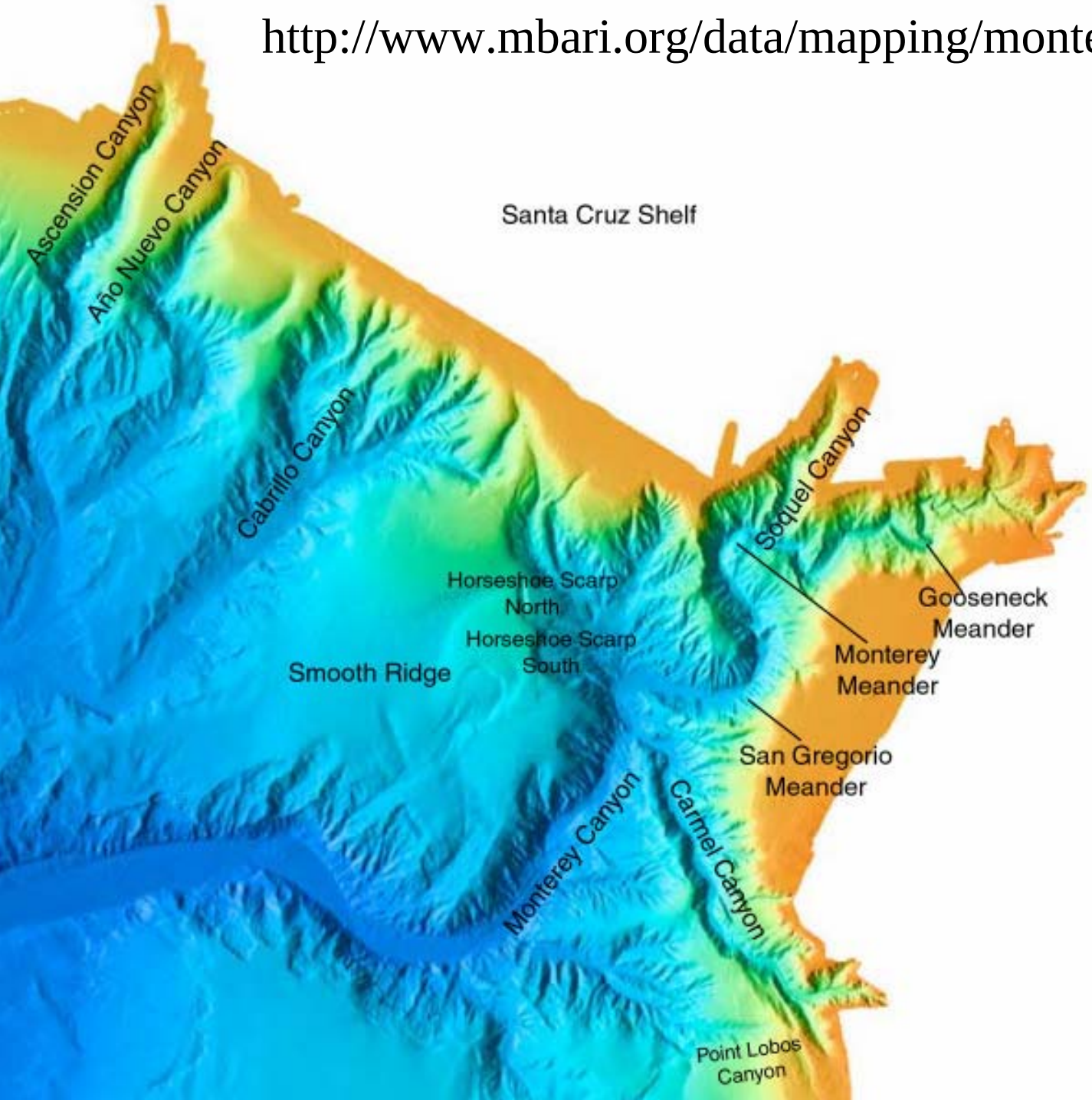
http://walrus.wr.usgs.gov/pacmaps/la_pers2.html

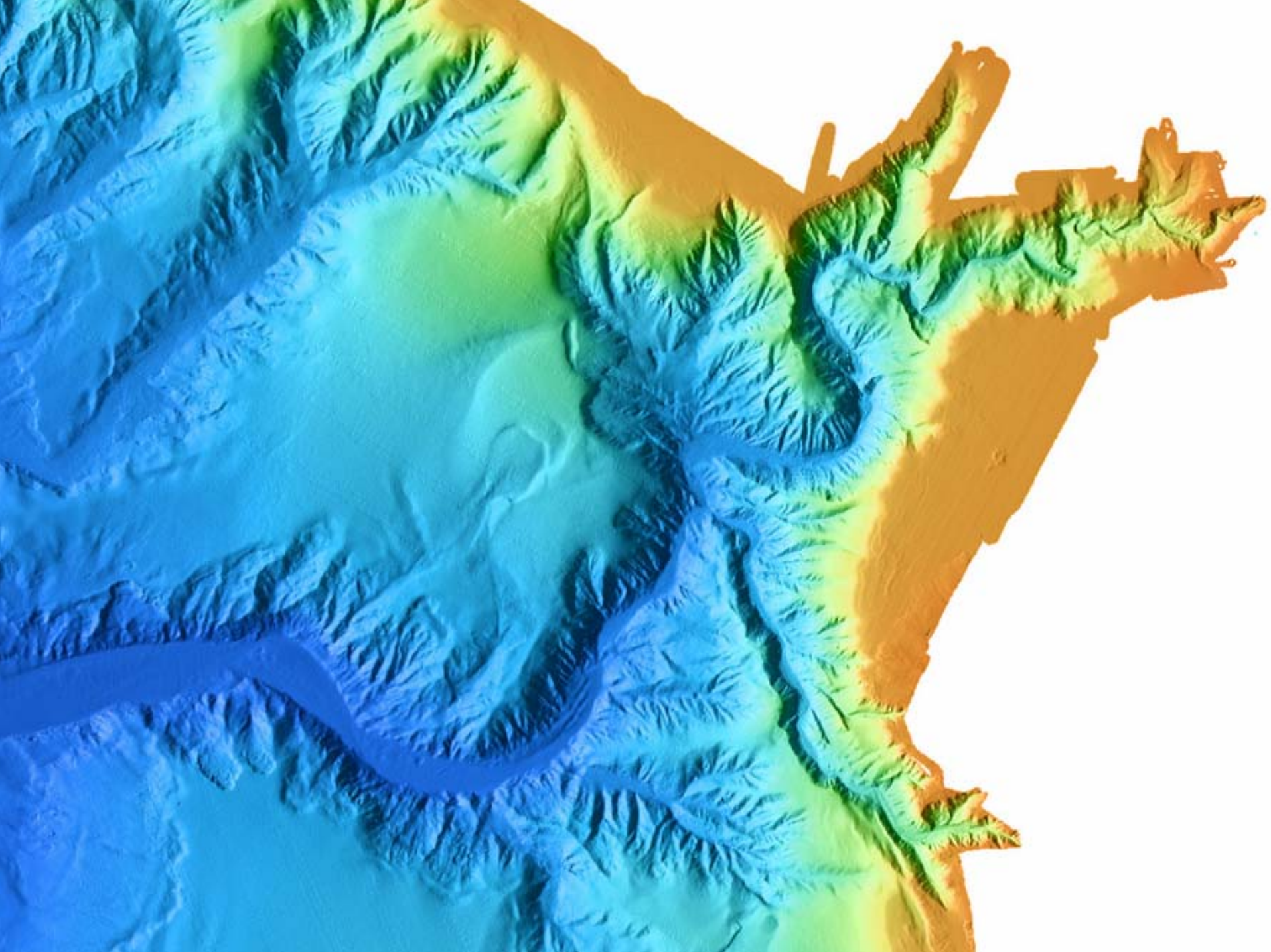
The world distribution of continental rises ( ) and deep sea trenches ( )



