Last Nights Homework

Sea Level Change – From 148,000 years ago to Present

Directions:
(1) Make a scaled line graph using the data table below:
(2) Be sure the your graph includes a title
(3) Make sure that you label your x & y axis.

Sea Level (in meters) Compared w/ today	Thousands of years before present
0	0
-24	7
-124	15
-95	20
-75	33
-78	38
-80	40
-77	41
-80	45
-82	48
-60	50
-75	54
-57	58
-76	61
-73	70
-70	75
-58	79
-35	85
-38	90
-35	92
-37	95
-26	100
-55	105
-53	110
-5	115
-2	120
-60	125
-52	130
-132	140
-127	142
-132	144
-125	146
-140	148

Looking at the graph, answer the following questions in <u>full complete sentences</u>.

1. When was sea level lowest?

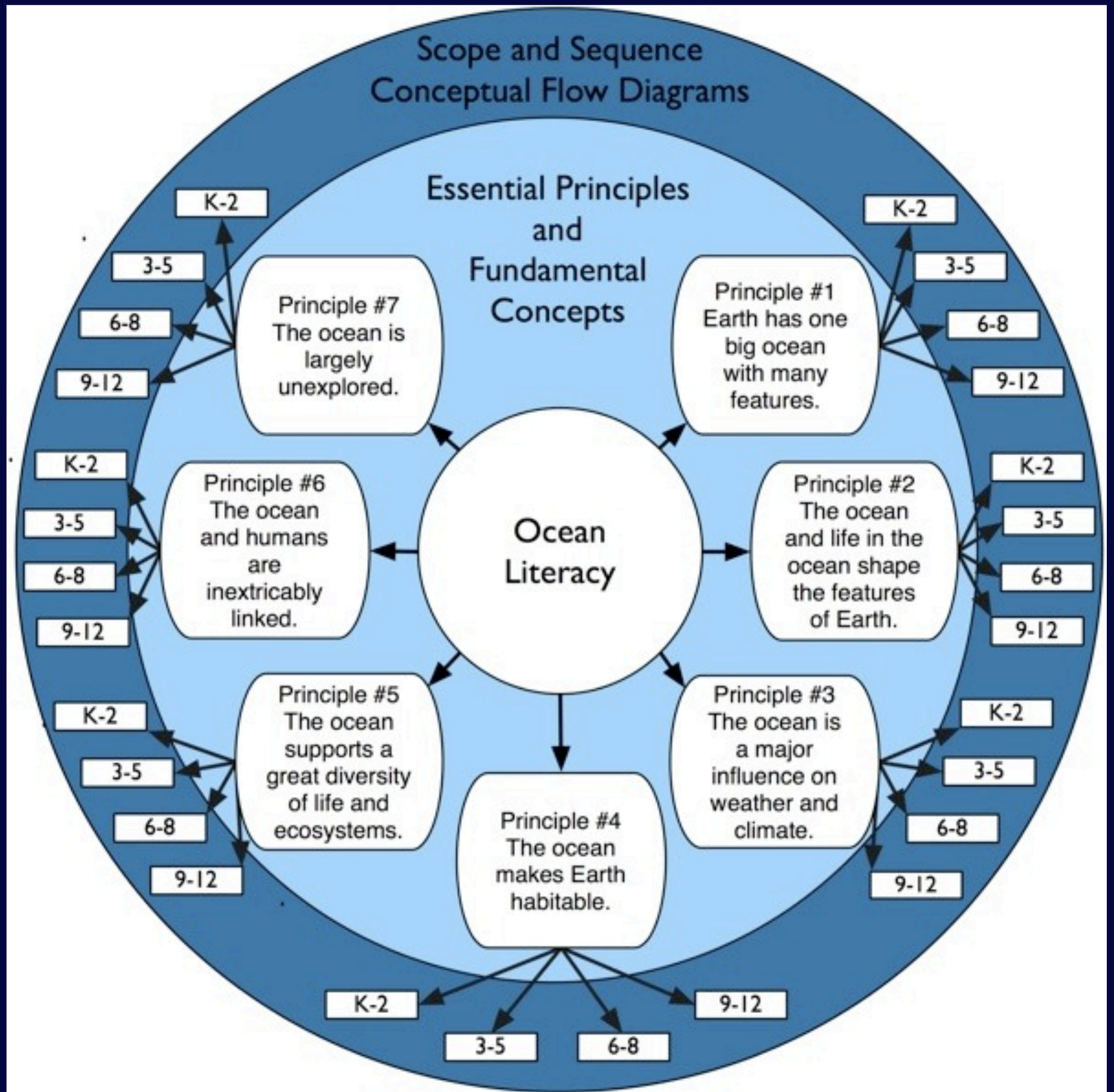
2. When was sea level the highest?

3. Climatologists at the USGS estimate that the sea level will rise 80 cm in the next century. More than 50% of the people in the U.S. live in coastal communities. Using at least four specific examples, what impact will sea level rise have on the U.S.?

4. Give two possible causes of sea level rise 120 thousand years ago.

5. Give two possible causes of current sea level rise.

6. You are a realtor specializing in beach front property on the Jersey Shore. What pressure can you bring on your elected officials to protect your livelihood?


Scope and Sequence
Conceptual Flow Diagrams
Essential Principles and Fundamental Concepts
Ocean Literacy
Principle #1 Earth has one big ocean with many features.
Principle #2 The ocean and life in the ocean shape the features of Earth.
Principle #3 The ocean is a major influence on weather and climate.
Principle #4 The ocean makes Earth habitable.
Principle #5 The ocean supports a great diversity of life and ecosystems.
Principle #6 The ocean and humans are inextricably linked.
Principle #7 The ocean is largely unexplored.
K-2
3-5
6-8
9-12

What makes Ocean Water Different?

Objectives:

- Explain why salt water is essential to Earth
- Explain the origin of water on Earth
- Describe the chemical composition of seawater
- Explain why salinity differs at various latitudes

Why is the Earth Called the Blue Planet?

What are the most important things to know about the

1. Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of Earth.
3. The ocean is a major influence on weather and climate.
4. The ocean makes Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.
7. The ocean is largely unexplored.

Oceans and Coastal Processes

Essential Questions:

1. Why are the oceans salty?
2. How do scientists explore the oceans?
3. How does ocean water circulate?
4. What causes the tides?
5. Why do coastlines change?

