

GEOG 101 Part II  
People and their  
Physical Environment

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**The Hydrosphere:  
Oceans**

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**PART II: People and their  
Physical Environment**

- ✓ I. Introduction to the Physical Environment
- ✓ II. Earth-Sun Relationship
- III. **Earth Systems**
  - A. The Hydrosphere: Oceans**
  - B. The Atmosphere: Weather and Climate
  - C. The Lithosphere: Geologic Influences
- IV. **Earth Habitat**
  - A. Biosphere
  - B. Natural Controls and Cycles
  - C. Human Impact
  - D. Natural Hazards
  - E. Earth Resources

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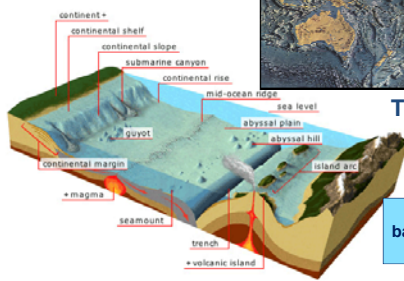
**HYDROSPHERE: Overview**

- **Earth is the Water Planet:** 71% of surface is water and 97% of all water is in the oceans.
- **Ocean Movements:** The oceans are a dynamic system with much activity and interactions.
- **Water Temperature and Climate:** Surface ocean temperatures affect air temperature and therefore climate.
- **Oceans and People:** Oceans play an important role in earth environment, influencing many things people do.

<https://www.youtube.com/watch?v=mP4QTVQTLUo>  
2 min oceans video

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**OCEAN BASIN TOPOGRAPHY**



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**THE DYNAMIC OCEAN**

**The movements found in the ocean are a result of numerous aspects of fluid dynamics working together, transferring energy and creating motion.**

<ul style="list-style-type: none"> <li>❖ <b>Ocean current:</b> a ribbon of moving water with unique characteristics.</li> <li>❖ <b>Gyre:</b> giant circulation system; it is found both on the surface of the oceans and in the atmosphere; caused by the earth's rotation and the Coriolis Effect.</li> <li>❖ <b>Ocean gyre:</b> a system of circular ocean currents.</li> </ul>	<ul style="list-style-type: none"> <li>❖ <b>Wave:</b> a friction-generated phenomena created as <u>wind</u> passes over and touches the surface of water, dragging it forward.</li> <li>❖ <b>Tsunami:</b> seismic sea wave created by a shock (falsely called a tidal wave).</li> <li>❖ <b>Tide:</b> moving water bulge created the moon's gravitational pull and by earth's rotation.</li> </ul>
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**MOVEMENTS in the OCEAN**

- ❖ **Ocean current:** A ribbon of moving water with unique characteristics generated by earth's rotation and by differences in water salinity and water temperature.
  - ✓ Ocean current movements are both horizontal (surface) and vertical (deep sea).

[https://www.youtube.com/watch?v=5xQP\\_B18vMw](https://www.youtube.com/watch?v=5xQP_B18vMw)  
3 min video on ocean water salinity

- ❖ **Gyre:** giant circulation system linked to rotation and Coriolis.
- **Ocean gyre** is a large system of circular ocean currents formed by global wind patterns, Earth's rotation and the Coriolis effect.
  - ✓ Movement of the world's **five ocean gyres** helps drive the oceanic conveyor belt which circulates ocean water around the planet.



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## MOVEMENTS in the OCEAN

### ❖ Waves are generated mainly by wind-friction.

- ✓ Waves help to mix water of different temperature and salinity.
- ✓ Waves alter the coastline by erosion and deposition.

### ❖ Tsunamis are seismic sea waves (falsely called tidal waves).

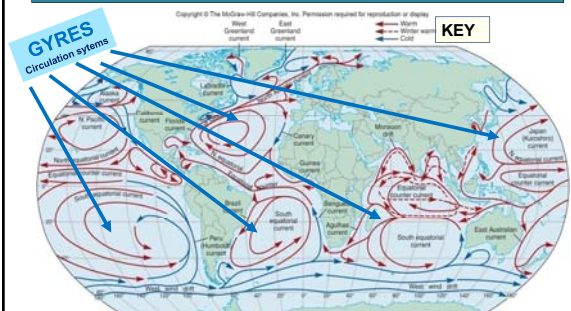
- ✓ They are generated by earthquakes, underwater landslides and any other shock inducer.