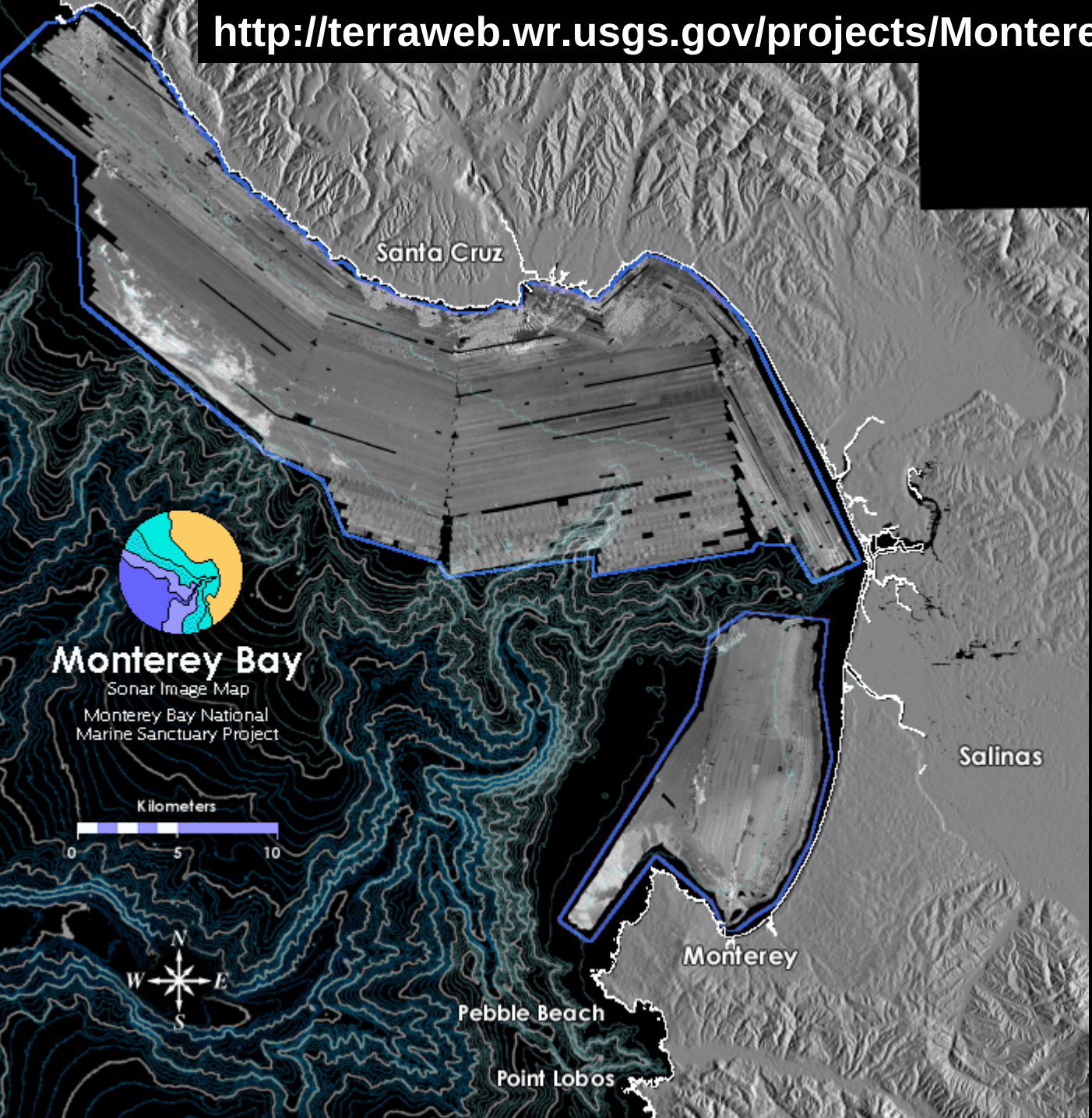

The Grand Canyon of the Colorado River
Depths below the Mean Sea Level
0 ft
2,000 ft
4,000 ft
6,000 ft
Heights above the Mean Sea Level
8,000 ft
6,000 ft
4,000 ft
The Monterey Submarine Canyon
Adapted from
F.P. Shepard: *Submarine Geology*
(Harper & Row, New York, 1973)

