“Ocean Basics”

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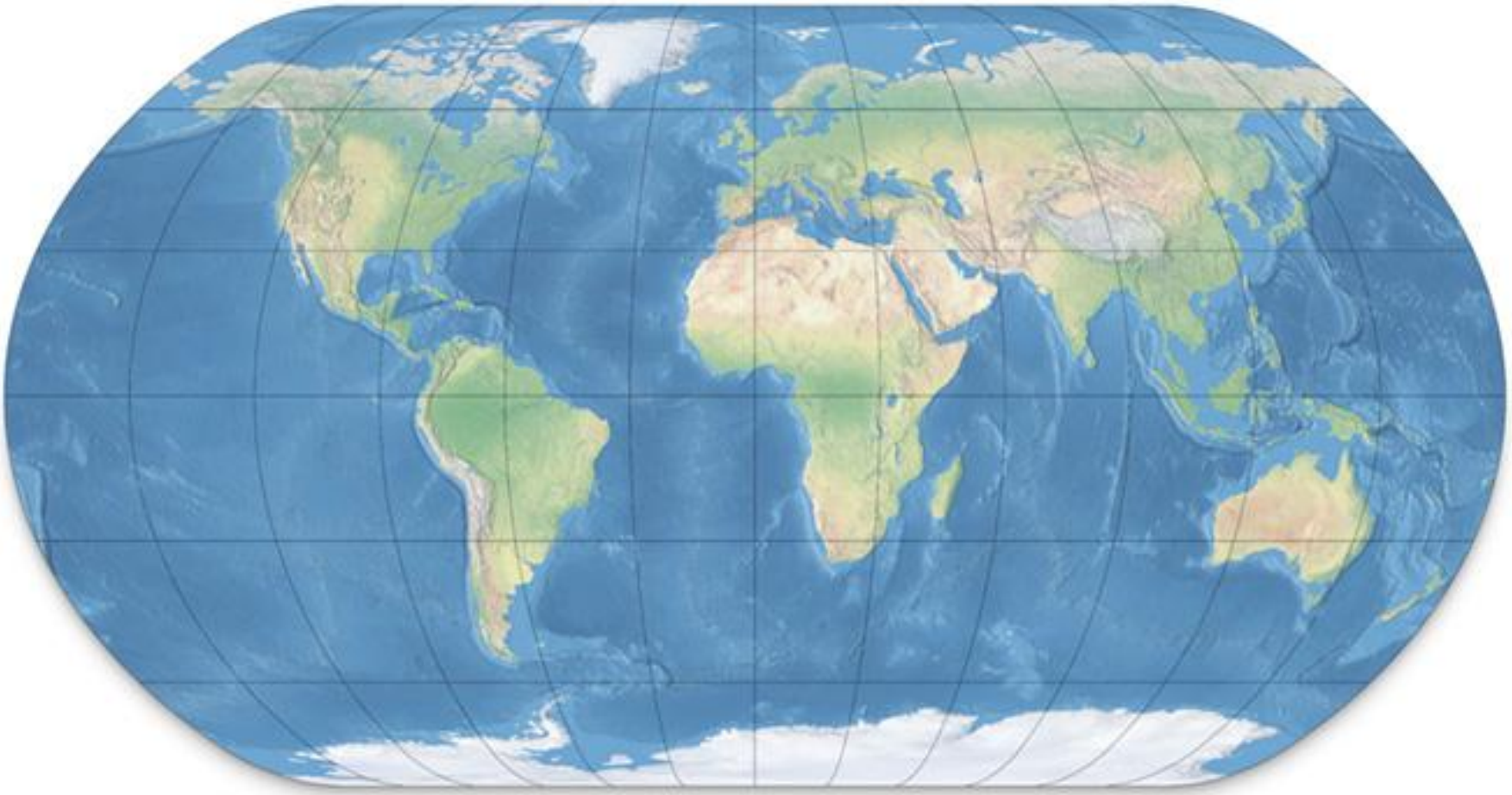
There is really only 1 ocean

