

Stability of Ocean Temperatures

- Temperatures are more stable than land temperatures
 - Water's high heat capacity
 - It takes much more heat to warm water than air
- Oceans regulate the earth's climate
 - They absorb and release heat
 - Ocean's surface circulation

Specific Heats of Common Materials

MATERIAL	SPECIFIC HEAT (calories/gram • C°)
Water {	solid
	liquid
	gas
Dry air	0.24
Basalt	0.20
Granite	0.19
Iron	0.11
Copper	0.09
Lead	0.03

Catching the EAC: Finding Nemo



Oceans Water Flows

Horizontally in Currents

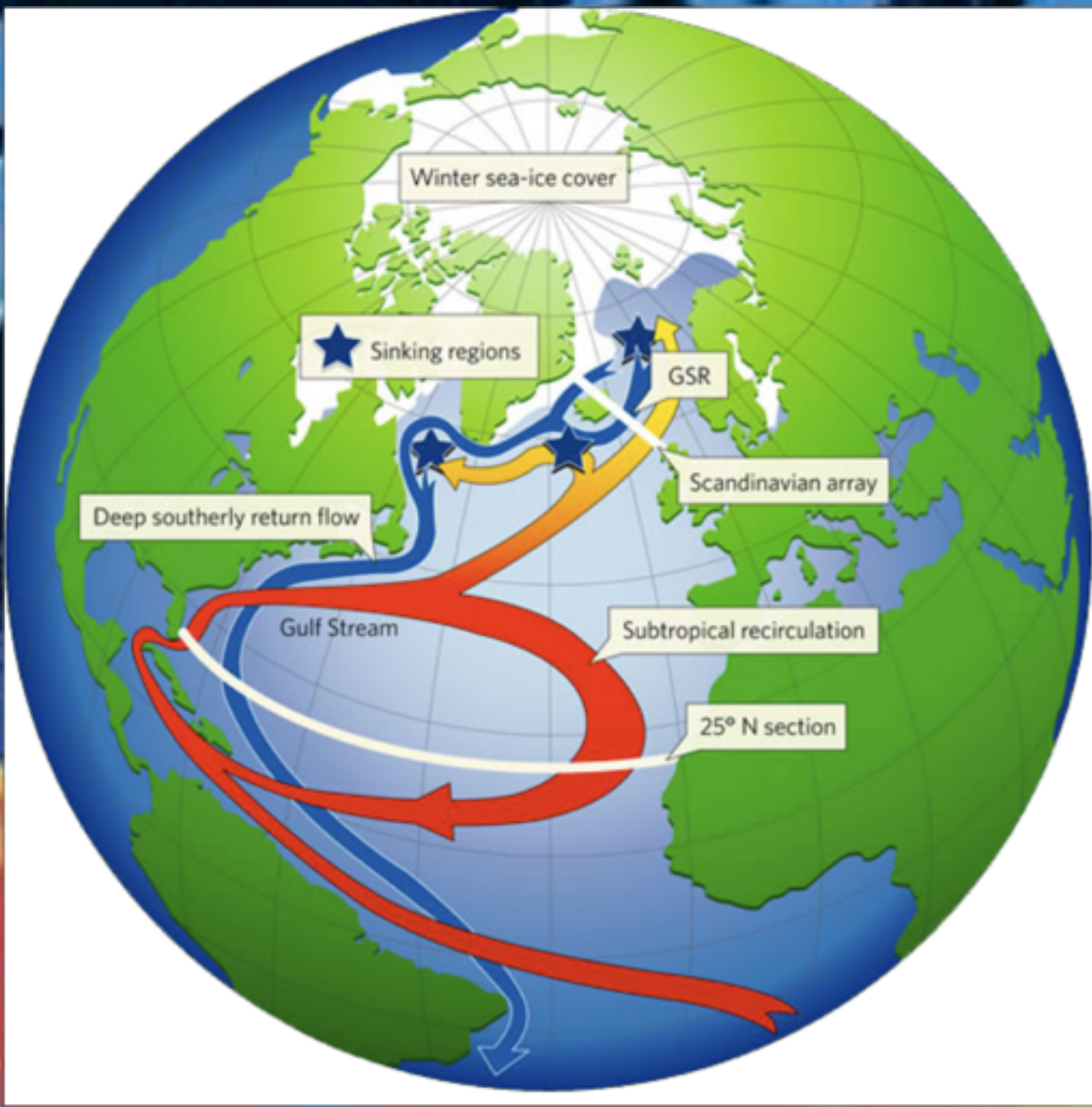
- **Currents:** The ocean is composed of vast riverlike flows
 - What drives ocean currents?
 - Driven by density differences, heating and cooling, gravity, and wind
 - Why are currents important?
 - Influence global climate and El Niño and La Niña
 - Transport heat, nutrients, pollution, and the larvae of many marine species
- Some currents such as the Gulf Stream are rapid and powerful
 - The warm water moderates Europe's climate