http://www.mbari.org/data/mapping/monterey/monterey.htm



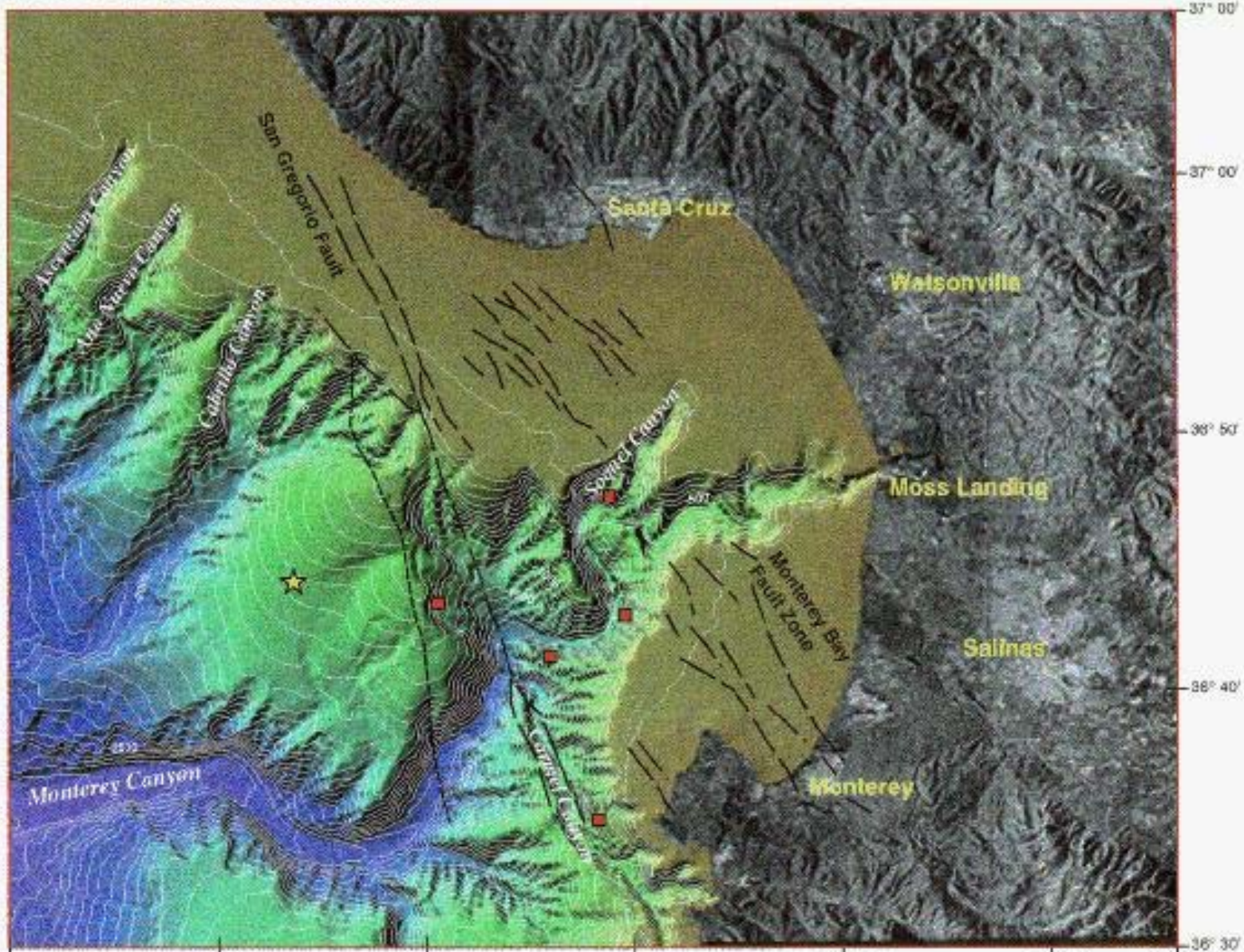


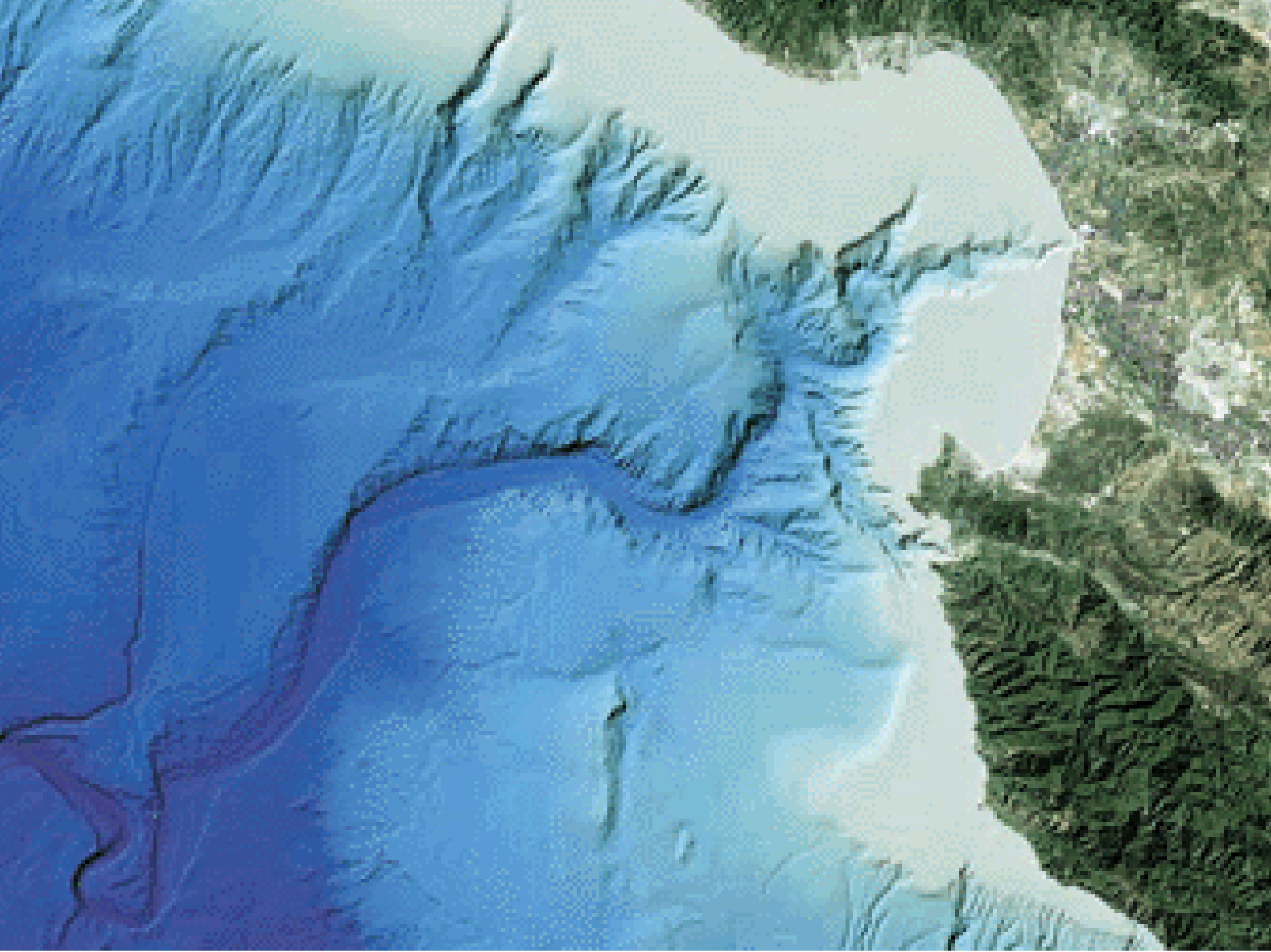
http://terraweb.wr.usgs.gov