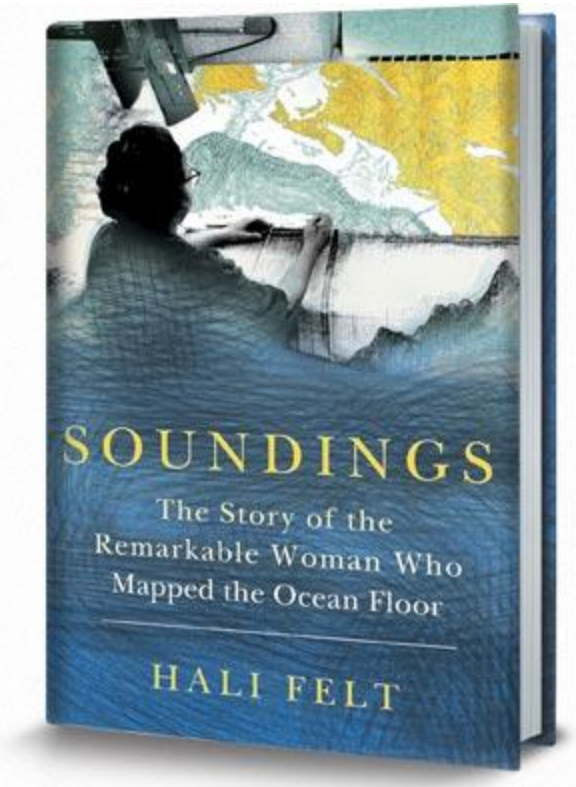
http://www.platetectonics.com/oceanfloors/images/Worldmap_2D.jpg