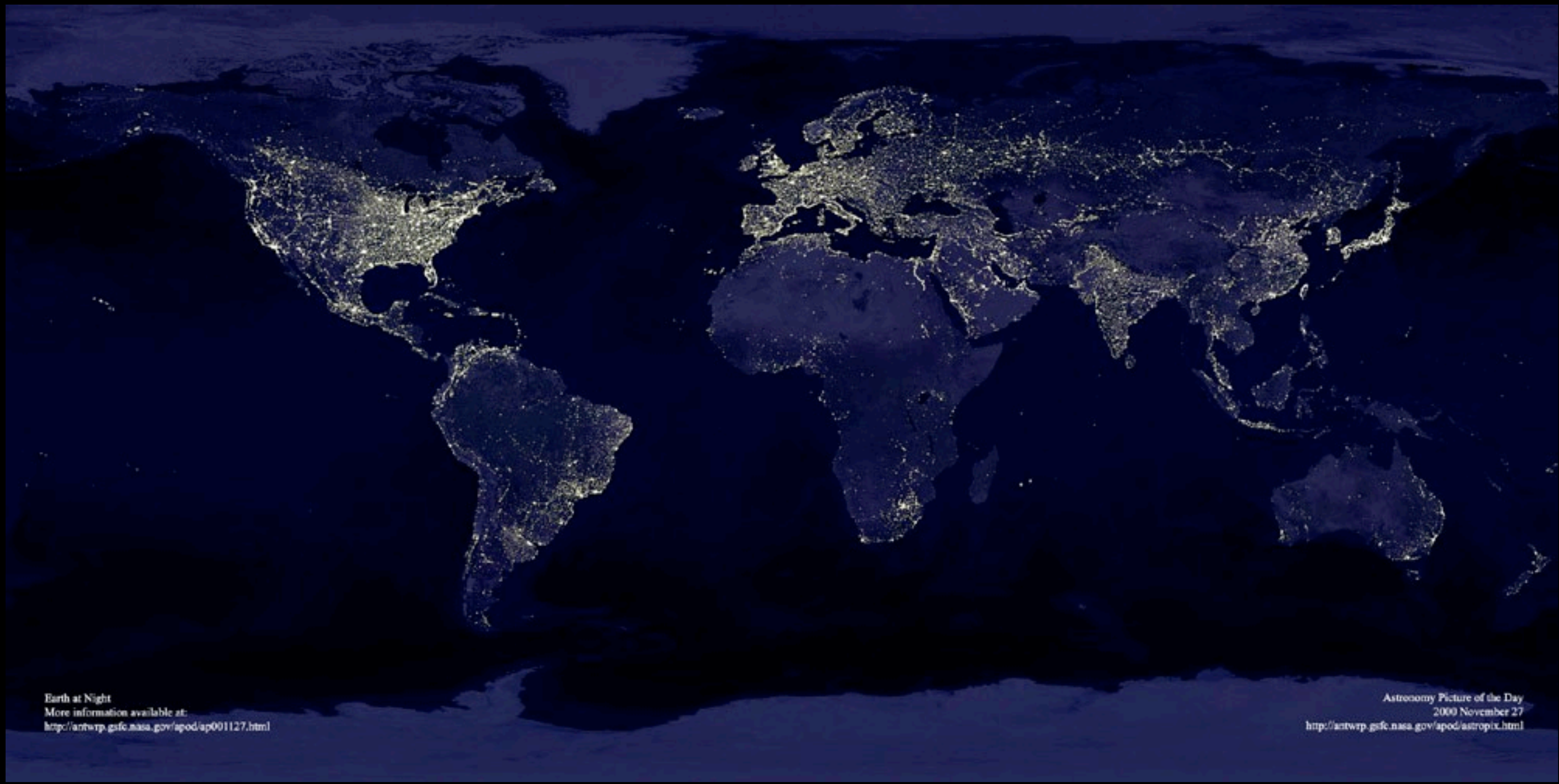
Do you know your Ocean?

The Global Ocean

Correct Answer

What is a Sea?

Large, saline body of water that is smaller than an ocean and that may be partially or completely surrounded by land



Over ___ % of the worlds population lives within 60 miles from a sea coast.

Human World

World population

Seen from the perspective of Asia's crowded east, this model of world population densities forms its tallest peaks in the places with the highest concentrations of people per square

Shows Eastern China, Japan, Indonesia, India and the cities of Europe and the Americas, continued with the world's highest, remote, and driest regions, the mountains to Tibet, the

With the world's population past six billion and growing fast, isolated nations are largely a thing of the past. Almost all trends in modern civilization lead to increasing global integration. International trade brings NBA T-shirts to Bali and Japanese televisions to Canada. Teenagers in Latvia log on to the same websites as their contemporaries in Chile. Cars in the U.S. burn fuel from Nigeria, and satellites transmit cell-phone calls from Moscow to Sydney. Large numbers of people are on the move, leaving homes in the countryside for jobs in the city or crossing borders legally or illegally for better opportunities abroad. But burgeoning populations, while fostering a healthy mix of world cultures, also bring conflict and environmental damage. Resources of food and fuel are already strained past the limit in many countries; growing economies are often growing polluters; and long-standing animosities between cultural groups flare into violence as different peoples compete for control of the same land and resources.

Global sea level changes

Sea level has:

(1) risen (when glaciers melt in warm periods)

(2) fallen (expanding glaciers during cool ice ages).

Describe resources provided by the oceans:

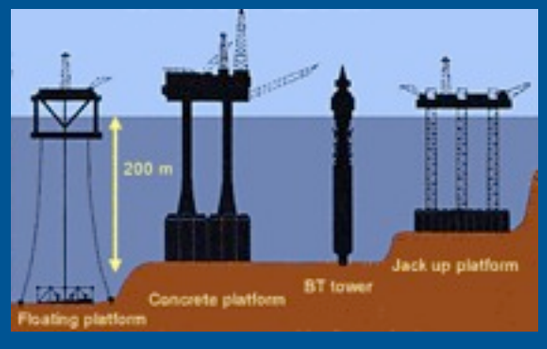
Natural resource:

Any useful material found in the environment

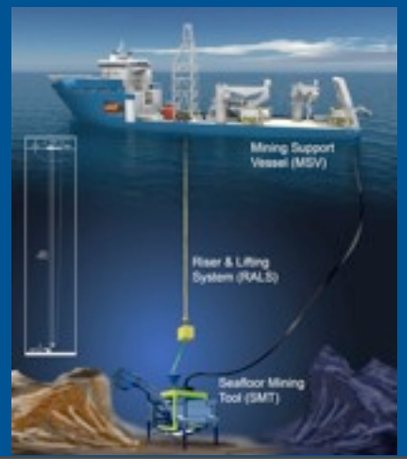
Fisheries

Shipping

Tourism



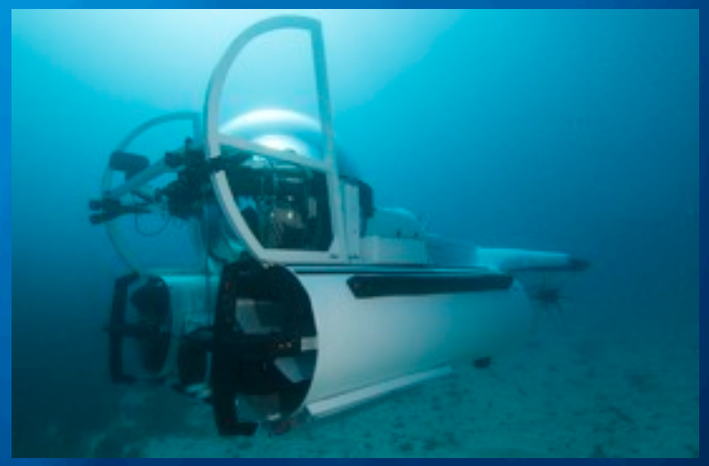
Mining



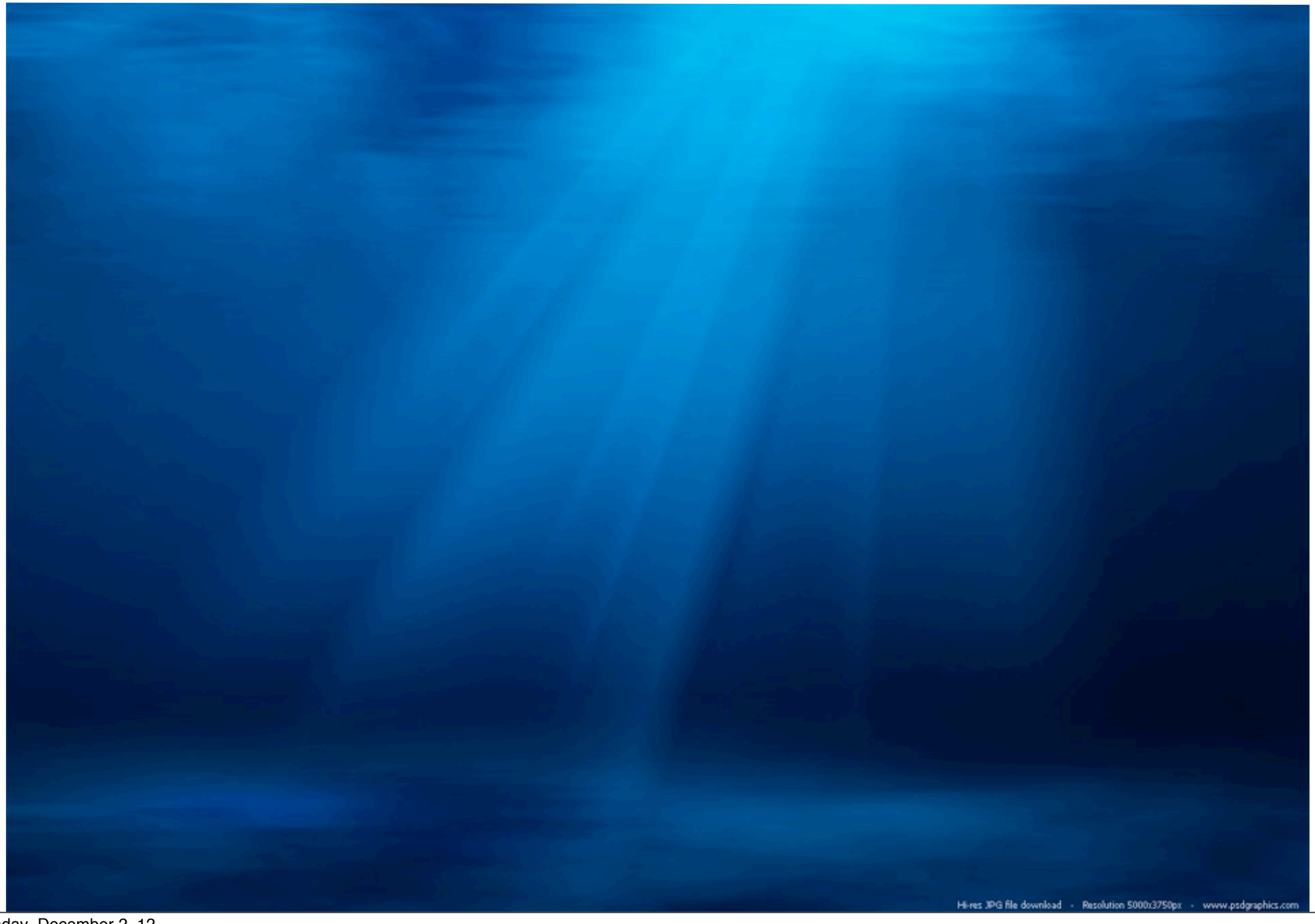
Who studies the ocean?

Oceanographer

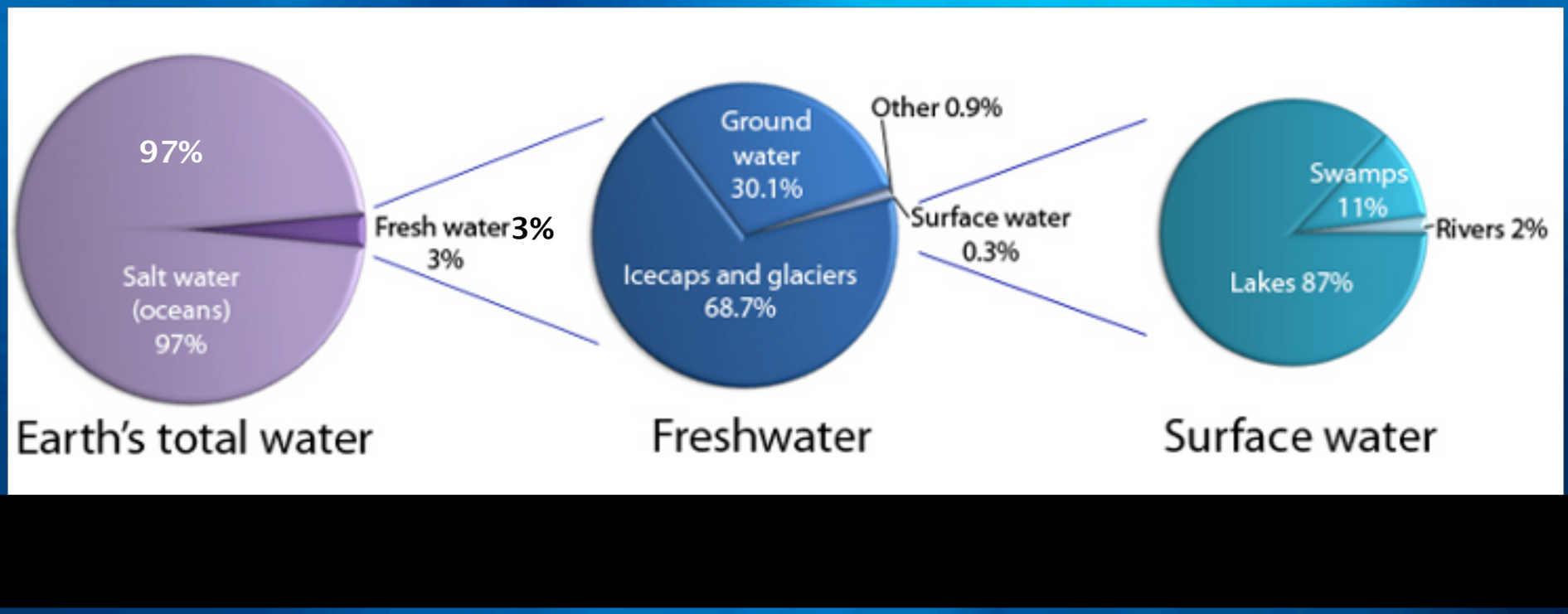
study of the ocean, including the properties and movement of ocean water, the characteristics of the ocean floor, and the organisms that live in the ocean



How can we investigate the Oceans



What makes ocean water different?



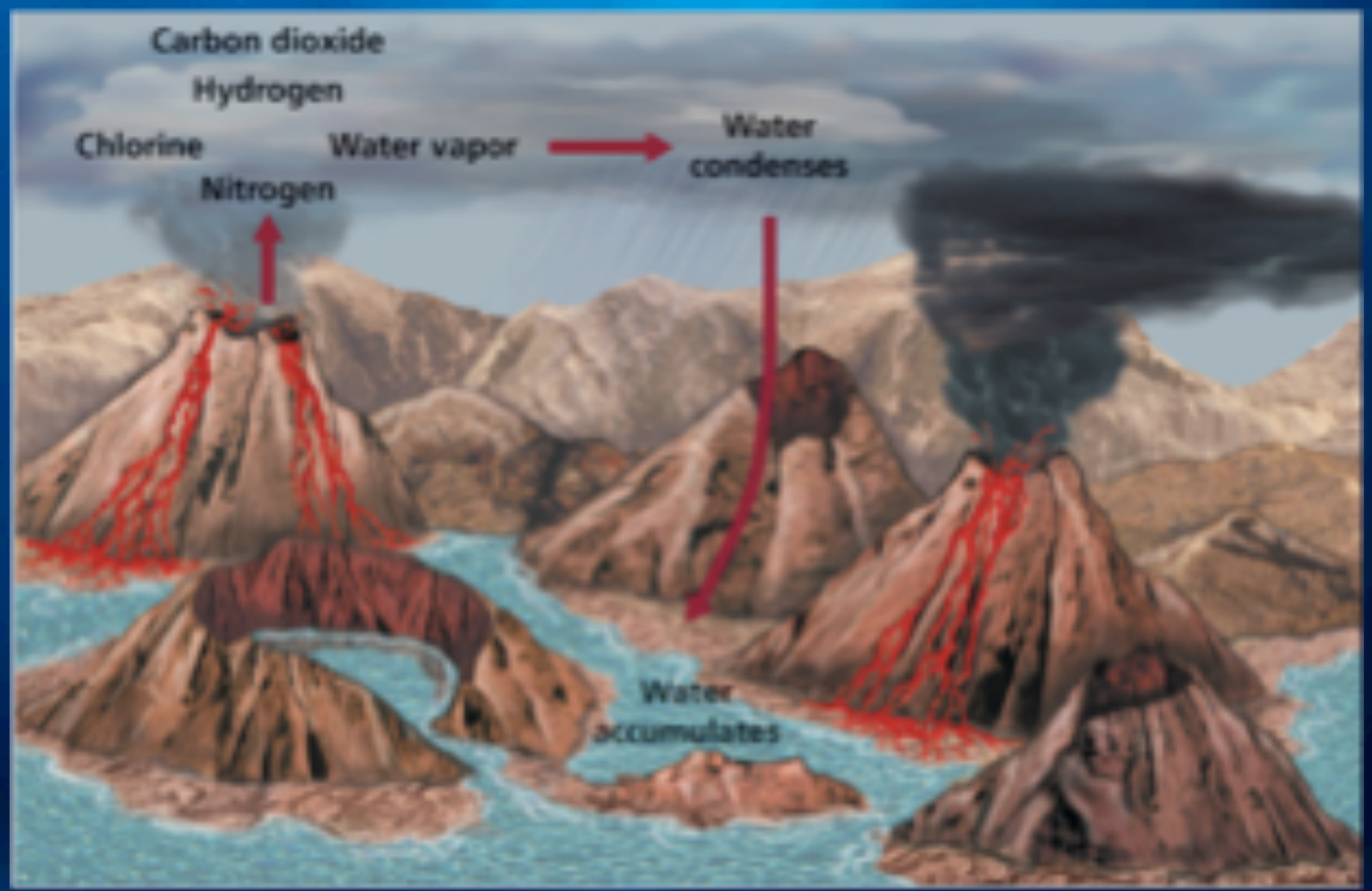
Origin of Earth's water?