Gulf Stre

NOR
AMER

Gulf of
Mexico

CENTRA
AMERIC

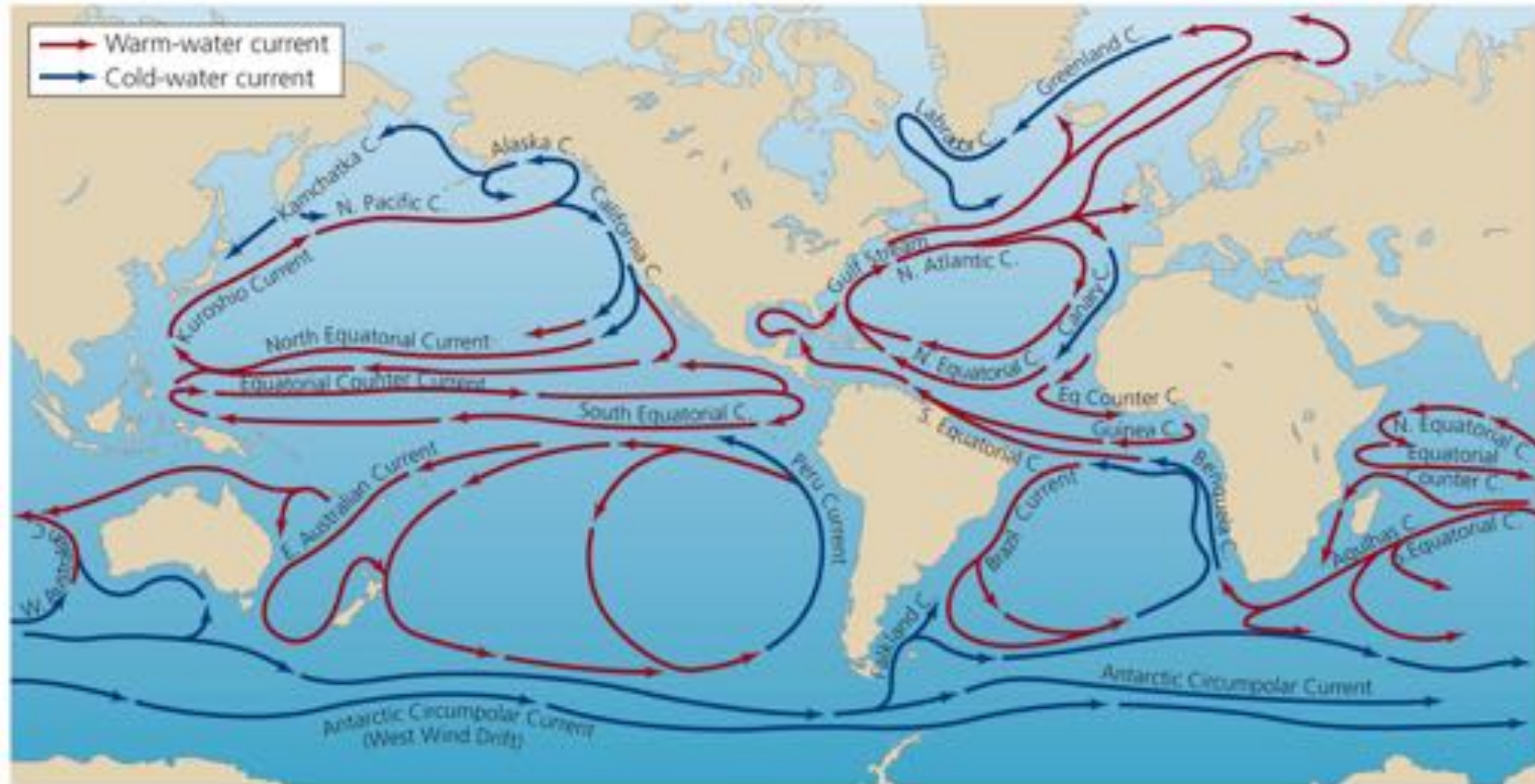


EUROPE



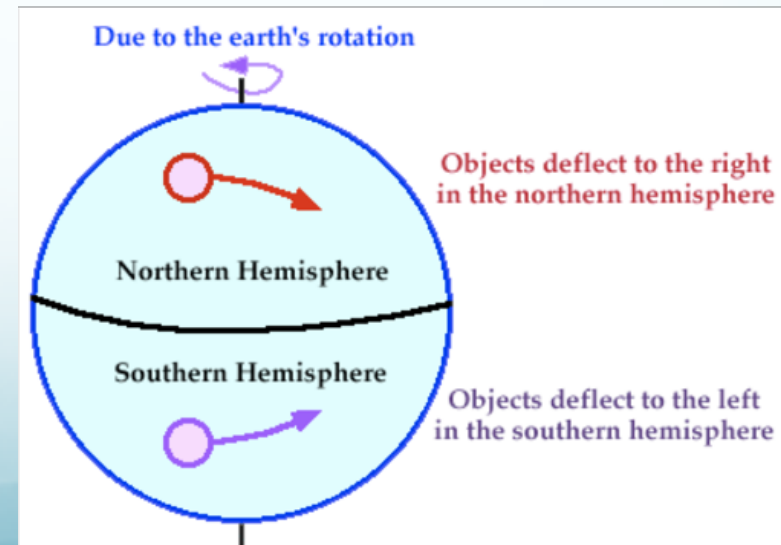
AFRICA

The Upper Waters of the Ocean Flows in Currents

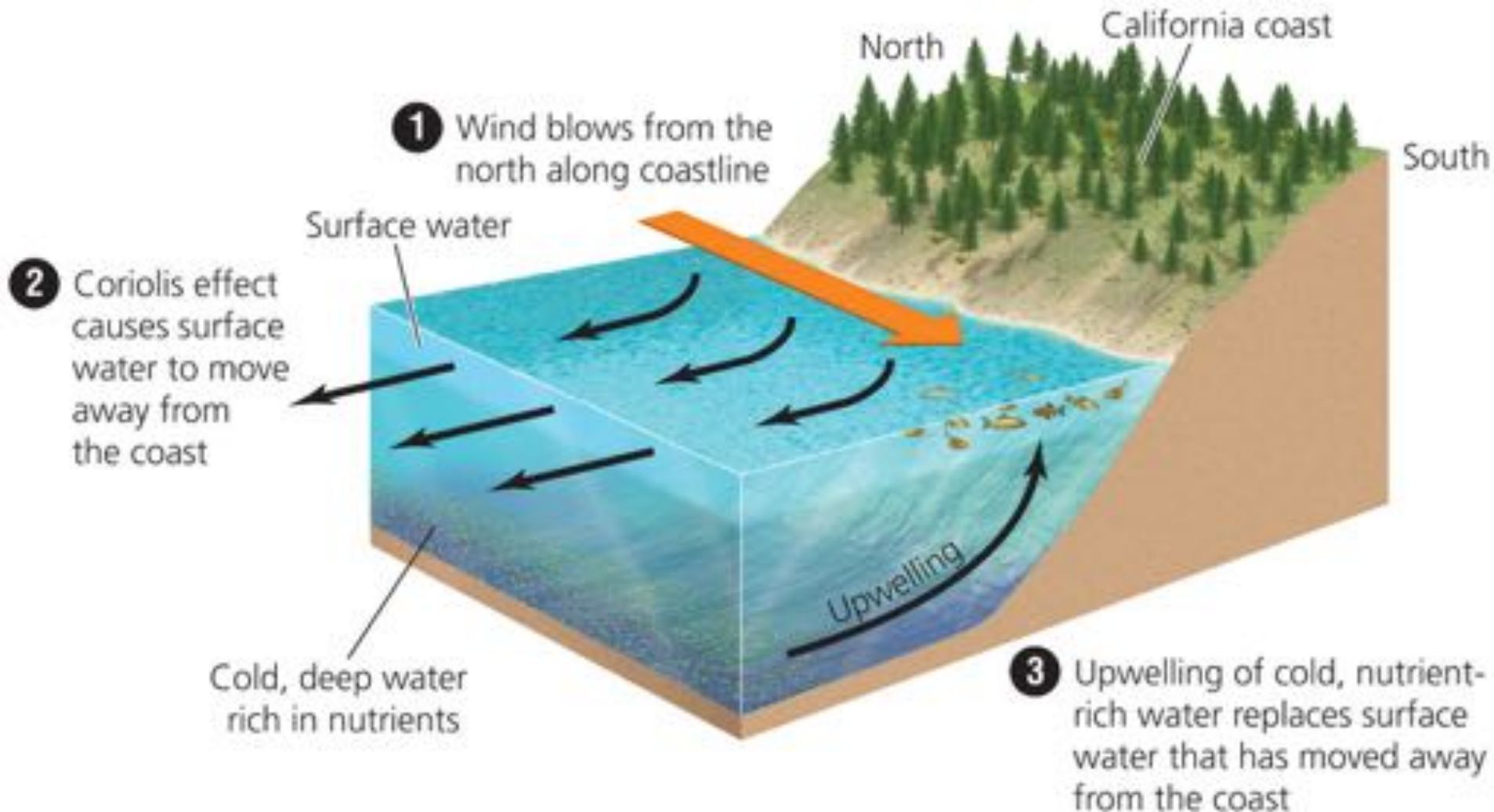


Surface Winds and Heating Create Vertical Currents

- **Upwelling:** The vertical flow of cold, deep water towards the surface
 - High primary productivity and lucrative fisheries
 - How does upwelling occur?
 - Also occurs where strong winds blow away from, or parallel to, coastlines
 - Ex: California Current