Continents and other land masses divide the waters at some latitudes

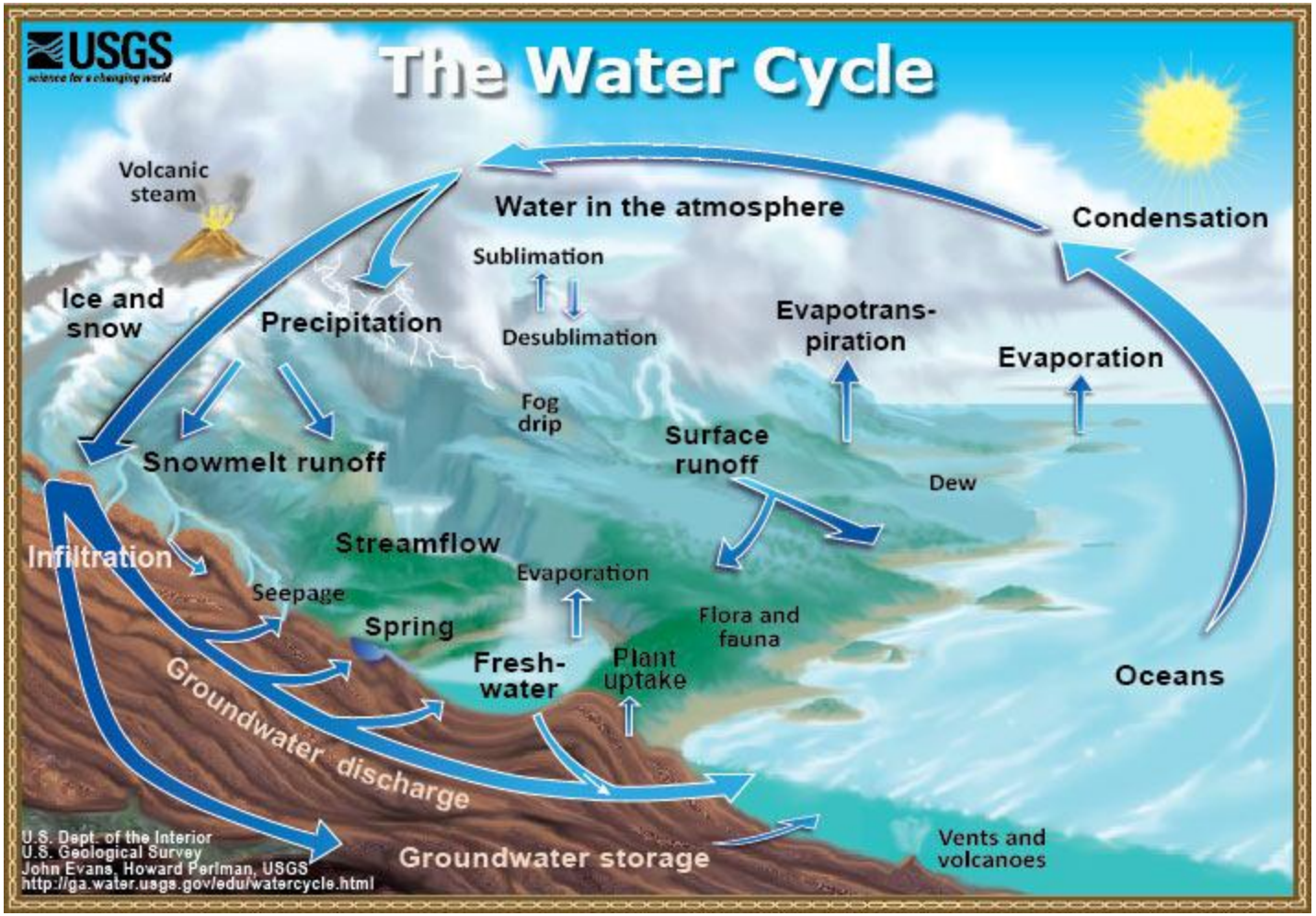


Studying the ocean floors is relatively recent and very incomplete

- Marie Tharp worked with Dr. Bruce Heezen at the Lamont-Doherty Earth Observatory of Columbia University to map features of the ocean floors.
- Hali Felt, 2012 Macmillian
  http://halifelt.com/soundings-book/



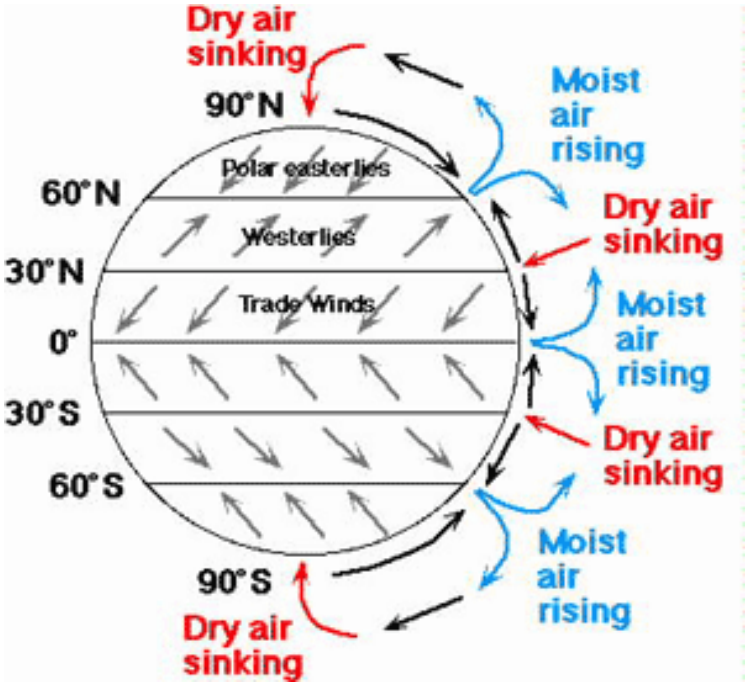
“The Water Cycle”