/projects/MontereySonar/georef.html

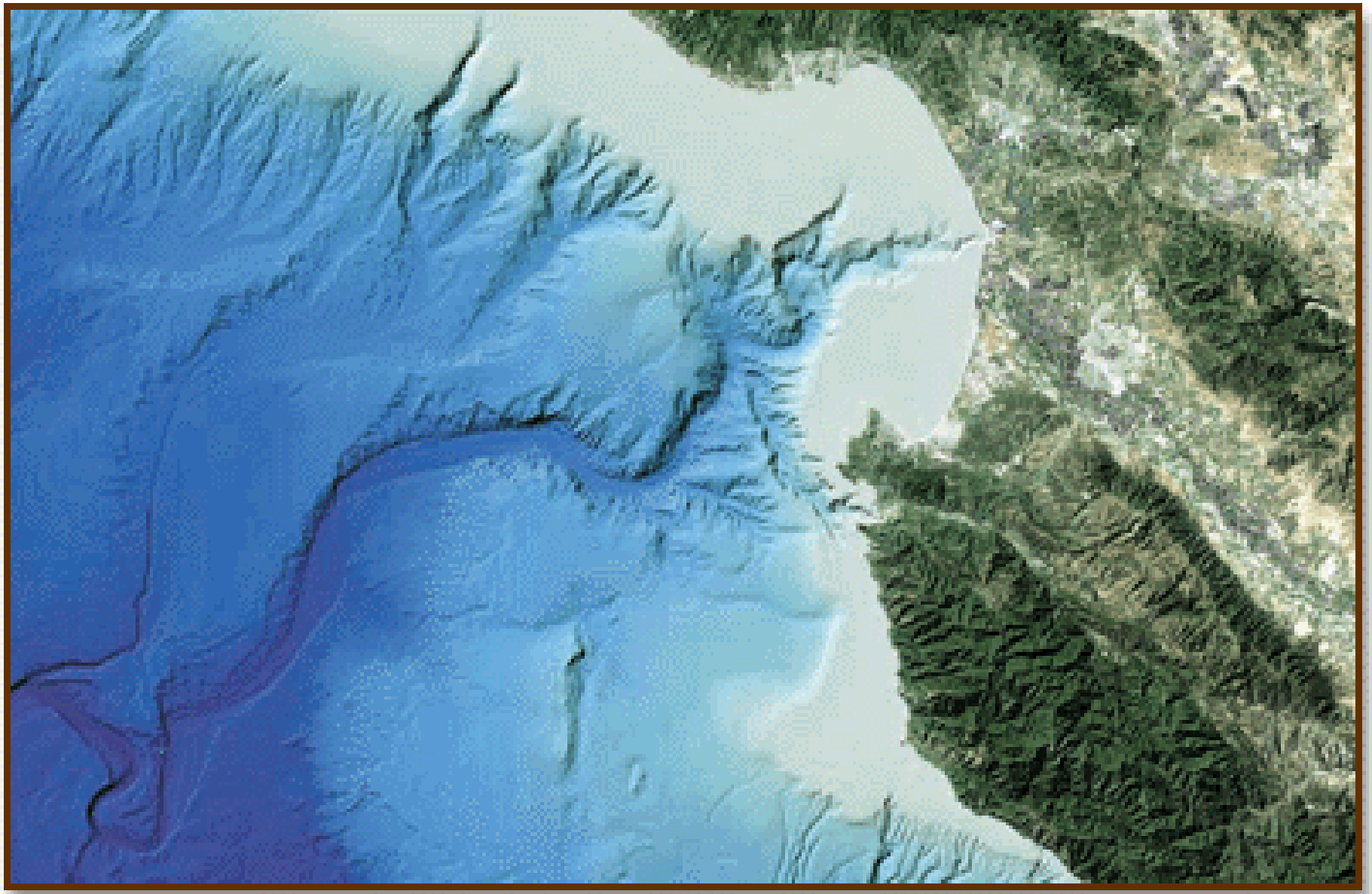


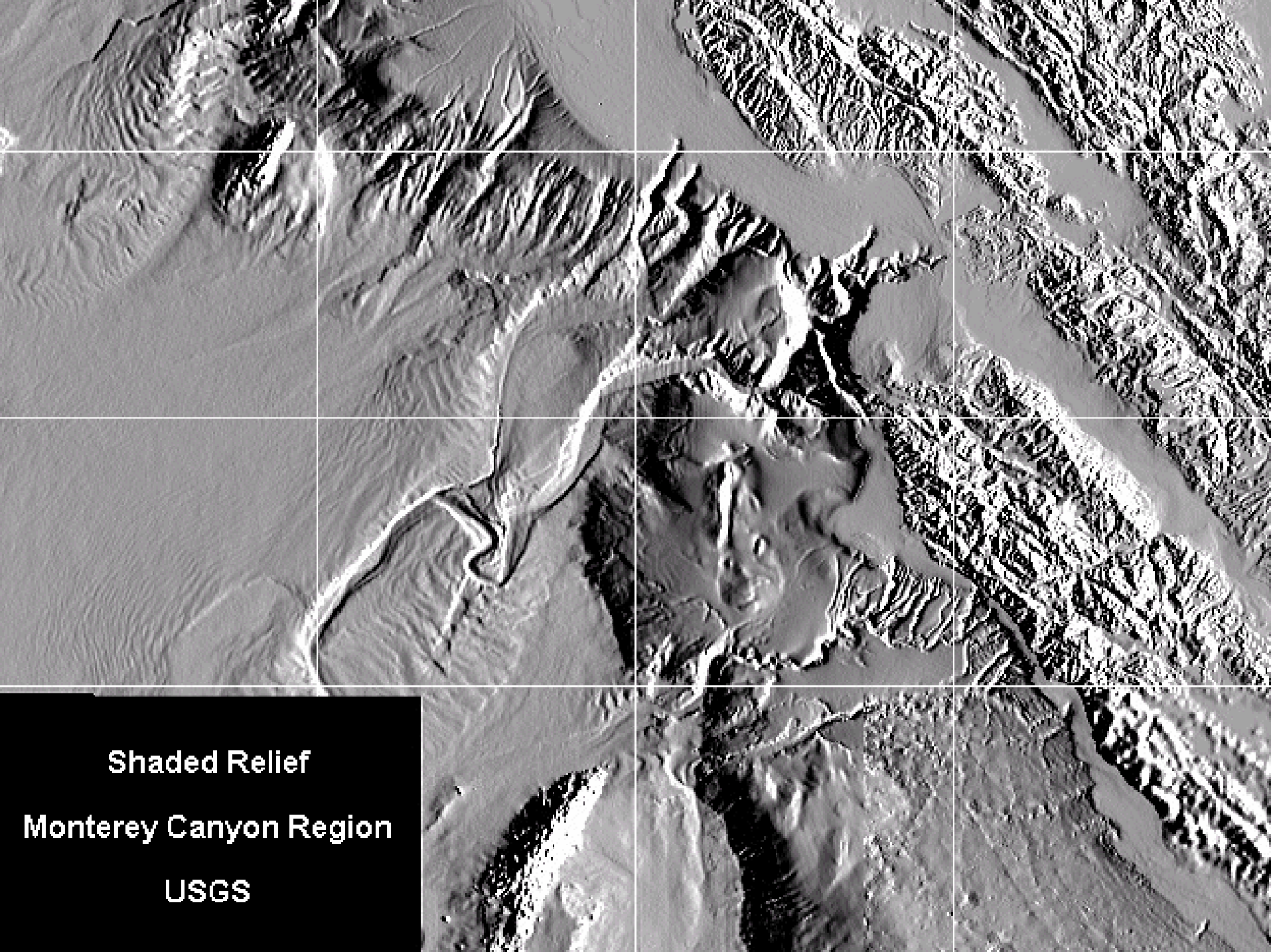
Monterey Bay Regional Geographic Reference Map