Accumulation

(1) Comets and meteorites could have contributed to the accumulation of water on Earth.

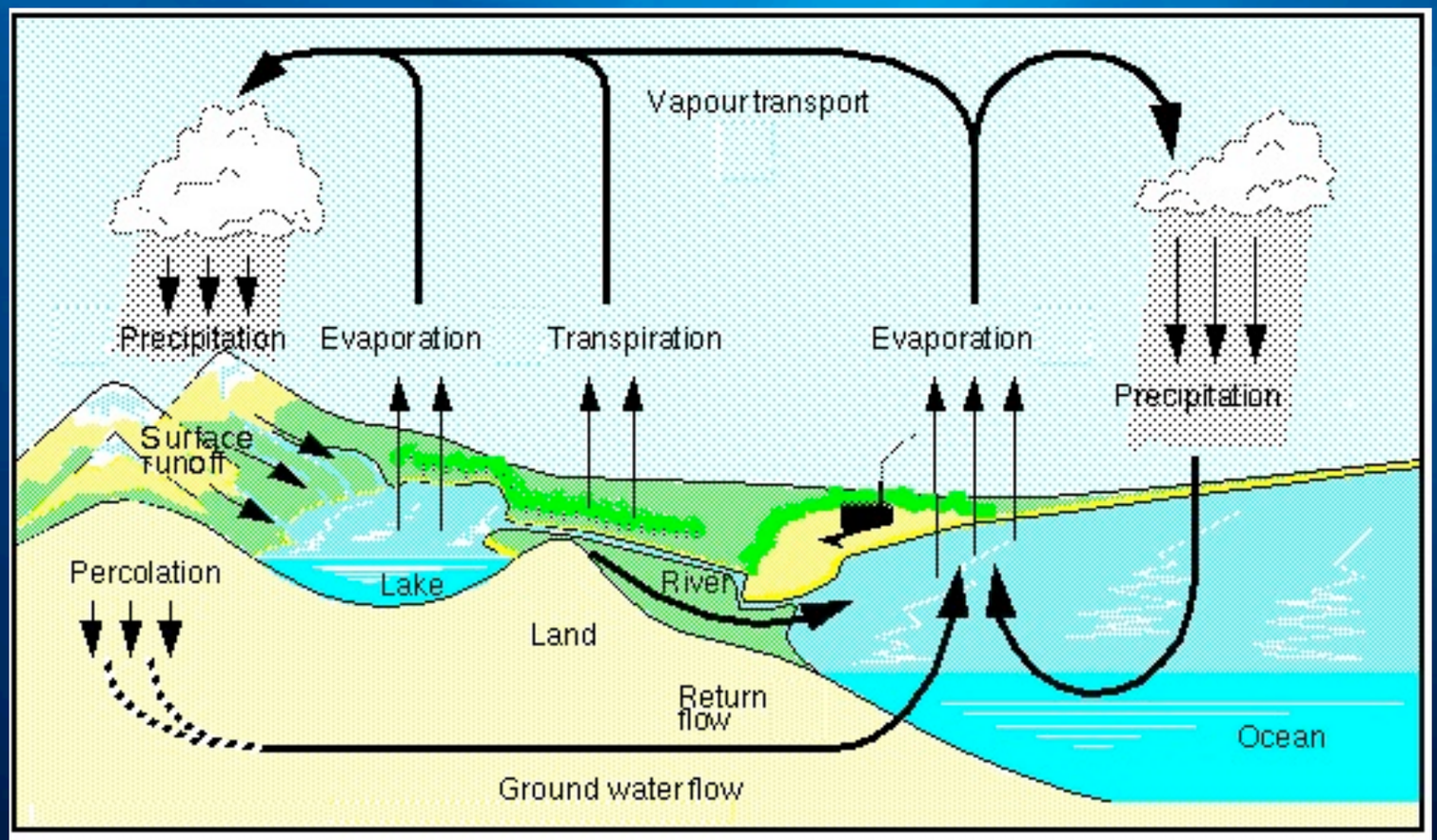
Outgassing

(2) Out gassing - water might have come from volcanic eruptions.



The Water Cycle

Cycle of processes by which water circulates between the hydrosphere, atmosphere, and geosphere.