http://ga.water.usgs.gov/edu/watercycle.html

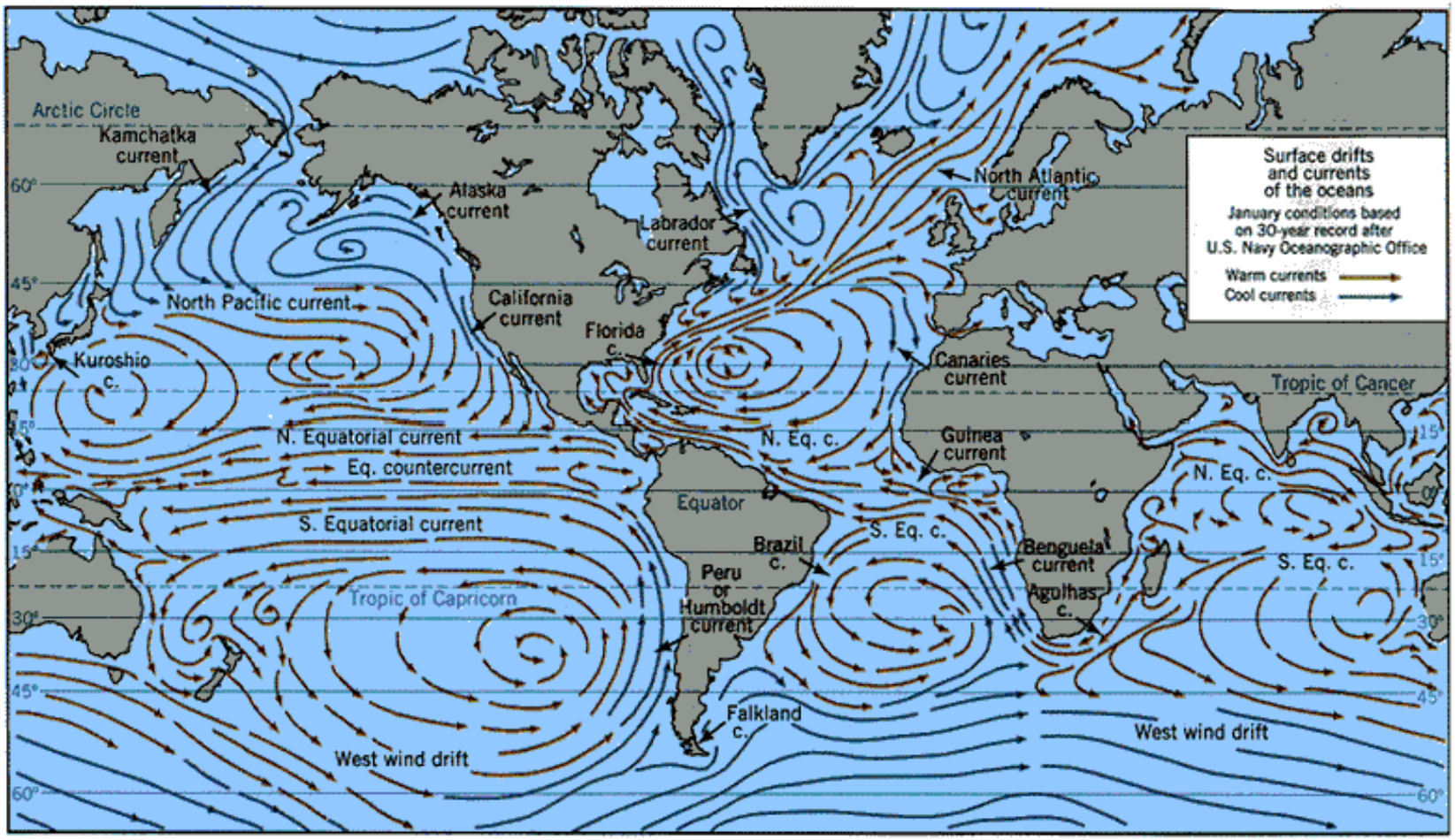
The Ocean-Atmosphere Connection Creates Weather and Climates

- Variations in heating/cooling and Earth's rotation (Coriolis effect) create global winds



http://schoolworkhelper.net/what-makes-the-wind-blow-factors-affecting-winds-patterns/