Upwelling

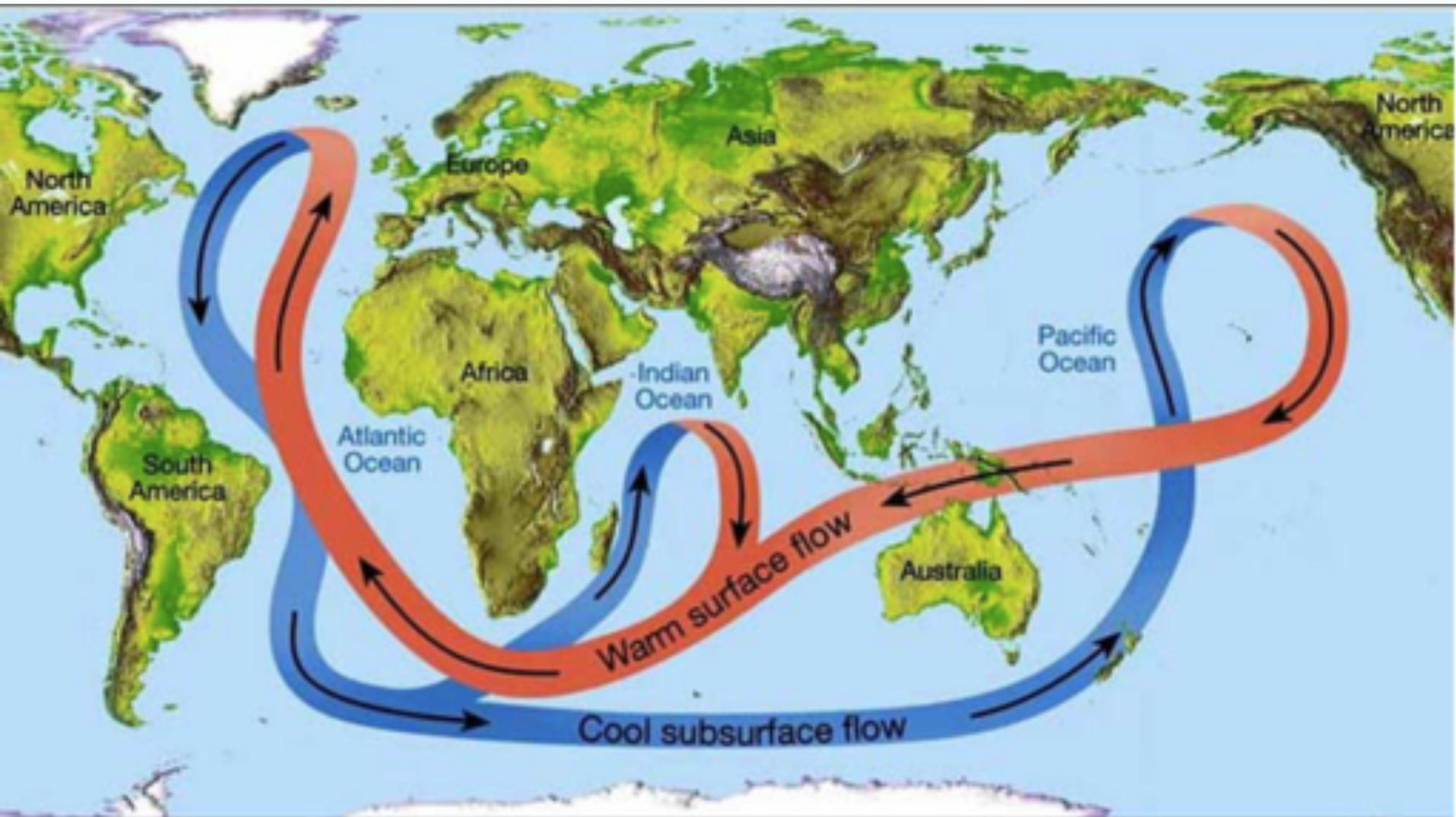


Downwelling

- **Downwellings:** Oxygen-rich water sinks where surface currents come together
- Why is downwelling important?
- Transports warm water rich in dissolved gases, providing an influx of oxygen for deep-water life

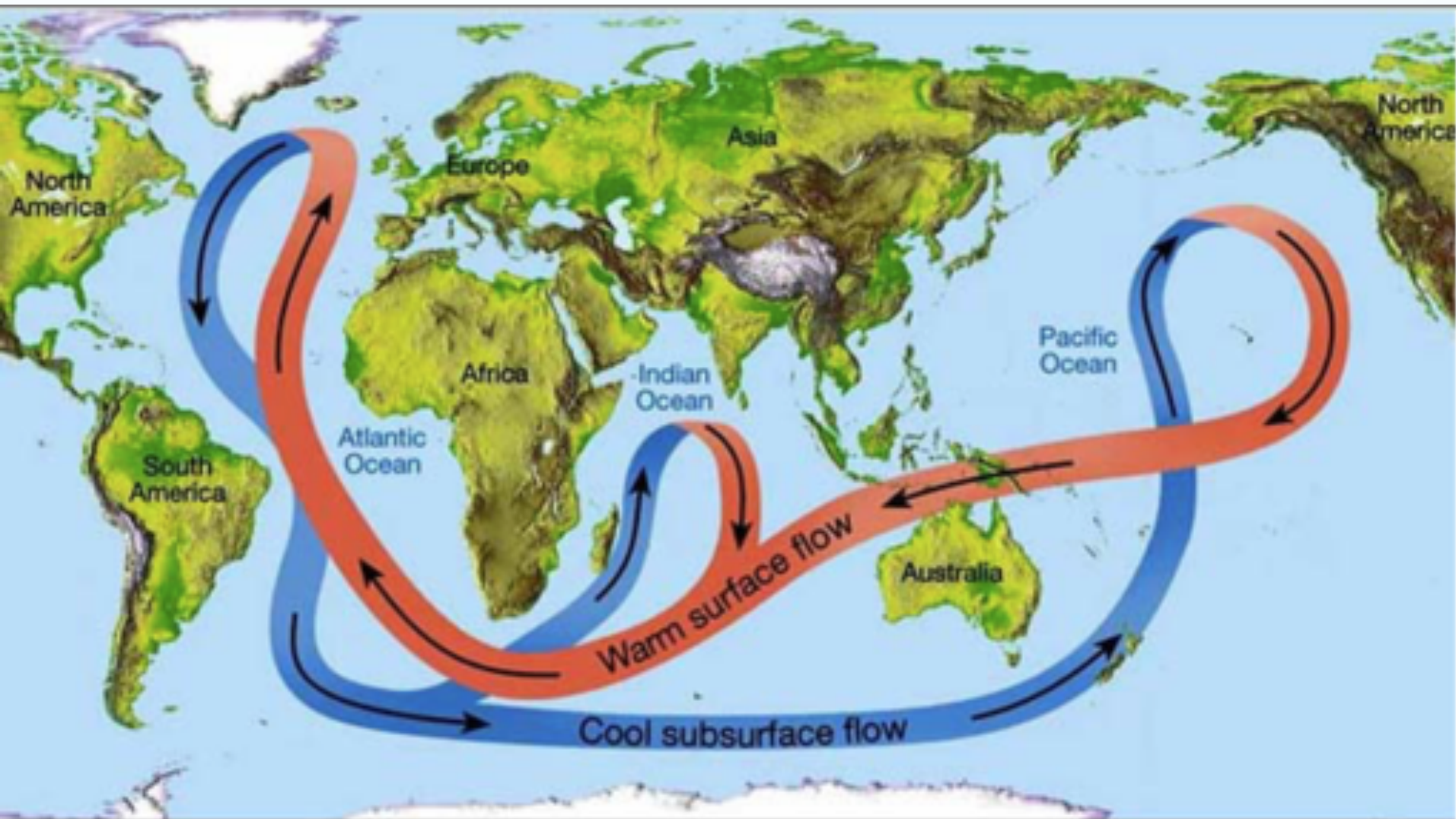
Thermohaline Circulation:

North Atlantic Deep Water (NADW)



THERMOHALINE CIRCULATION - GREAT OCEAN CURRENT

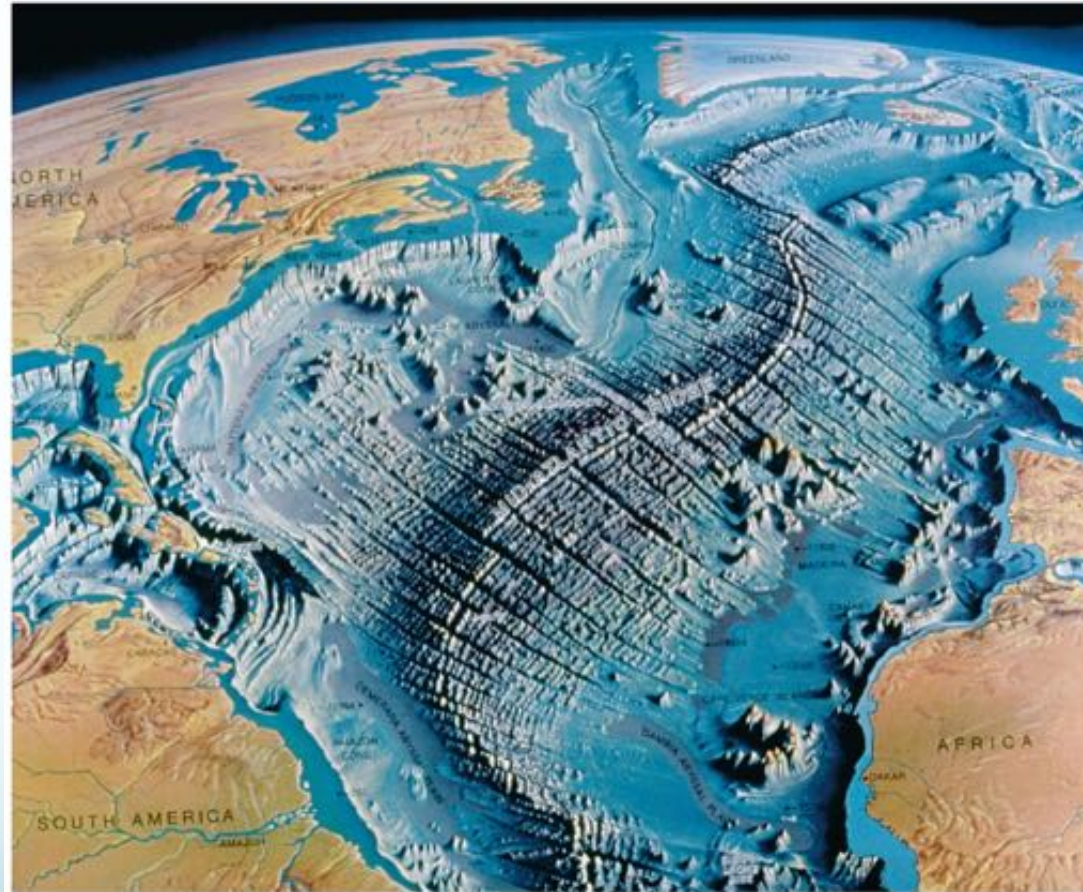
How Could Climate Change Influence the Thermohaline Circulation?