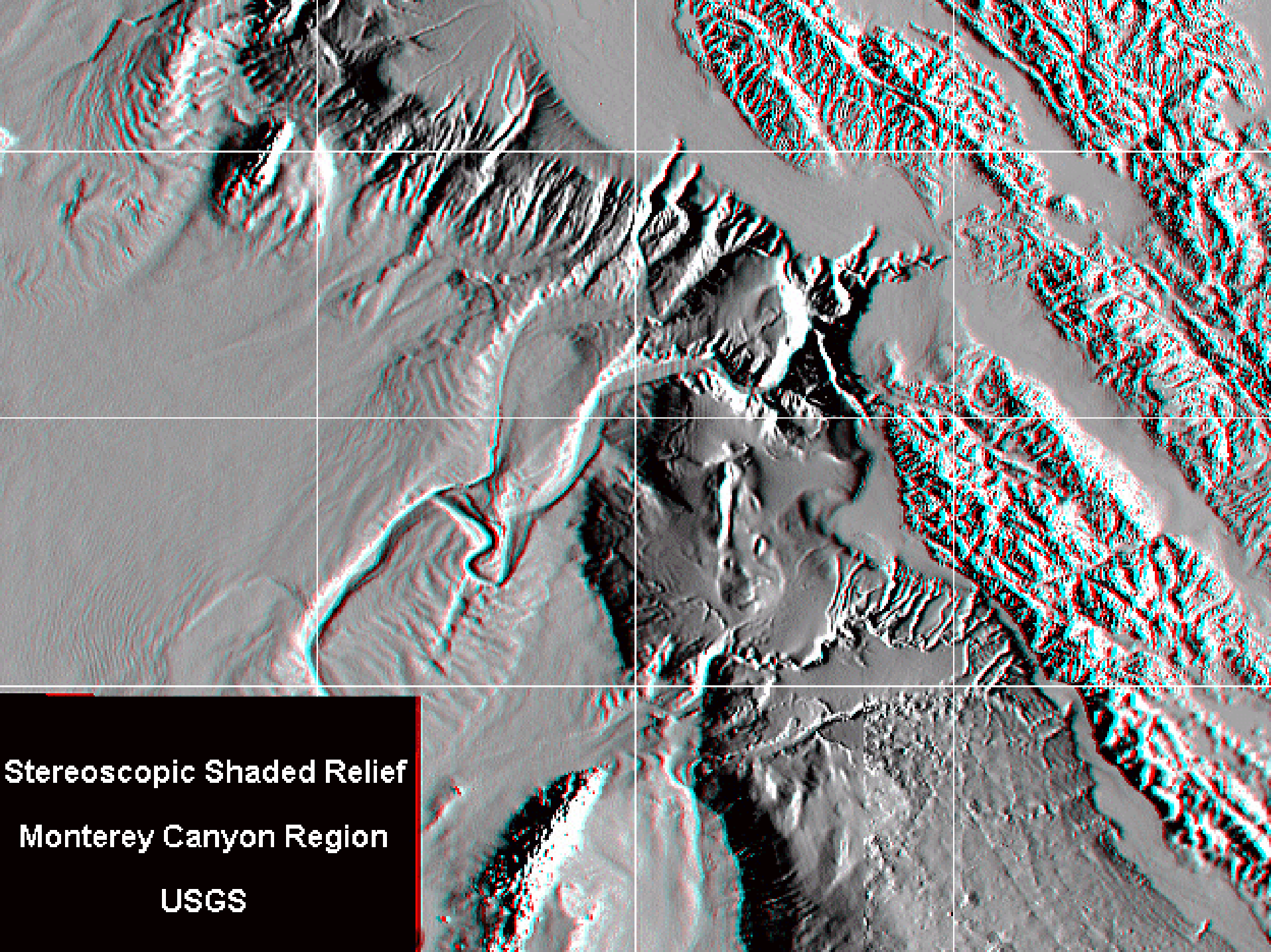
MBARI Seismic Stations

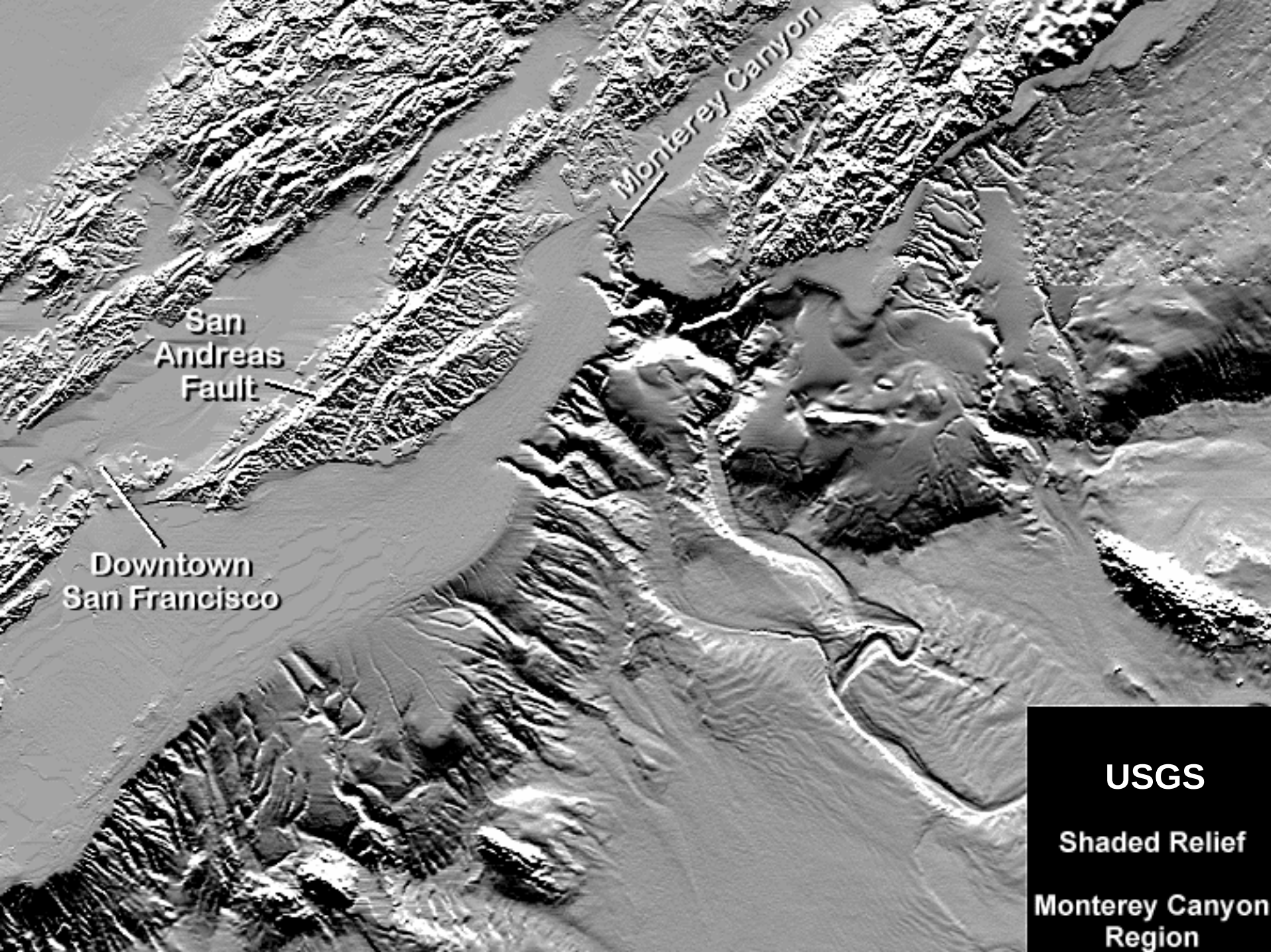


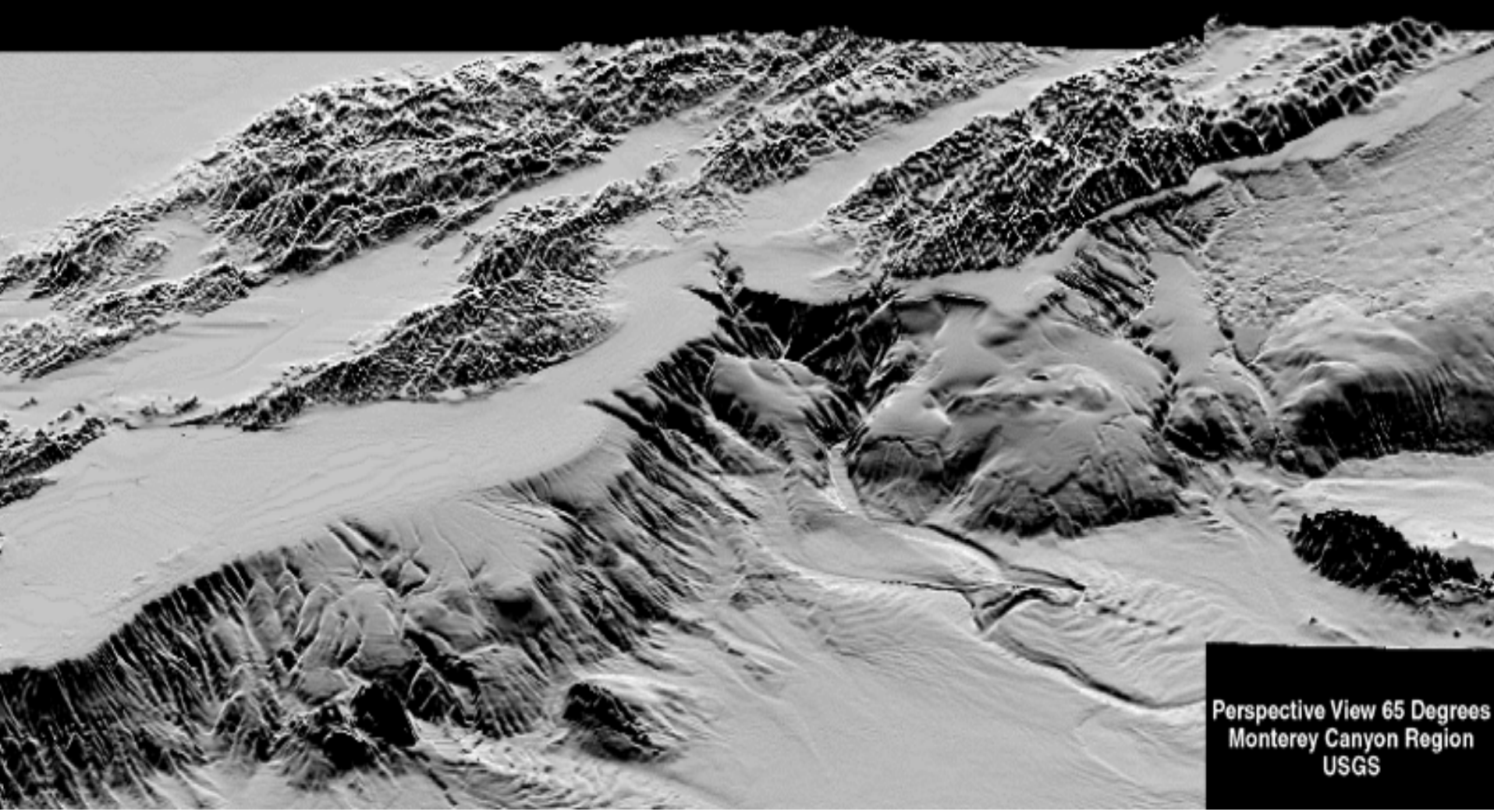




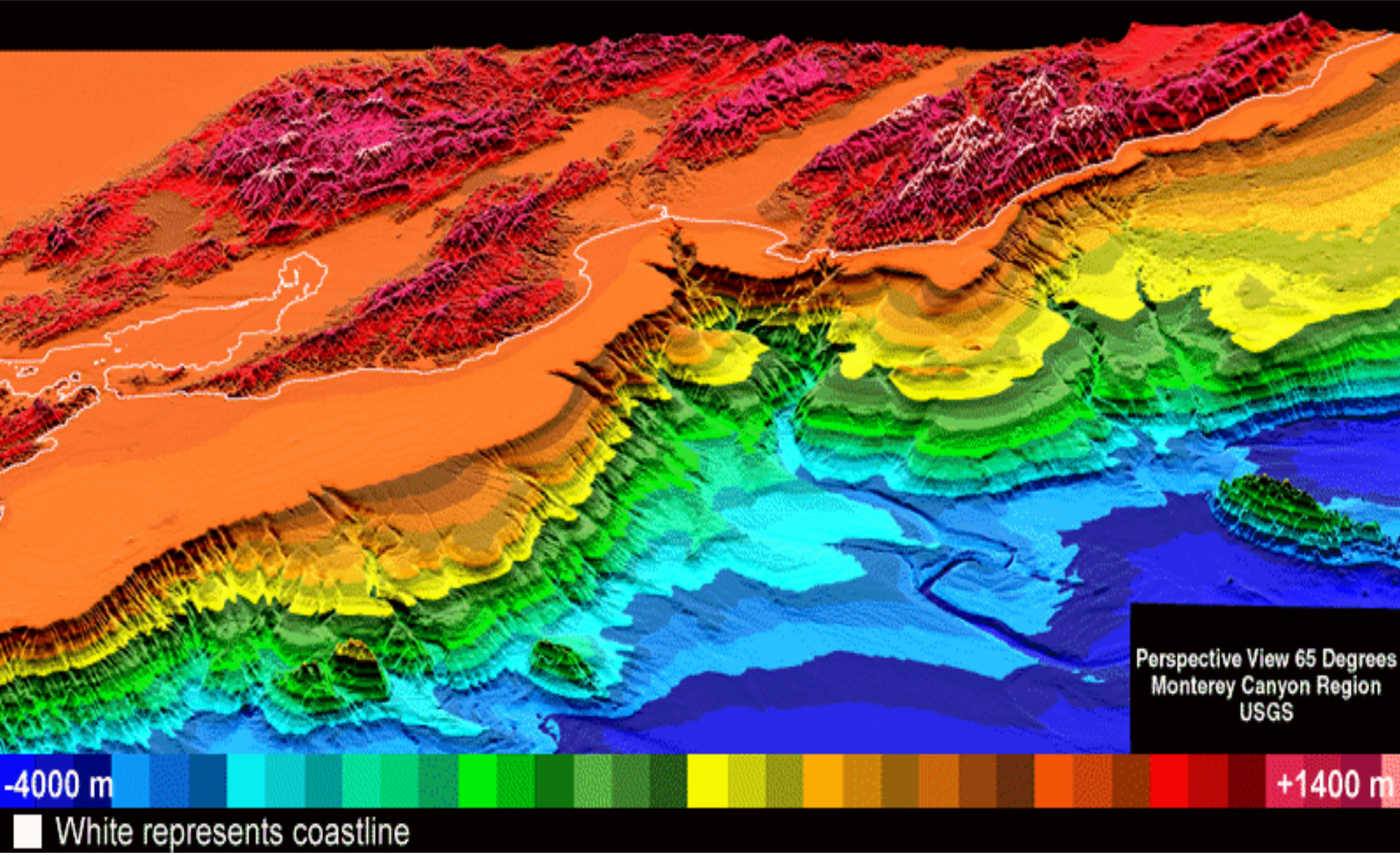

Shaded Relief
Monterey Canyon Region
USGS


Stereoscopic Shaded Relief
Monterey Canyon Region
USGS

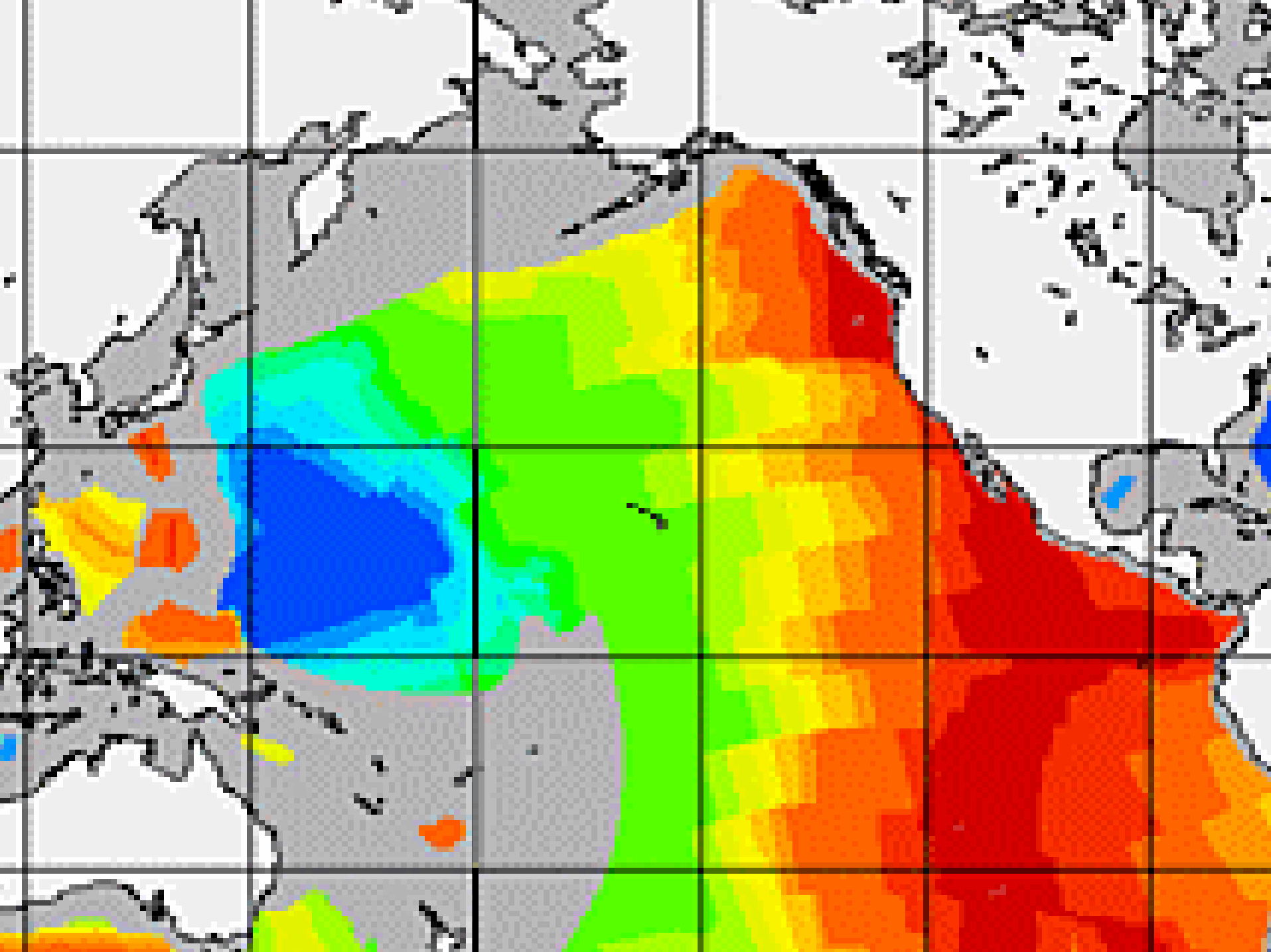

Monterey Canyon
San Andreas Fault
Downtown San Francisco
USGS
Shaded Relief