Courtesy Erich Roeckner, Max Planck Institute for Meteorology

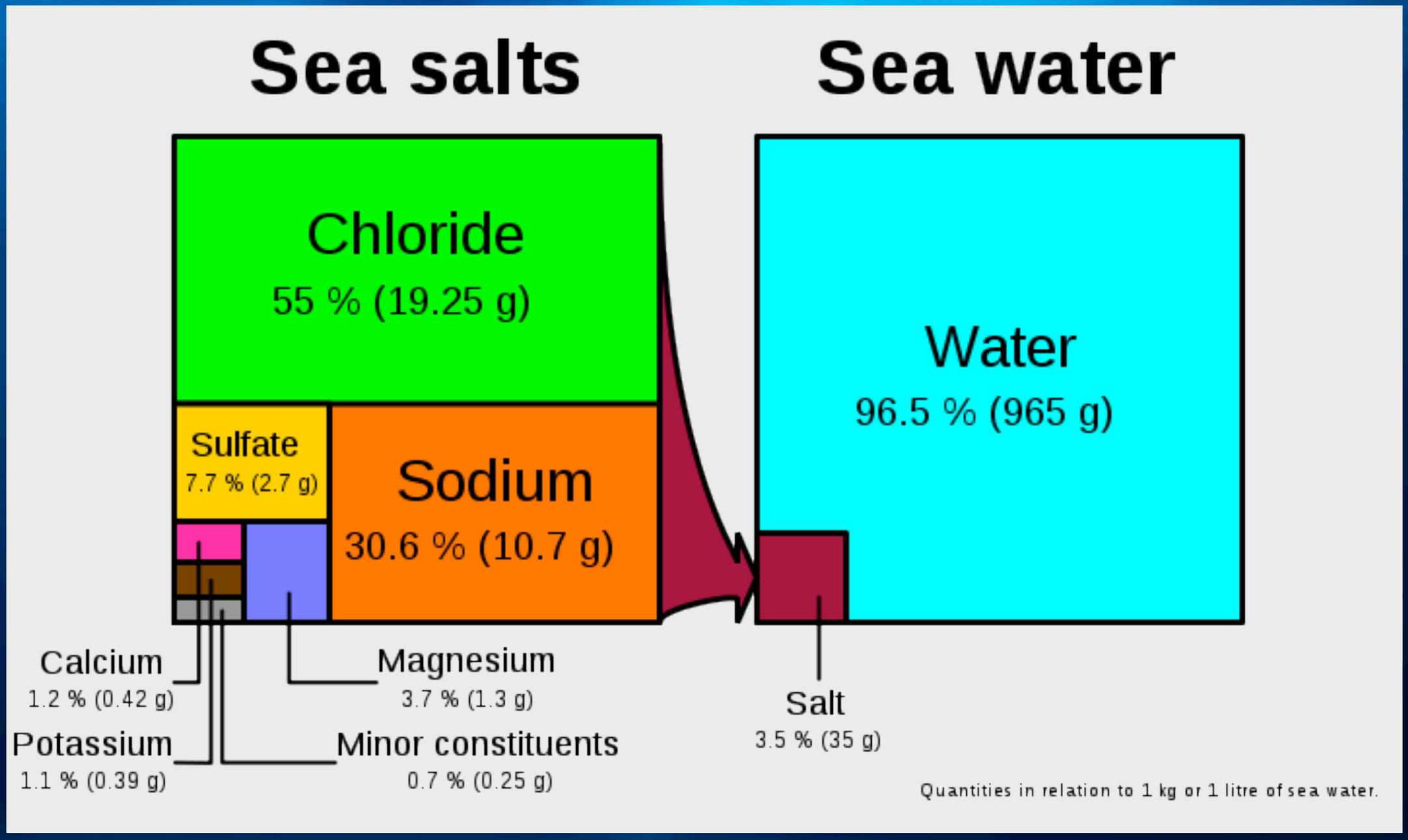
Distribution of Earth's Water

Table 7.1. Major Storages Associated with the Contemporary Global Water System (Shiklomanov and Rodda 2003)

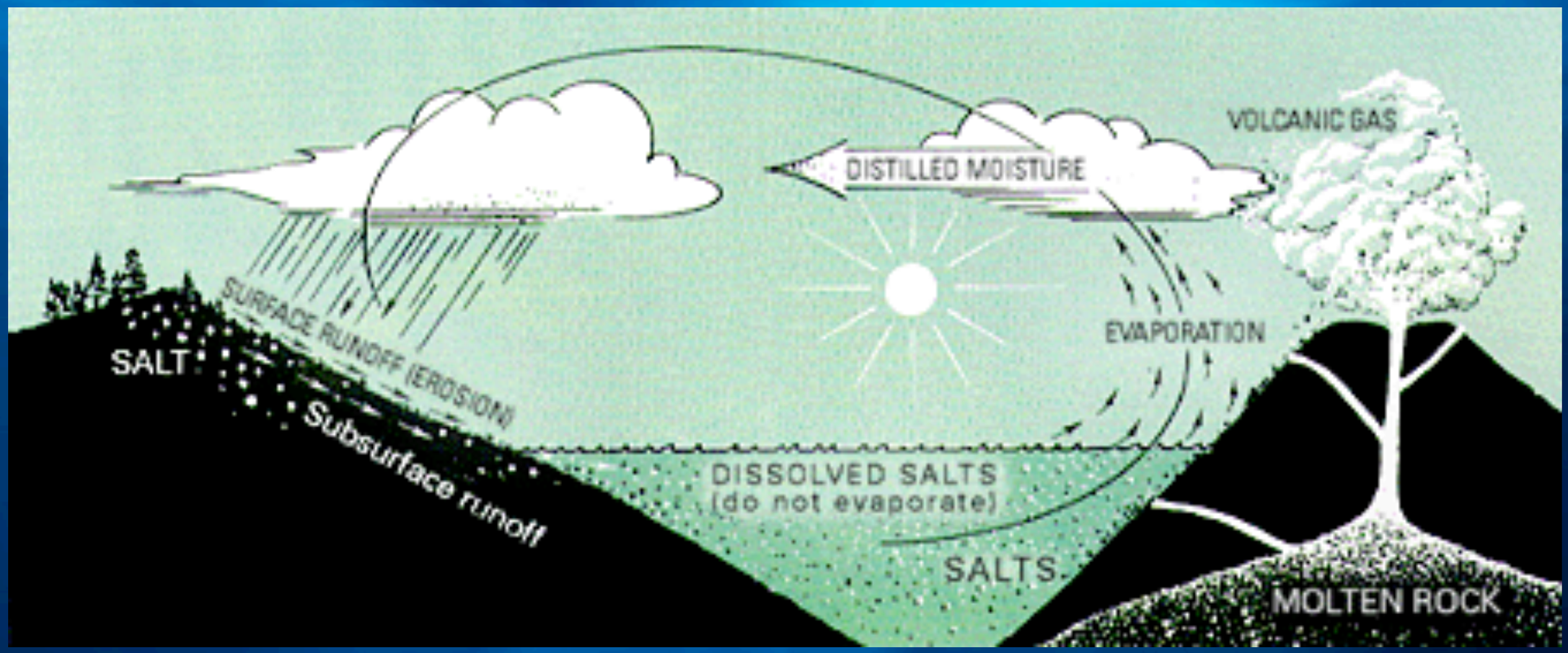
Type	Volume	Fraction of Total Volume	Fraction of Fresh Water
	(thous. cu. km.)	*(percent)*	*(percent)*
World Ocean	1,338,000	96.5	–
Groundwaters	23,400	1.7	–
–Fresh	10,530	0.76	30.1
Soil moisture	16.5	0.001	0.05
Glaciers/permanent ice	24,100	1.74	68.7
Ice in permafrost	300	0.022	0.86
Lakes (fresh)	91	0.007	0.26
Wetlands	11.5	0.0008	0.03
Rivers	2.12	0.0002	0.006
Biological water	1.12	0.0001	0.003
Atmosphere	12.9	0.001	0.04
Total hydrosphere	1,386,000	100	–
Total fresh water	**35,029**	**2.53**	**100**

What makes the ocean salty?