Surface Ocean Currents Caused in part by Global Winds



http://www.learner.org/jnorth/images/graphics/n-r/OceanCurrentsUSNOO.gif

Surface Currents and Deep-Sea Currents

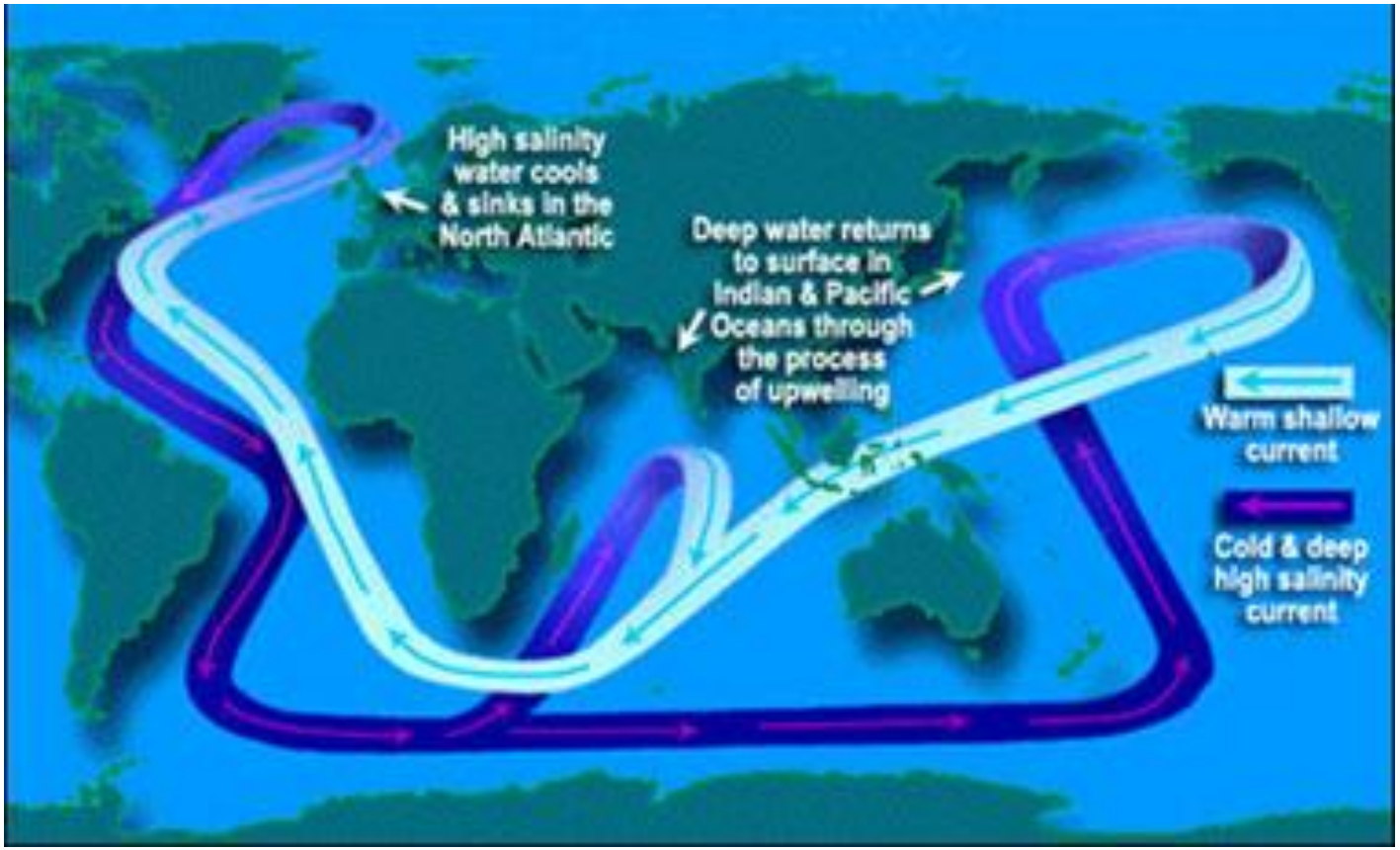
Surface Currents

- ‘Driven’ by global wind patterns
- Shallow (<50 m)
- Fast (1 – 5 kt; m/hr)
- Carry heat energy toward higher latitudes