Monterey Canyon Region

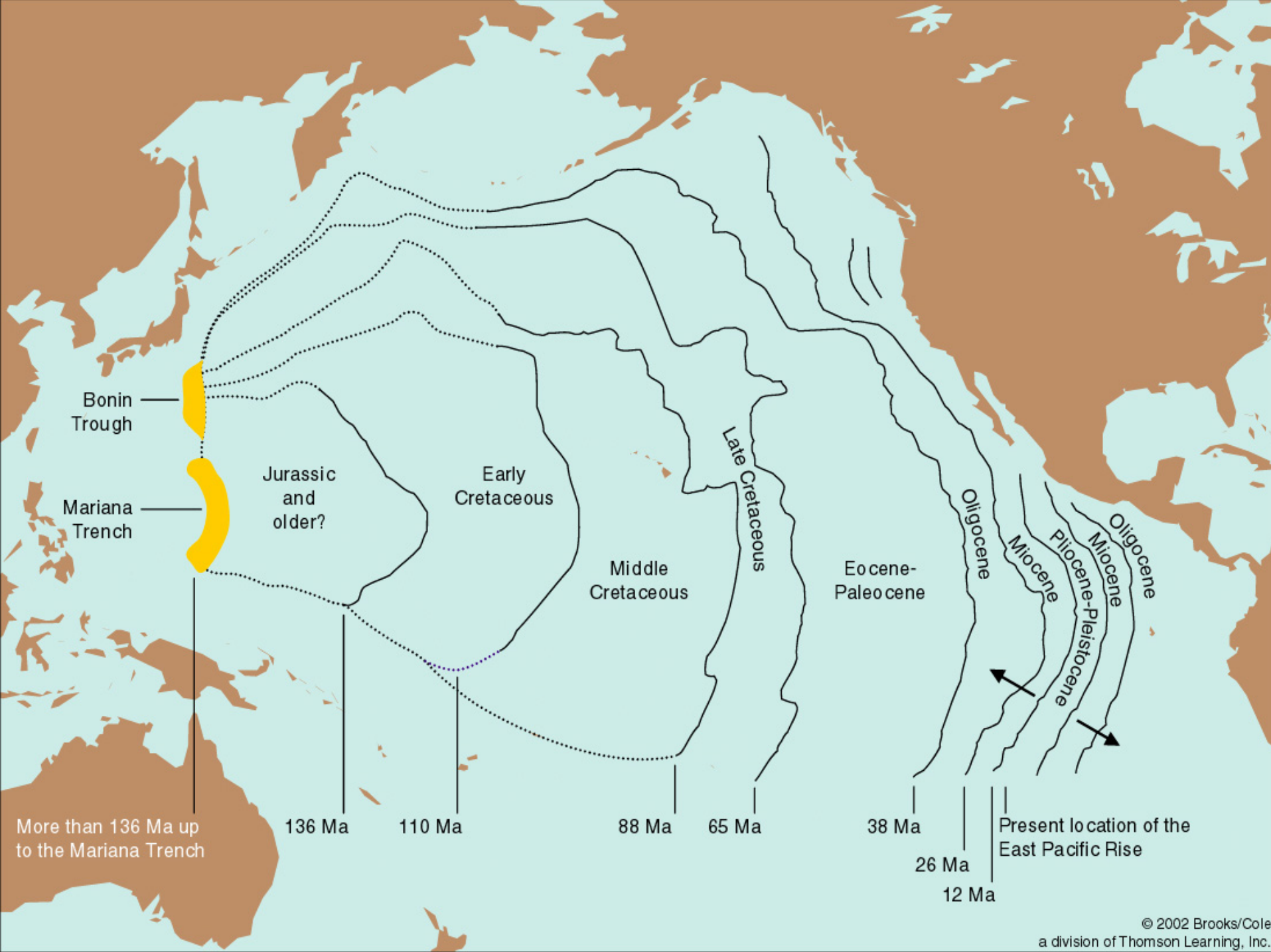


In this image, the viewer has been positioned to the west of the image at an elevation angle of 25º above the ocean (65º from directly above). The topographic relationships between the on-land mountains, ocean shelf, slope and basin are easily seen in this image.



This is the same as the previous image, but with color coded bathymetry.