THERMOHALINE CIRCULATION - GREAT OCEAN CURRENT

Seafloor Topography Can Be Rugged and Complex

- The seafloor consists of:
 - Underwater volcanoes
 - Steep canyons
 - Mountain ranges
 - The planet's longest range is under water
 - Mounds of debris (from glaciers)
 - Trenches
 - Some flat areas

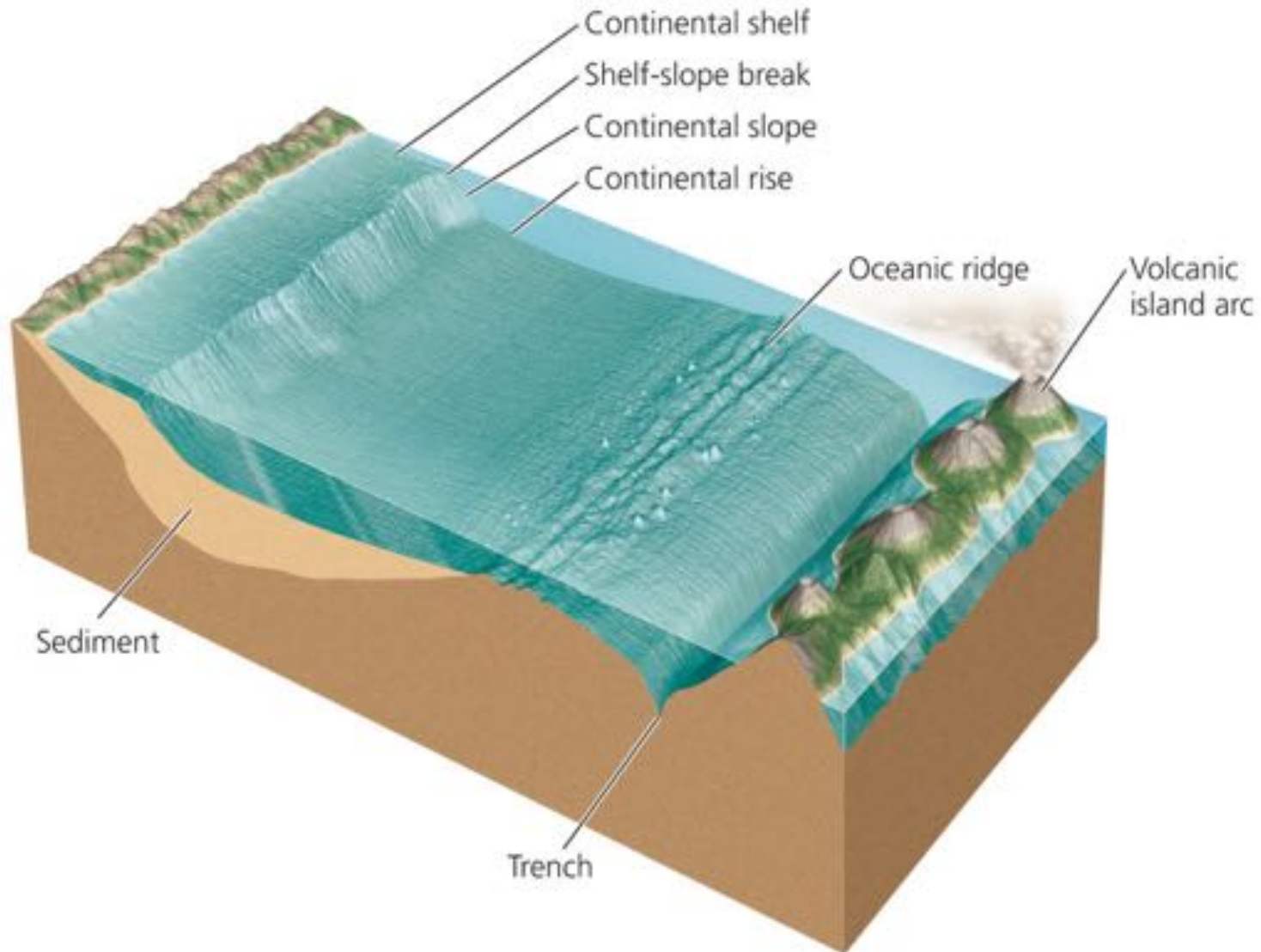


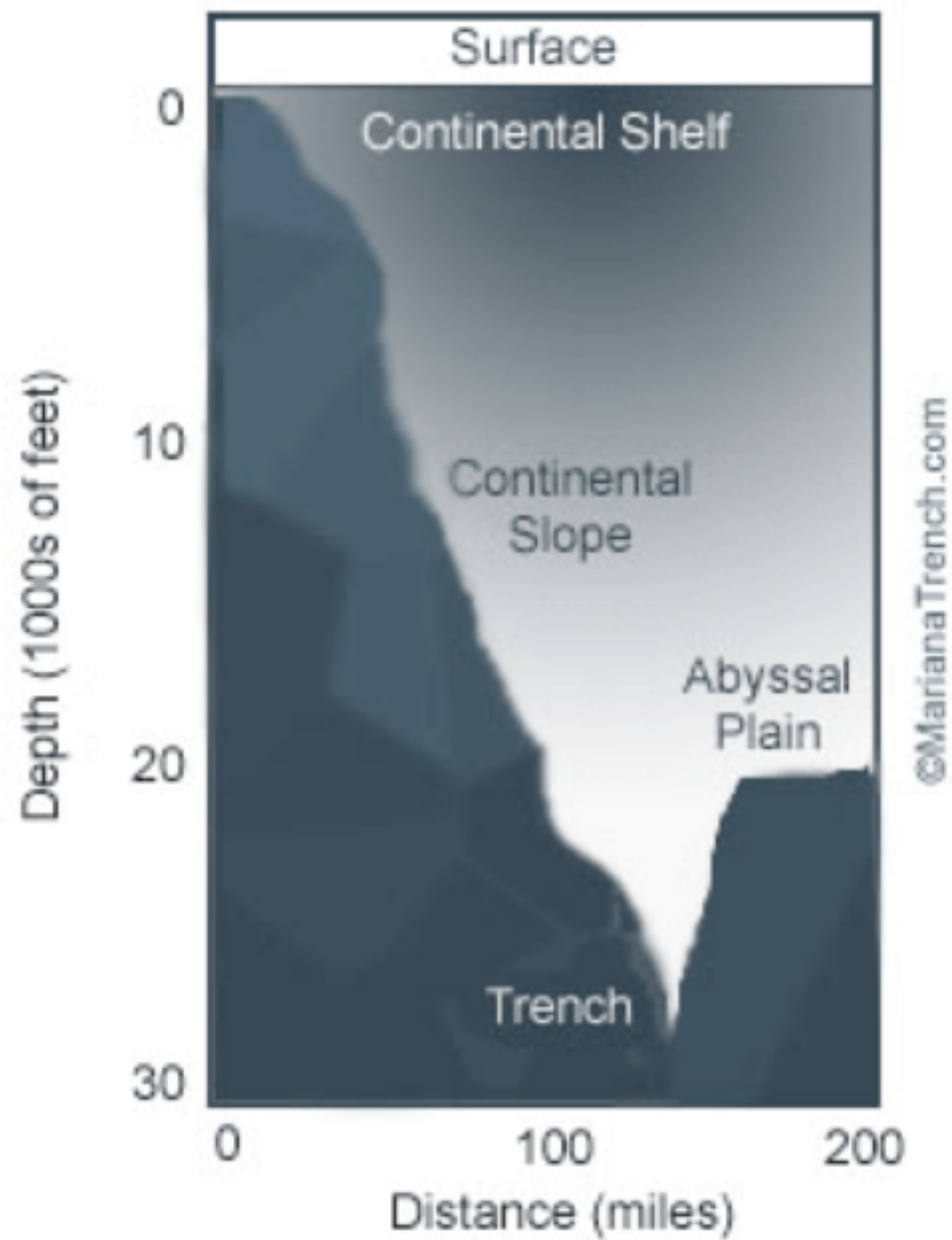
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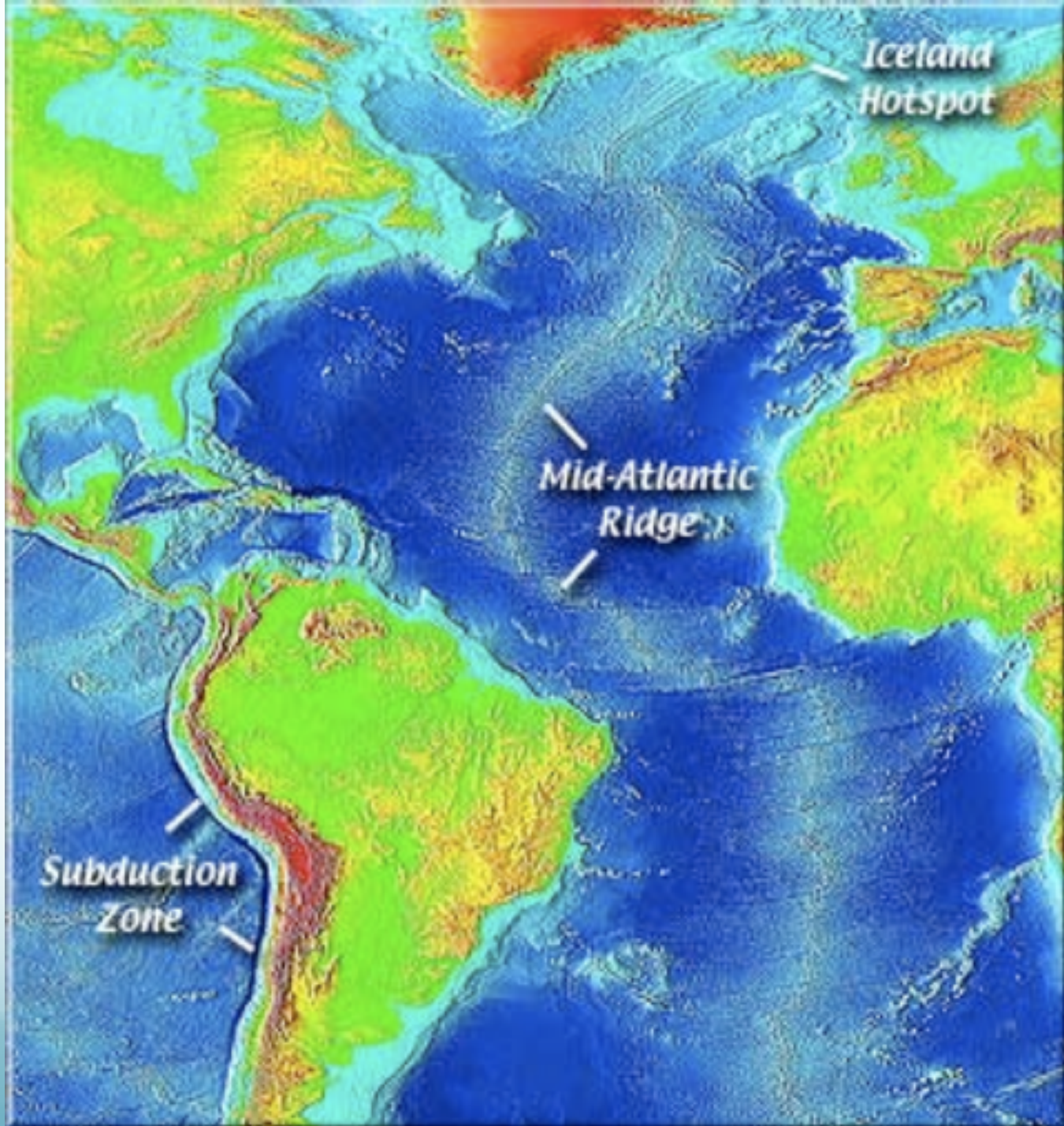
Understanding Underwater Geography