Deep-Sea Currents

- ‘Driven’ by density differences (salinity & temperature)
- Layered down to ocean bottom
- Slow (m/yr)
- Influence long-term climate changes

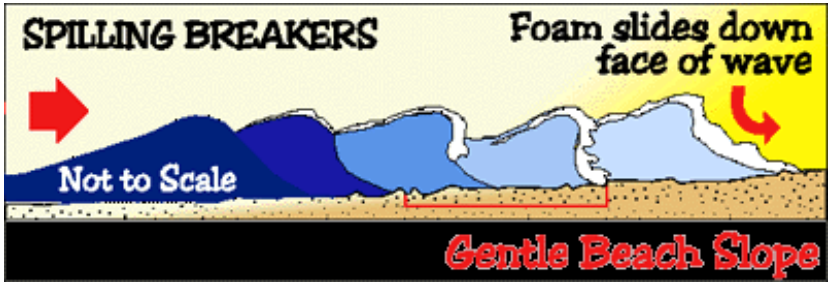
Density-Driven Deep-sea Currents

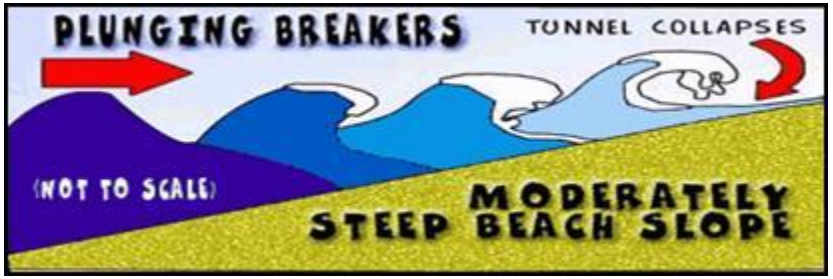


http://oceanmotion.org/html/background/ocean-conveyor-belt.htm

When most students and teachers think of the ocean, they think of waves

- Waves break as they approach the shore when the trough is slowed and the crest continues until it 'outruns' support and collapses forward