The beach Material is typically classified according to diameter

$2^{7} - 2^{8}$ mm Boulder

$2^{5} - 2^{6}$ mm Cobble

$2^{2} - 2^{4}$ mm Pebble

2^{1} mm Granule

$2^{-4} - 2^{0}$ mm Sand

$2^{-8} - 2^{-4}$ mm Silt

$2^{-9} - 2^{-12}$ mm Clay

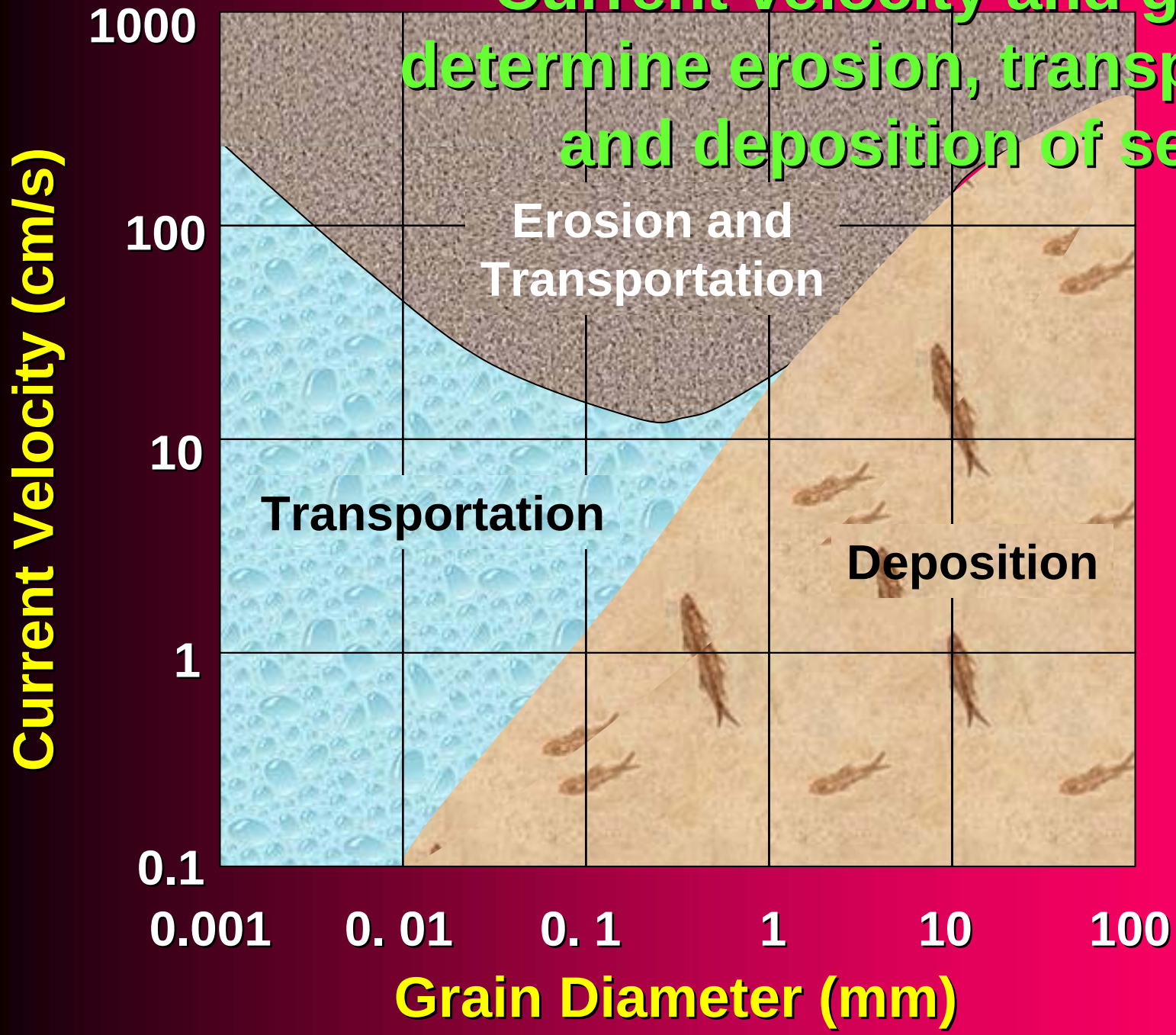
Distribution and thickness of world's sediments

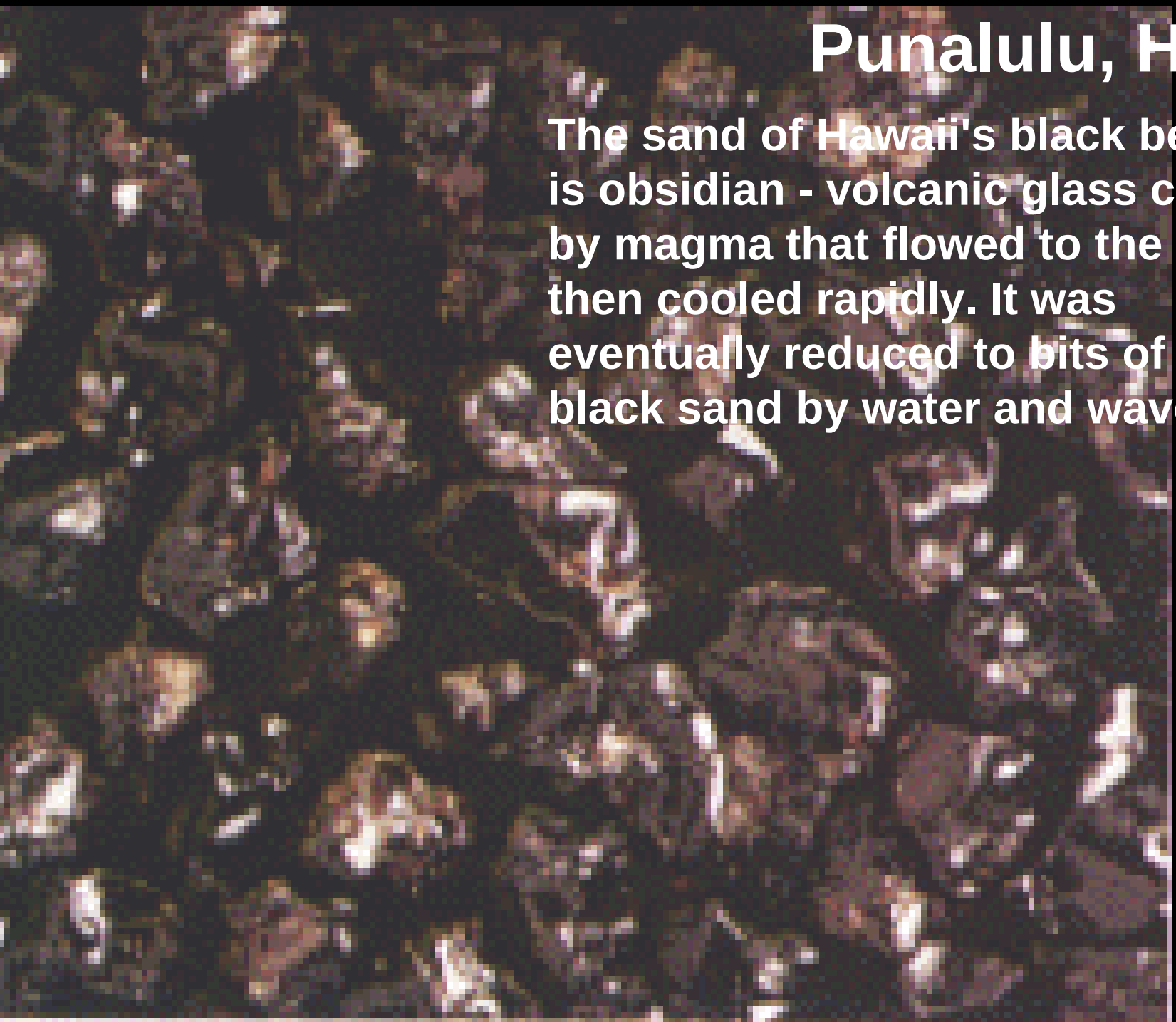
Physio-graphic Province	Proportion of Earth's surface area	Proportion of total sediment volume	Average sediment thickness
Continents	29%	8%	0.3 Km
Continental Margins (shelves, slopes, rises)	14%	80%	7.5 Km
Deep Sea Floor	56%	12%	0.2 Km

Sahara Desert, Africa

Dull opaque surfaces due to erosion from high speed winds. Desert sands tend to have a wider assortment of grain sizes. On the other hand, sand found near water has its sediments constantly sifted, thus depositing grains that are nearly the same size.

Current velocity and grain size determine erosion, transportation and deposition of sediments





Punalulu, Hawaii

The sand of Hawaii's black beaches is obsidian - volcanic glass created by magma that flowed to the sea and then cooled rapidly. It was eventually reduced to bits of fine black sand by water and waves.

Lifuka Island, Tonga, SW Pacific

Remains of tiny sea animals called crinoids (sea lily) make up part of the sand in this area of the South Pacific. These stony disks which are calcified, wheel-like plates, fall in large numbers to the bottom of the ocean.

Seven Mile Beach, Dongara, Australia

This area, teaming with life from the Indian Ocean, reveals many small corals and shells. In addition, this sand is predominantly made up of some very immature bivalve shells. Most unusual however, are the three-axial, icicle-like sponge points.