Composition of Ocean Water



Source of Salts



Rocks

(1) The weathering of crustal rocks

Volcanoes

(2) Sulfur dioxide & chlorine gases from volcanoes

Salinity

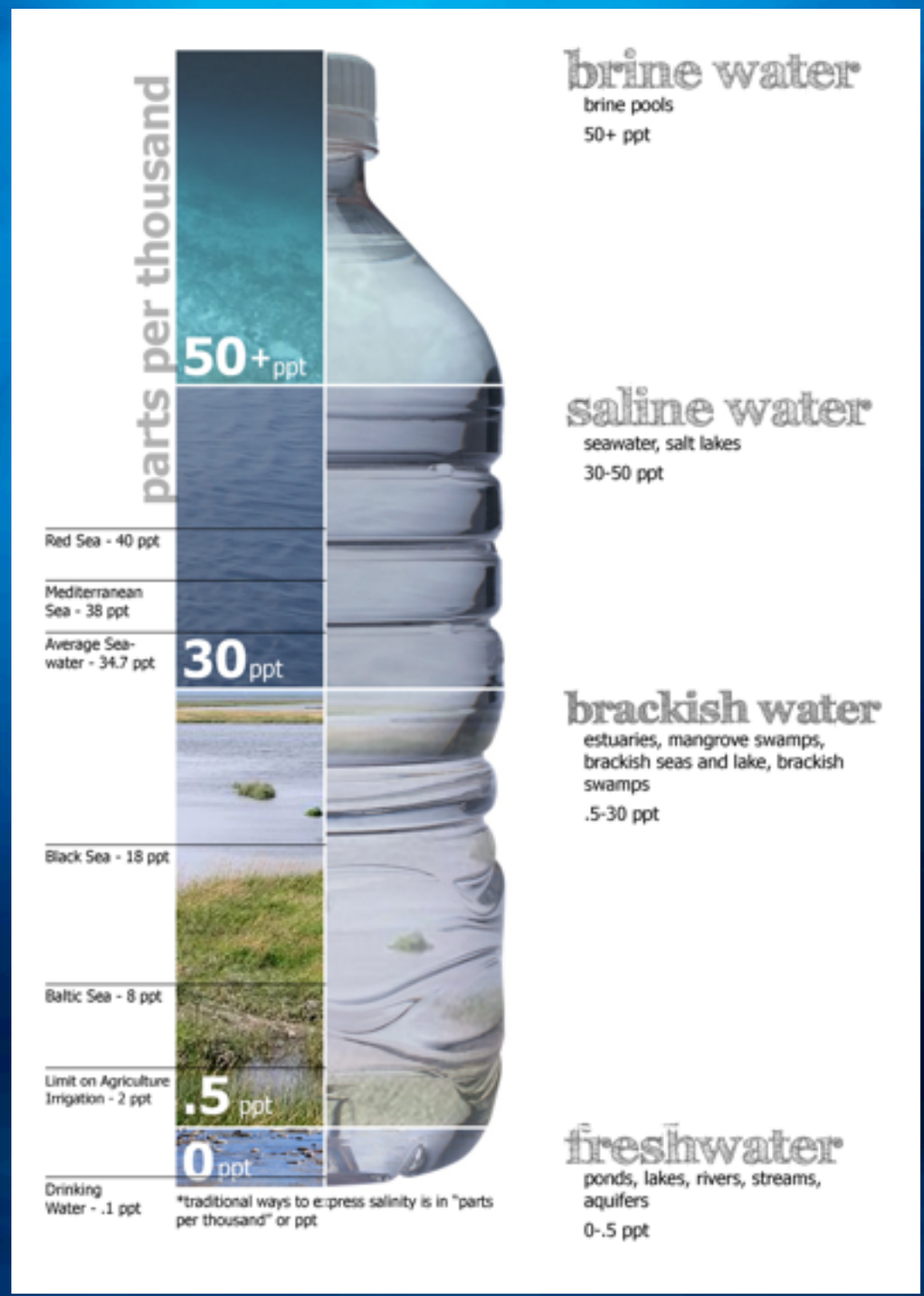
is the proportion of dissolved salts in surface

Brine

Saline

Brackish

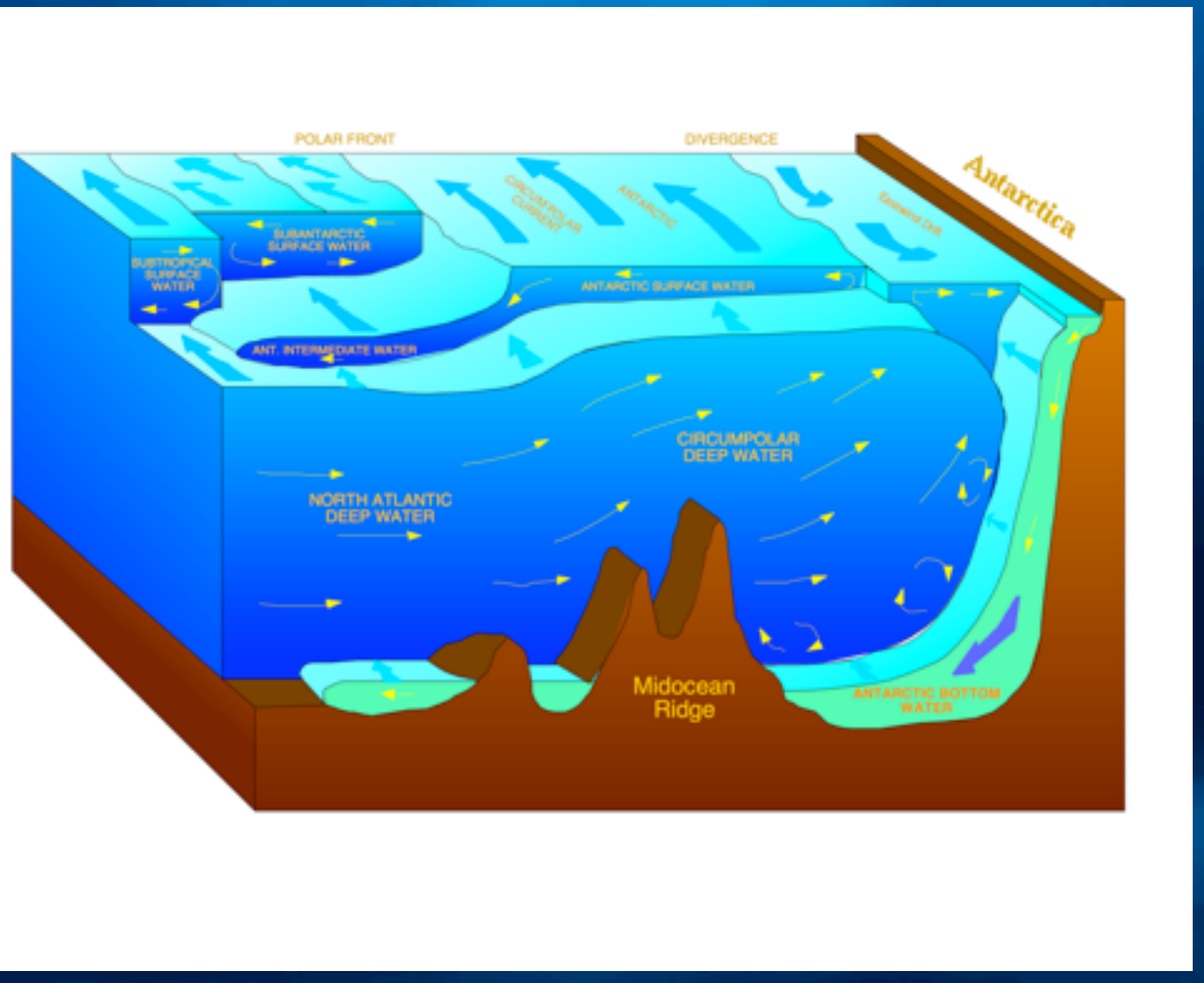
Freshwater



Density of Seawater

Is a function of temperature and salinity.

(1)The more saline the water the more dense it is.
(2) The colder ocean water the more dense it is