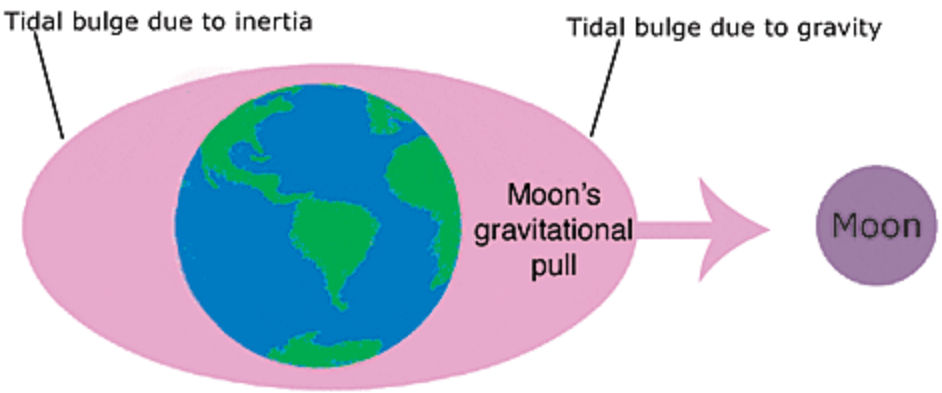




http://www.crd.bc.ca/watersheds/protection/geology-processes/waves.htm

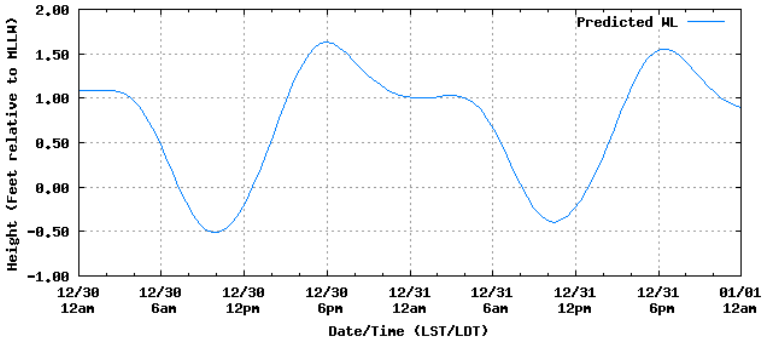
Ocean Tides

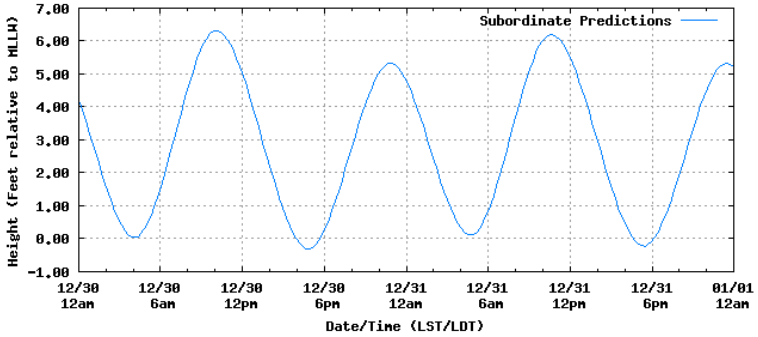
- Gravity and inertia act in opposition on the Earth's oceans, creating tidal bulges on opposite sites of the planet.
- On the "near" side of the Earth (the side facing the moon), the gravitational force of the moon pulls the ocean's waters toward it, creating one bulge.
- On the far side of the Earth, inertia dominates, creating a second bulge.