Ryukyu Islands, Japan

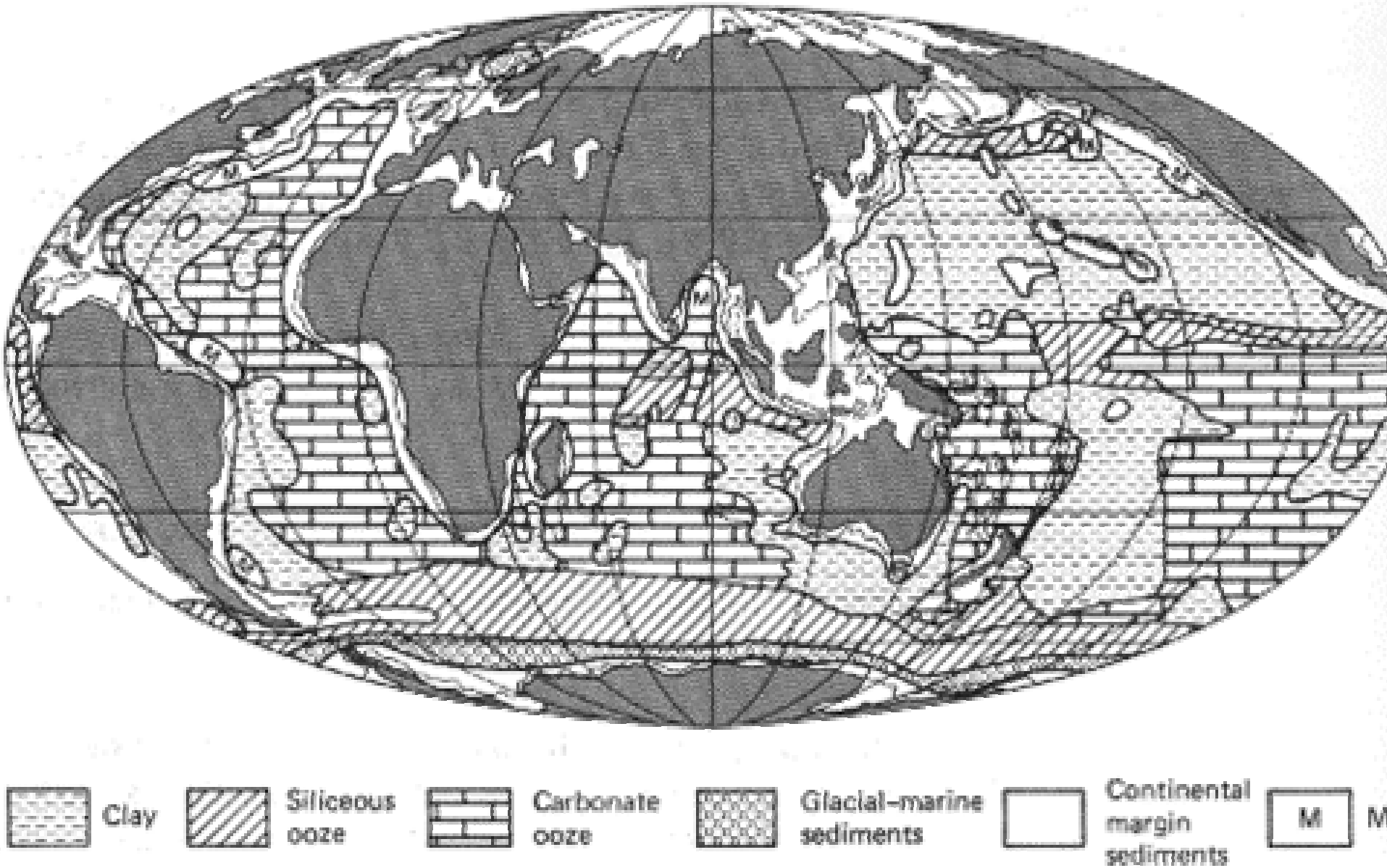
Some of the southern Japanese islands are famous for their beautiful "star sand." These grains are the shells of microscopic, single-celled animals that are found in abundance throughout our oceans.

Saint-Tropez, French Riviera

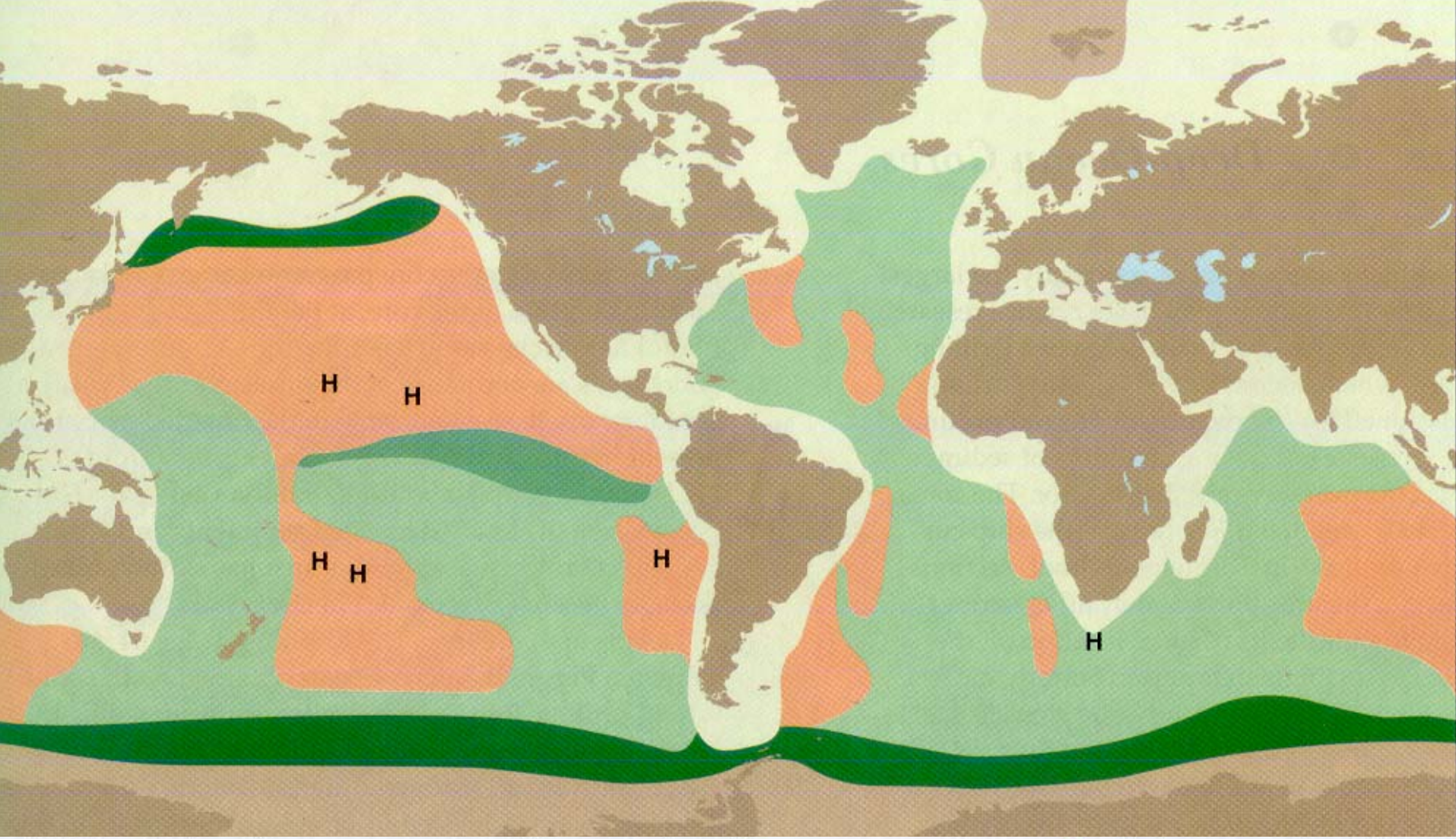
The reefs along this shoreline support many different animals whose shells are tossed onto the beach by the waves. This sample shows cone-like mollusks, and tubular mollusks. Below these you can see the horn of a marine ram. You can also see some black and gold mica crystals along with a sponge or sea-urchin spine.

Type/ Source	Exam-ples	Distri-bution	Relative abundance
Terrigenous			
Erosion of land, volcanic eruptions, blown dust	Quartz sand, clays, estuarine mud	Dominant on continental margins, abyssal plains, polar ocean floors	~45%
Biogenous			
Accumulation of shells of marine organisms	Calcareous and siliceous oozes, corals	Dominant on deep-ocean floor (siliceous ooze below ~5 km)	~55%
Hydrogenous **(a) Precipitate**			
Precipitation of minerals dissolved in water	Limestones, phos-phate deposits	Present with the other, more dominant sediments	< 1%
(b) Evaporate			
Residue from the evaporation of seawater	Salt, Gypsum/ anhydrite	Present with the other, more domi-nant sediments	
Cosmogenous			
Dust from space, meteorite debris	Tektite spherules, glassy nodules	Mixed in very small proportion	Traces (< 0.01%)

The distribution of various kinds of seafloor sediments



http://www.unf.edu/~gmead/ocbasins/marseds.htm



Terrigenous deposits:

- Continental margins
- Glacial deposits
- Clays

Biogenous deposits:

- Calcareous oozes
- Siliceous radiolarian oozes
- Siliceous diatom oozes

H Hydrogenous deposits also present (manganese nodules)

Continental shelf sediments, as function of latitude