- Maps show:
 - **Bathymetry:** The measurement of ocean depths
 - **Topography:** The physical geography or the shape and arrangement of landforms
- **Continental Shelves:** Gently sloping areas that underlie the shallow waters bordering continents
- **Shelf-Slope Break:** Sudden drop off of the continental shelf
- **Continental Slope:** Connects the continental shelf to the ocean floor

A Stylized Bathymetric Profile of the Ocean

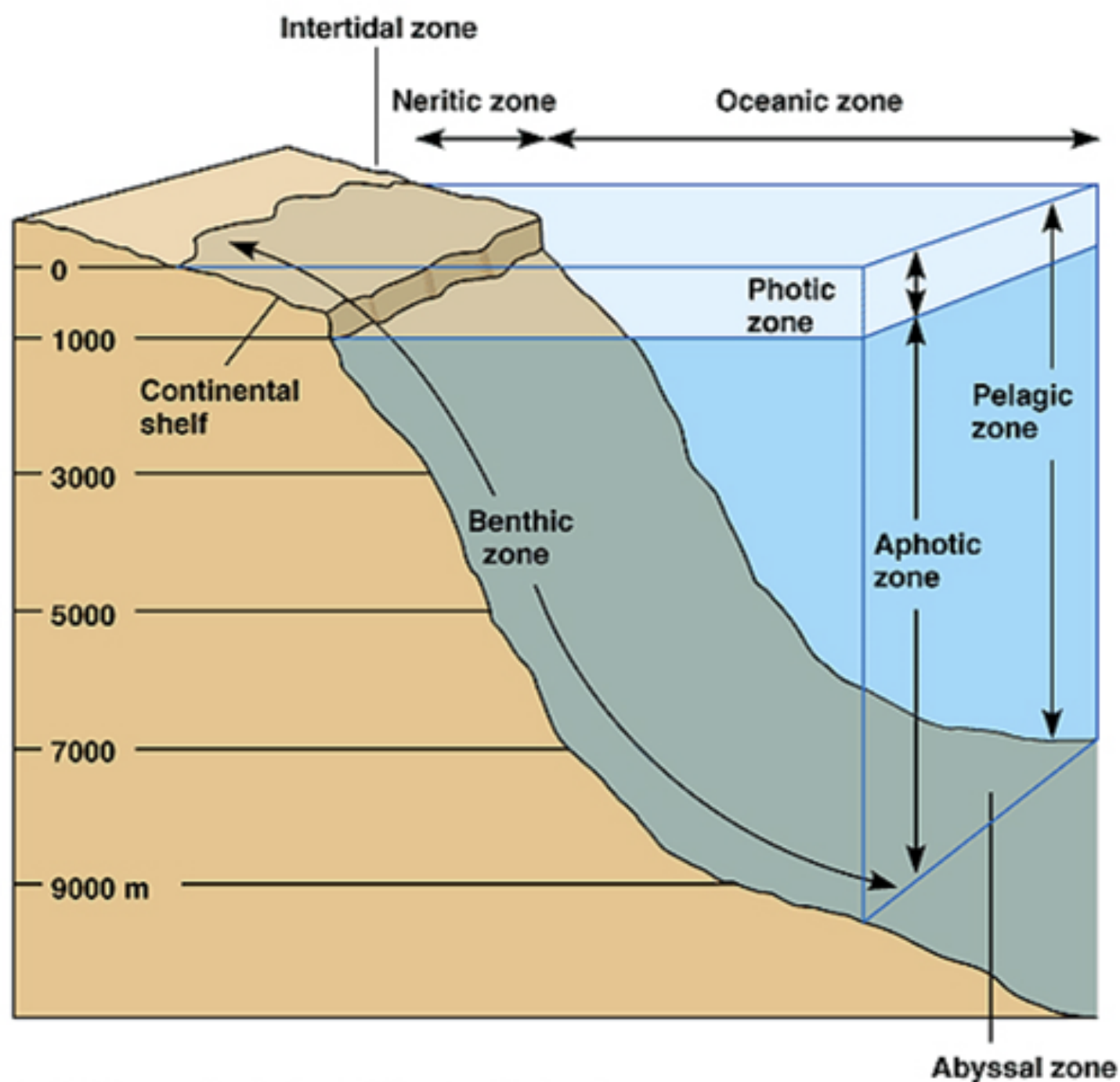






Regions of Ocean Differ Greatly

- Some zones support more life than others
- **Photic Zone:** Well-lighted top layer that supports high primary productivity
- **Pelagic:** Habitats and ecosystems occurring between the ocean's surface and floor
- **Benthic:** Habitats and ecosystems occurring on the ocean floor



Essay Question: **Turn & Talk**

1. What factors drive the system of ocean currents?
2. In what ways do these movements affect conditions for life in the oceans?