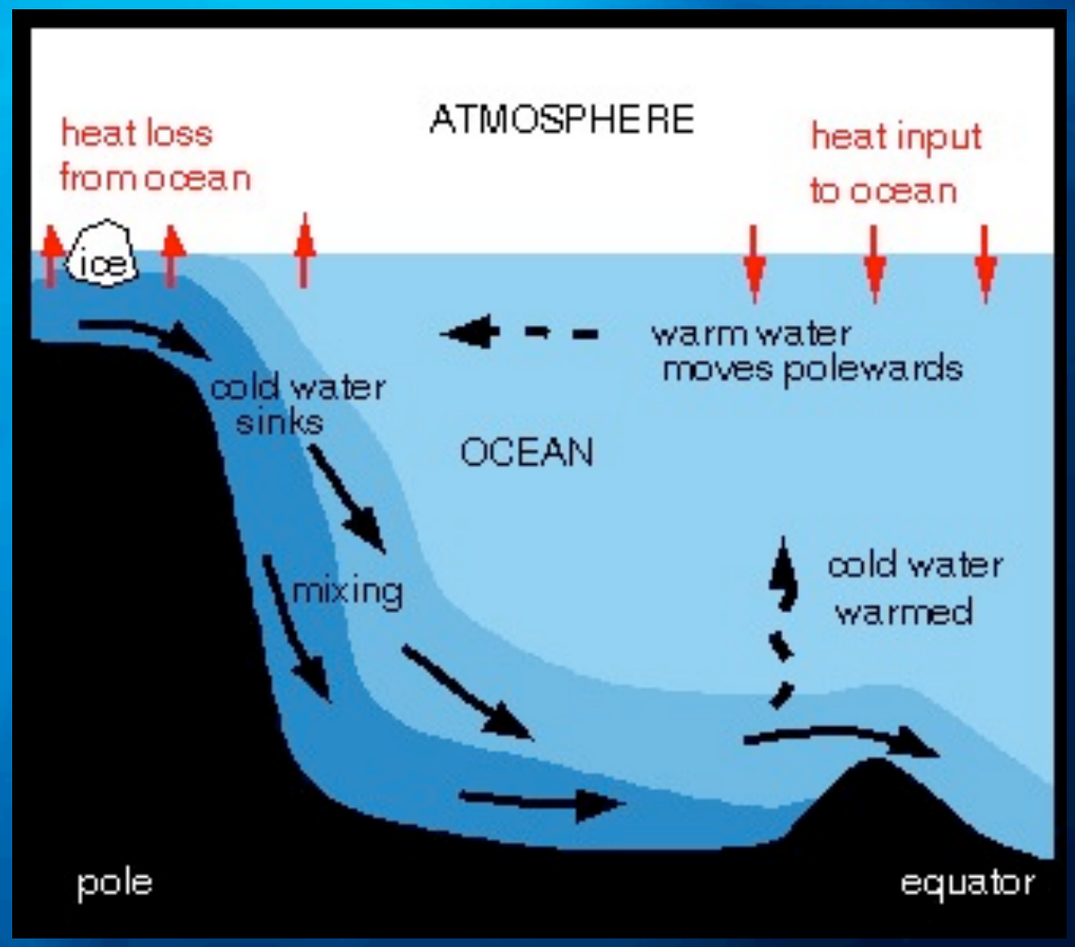


Salt from Seawater

Seawater Density

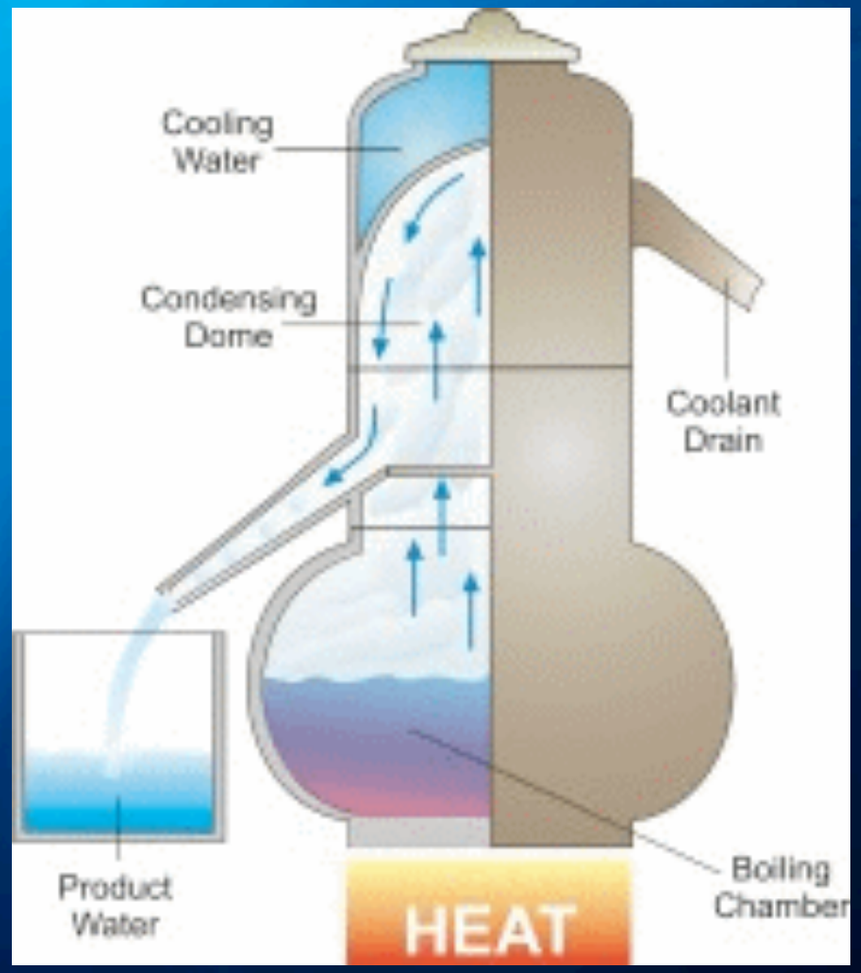
Salt water is more dense than freshwater,

Cold water is more dense than warm water.