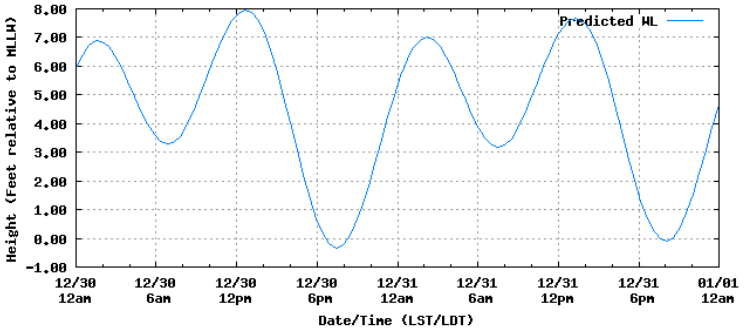


http://oceanservice.noaa.gov/education/kits/tides/media/supp_tide03.html

Actually, it’s not so simple



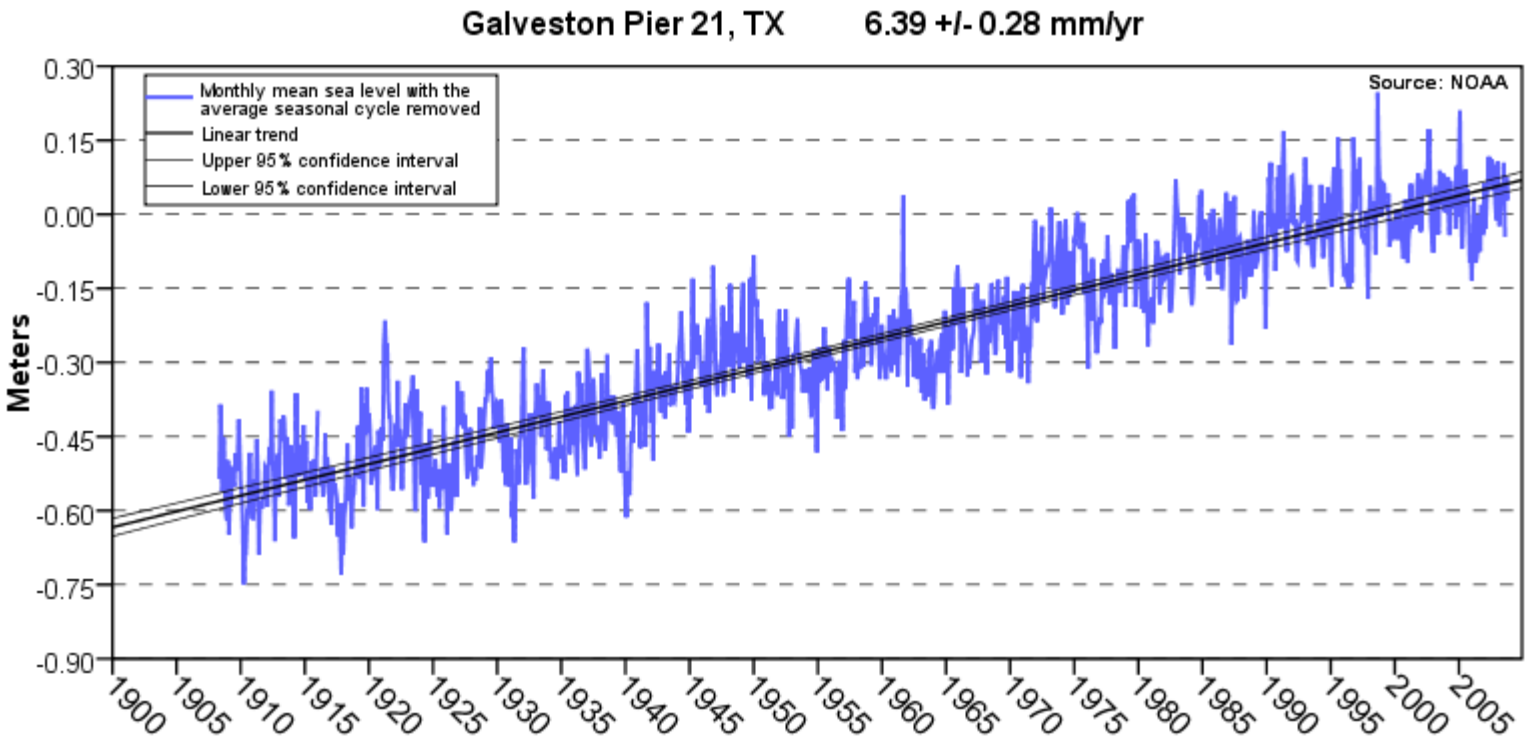




http://tidesandcurrents.noaa.gov/tide_predictions.shtml

Changing Sea Levels

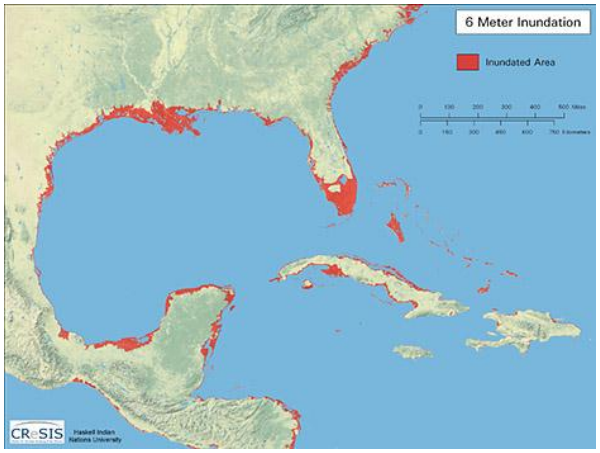
- A final point – many factors combine to create rising sea level across the globe



http://oceanworld.tamu.edu/resources/oceanography-book/beachprocesses.htm

Climate and Changing Sea Levels

- ‘Global warming’ can result in thermal expansion – water increases in volume when it warms
- ‘Melting glaciers’ in Greenland and Antarctica add liquid water to the oceans



http://media.treehugger.com/assets/images/2011/10/20090206-6-meter-sea-level-rise.jpg

To learn more, start at:

- AMS DataStreme Ocean
  http://www.ametsoc.org/amsedu/DS-Ocean/home.html
- NOAA Ocean Explorer
  http://oceanexplorer.noaa.gov/welcome.html
- NOAA Educational Resources – Oceans & Coasts
  http://www.education.noaa.gov/Ocean_and_Coasts/
- Hali Felt, 2012, “Soundings” Henry Holt & Co