### ❖ Tides (moving water bulges) are caused by the gravitational pull of the moon and the earth's rotation.

- Tidal bore (a true tidal wave) is the leading edge of the incoming tide.
- Tidal range is the difference between high and low tide.

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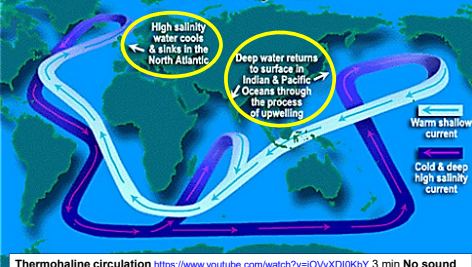
## SURFACE OCEAN CIRCULATION



Currents are designated **warm** and **cold** by their source region, not their temperature. Surface currents influence climate on land through the transfer of temperature and moisture characteristics.

## DEEP-SEA OCEAN CURRENTS

### Generalized model of thermohaline circulation: "Global Conveyor Belt"

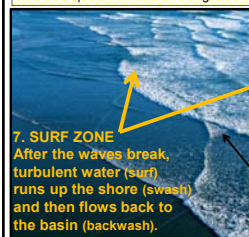


Thermohaline circulation <https://www.youtube.com/watch?v=QVvXDI0KbY>; 3 min No sound

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## WAVE FORMATION

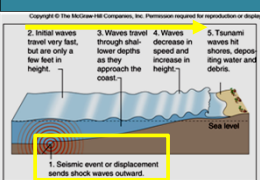
5. The "wave swells" grow in height until they reach a point beyond which they cannot support themselves (orbit collapses) and the "swells" break apart and crash" creating breakers.



**Most waves are wind generated.** Friction from the bottom of an air mass moving against the top of the water causes the water to move in orbits and pile on top of itself creating swells.

✓ **Breaking waves** in the surf zone constantly shape the shoreline.

## TSUNAMI: A shock-generated ocean wave



### CAUSES:

- Earthquake
- Landslide
- Meteor strike

Sendai, Japan (2011) before and after being hit by the tsunami.



<https://www.youtube.com/watch?v=StwZzbGh7Cw>  
earthquake tsunami 3D demo 1 min no sound

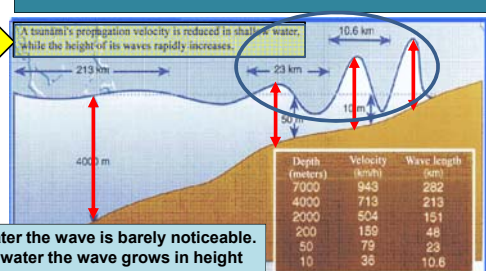
<https://www.youtube.com/watch?v=KstQogN8DU4> NOAA Hawaii landslide tsunami scenario, animation, 2 min

<https://www.youtube.com/watch?v=mDf6zEL4Dh4> Small tsunami, Indonesia, Jan. 2018, 2 min

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## Tsunamis and the Ocean Floor

The physics behind a tsunami wave



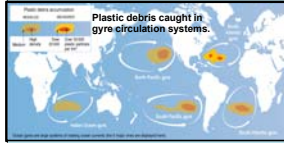
**In deep water the wave is barely noticeable. In shallow water the wave grows in height proportional to its length, similar to a flat piece of paper being pressed against a hard object. Also, note that the wave crests are closer to each other in shallow water producing numerous "wave hits" against the shoreline within a short period of time.**

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## OCEANS and PEOPLE

- ✓ Oceans help to **equalize the Earth's temperature**.
- ✓ They are the **chief source of atmospheric moisture**.
- ✓ They are an important **link in the carbon/oxygen cycle**.
- ✓ They are a **source of food**.  
<https://www.nytimes.com/2019/02/28/climate/fish-climate-change.html?login=email&auth=login-email>
- ✓ They are a **source of minerals**.
- ✓ Their rise and fall effects **coastline habitation**.

- ✓ They are used for:
  - **transportation**
  - **drinking water** through desalination process
  - **recreation**
  - **waste disposal**



- ✓ They are a major **barrier to interaction**.
- ✓ Historically ocean coasts have been the **gateway to cultural interaction**.

## NEXT

### THE ATMOSPHERE: Aspects of Weather and Climate

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