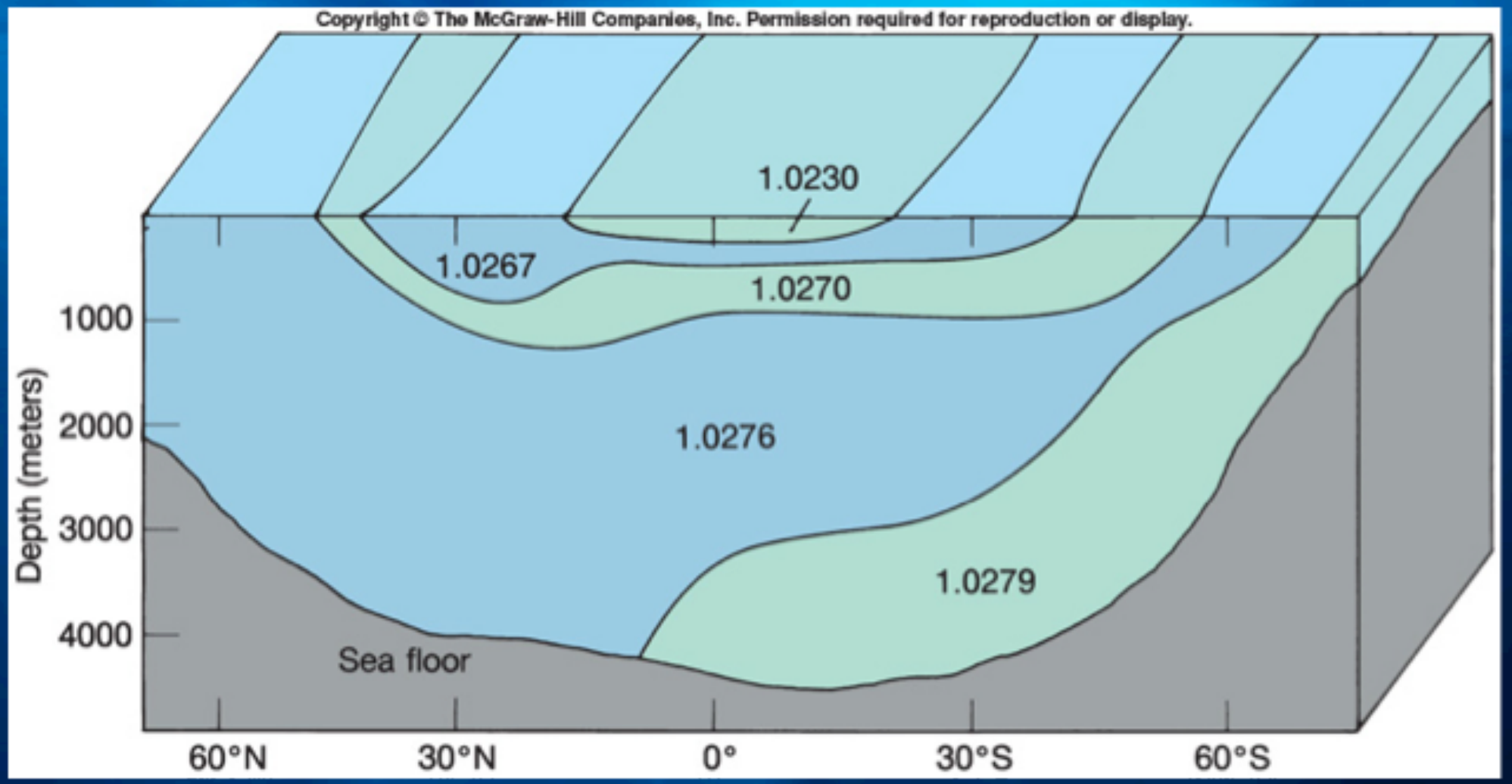


Desalination

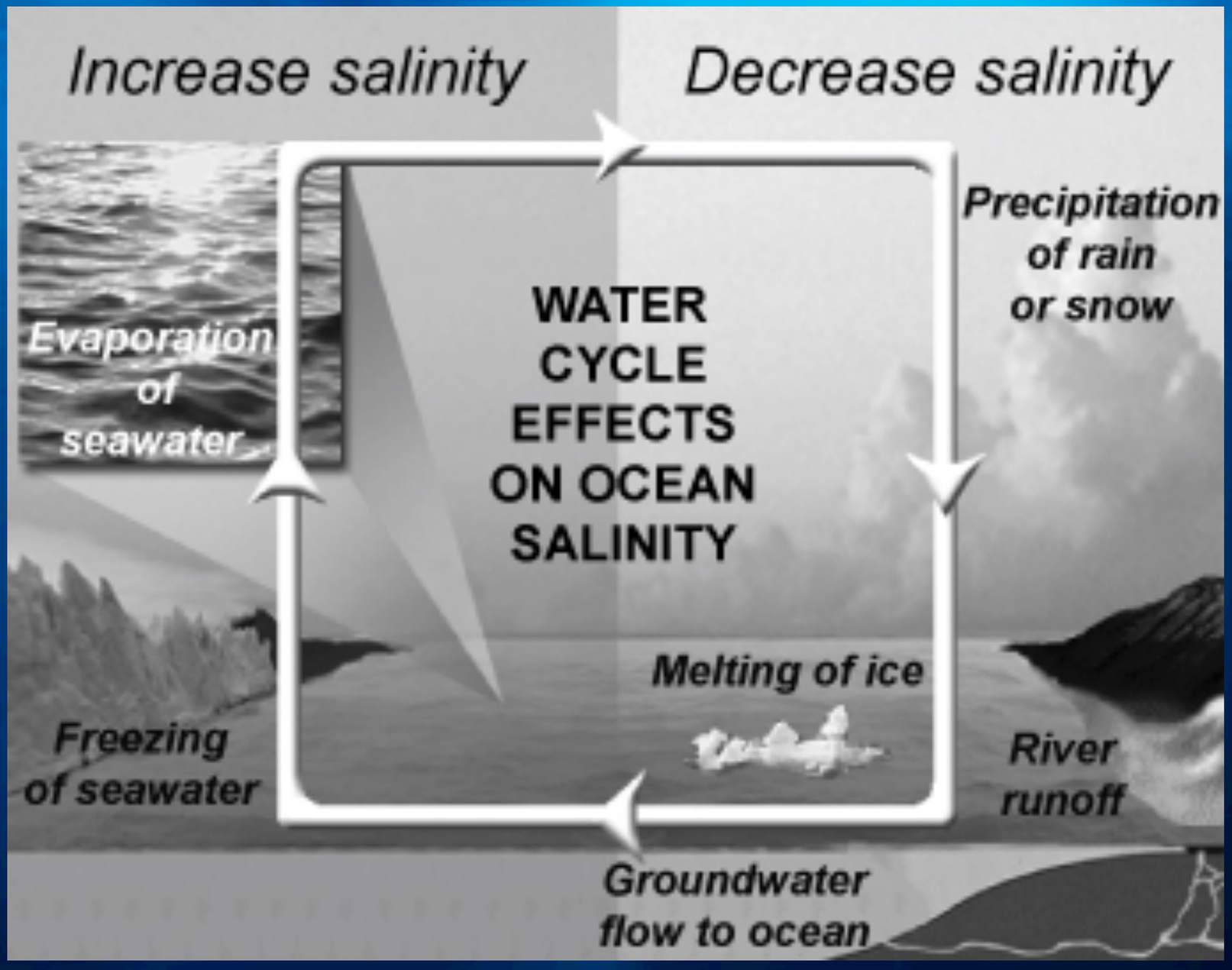
Process to remove salt from saline water



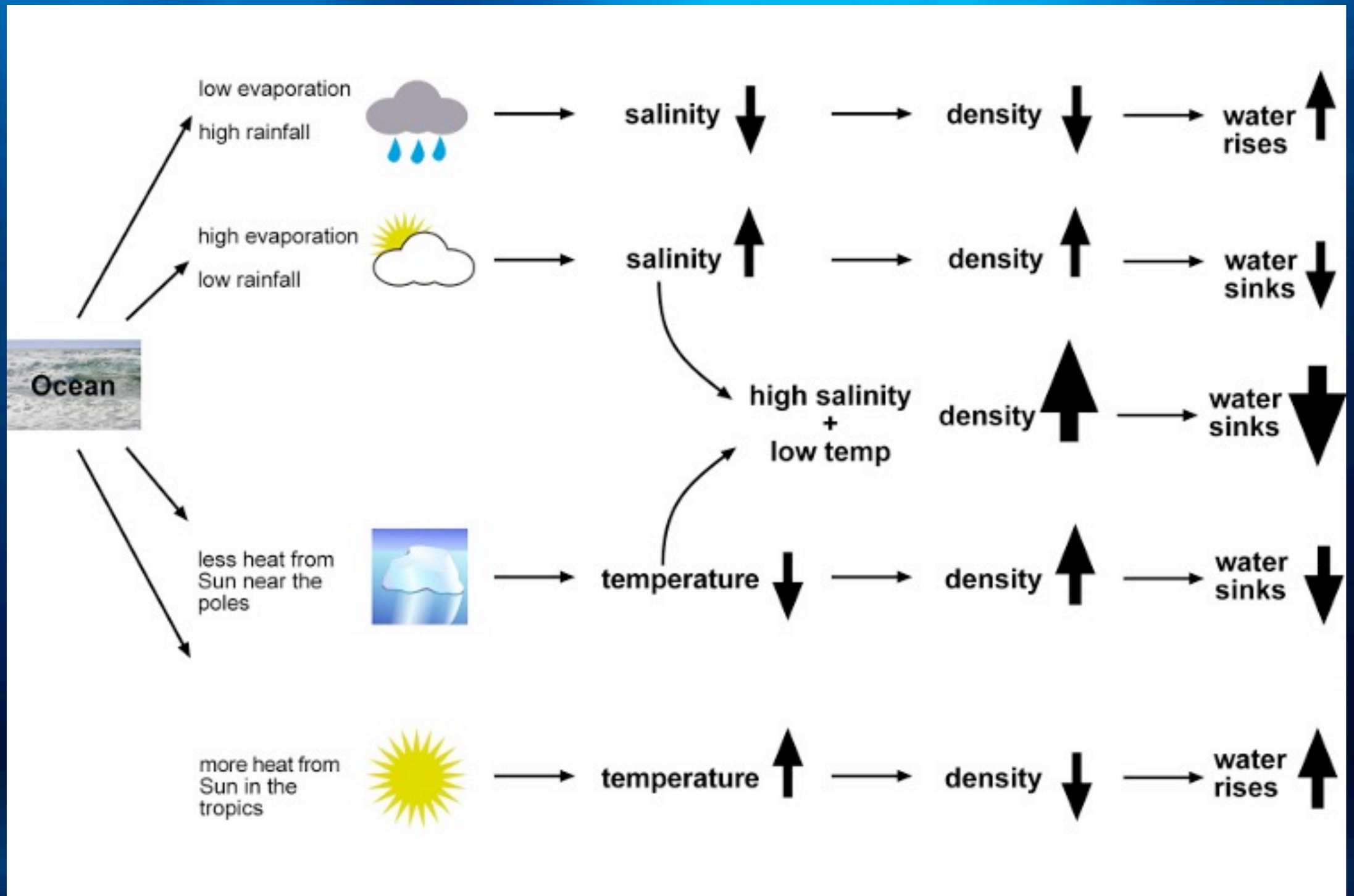
Density of Seawater



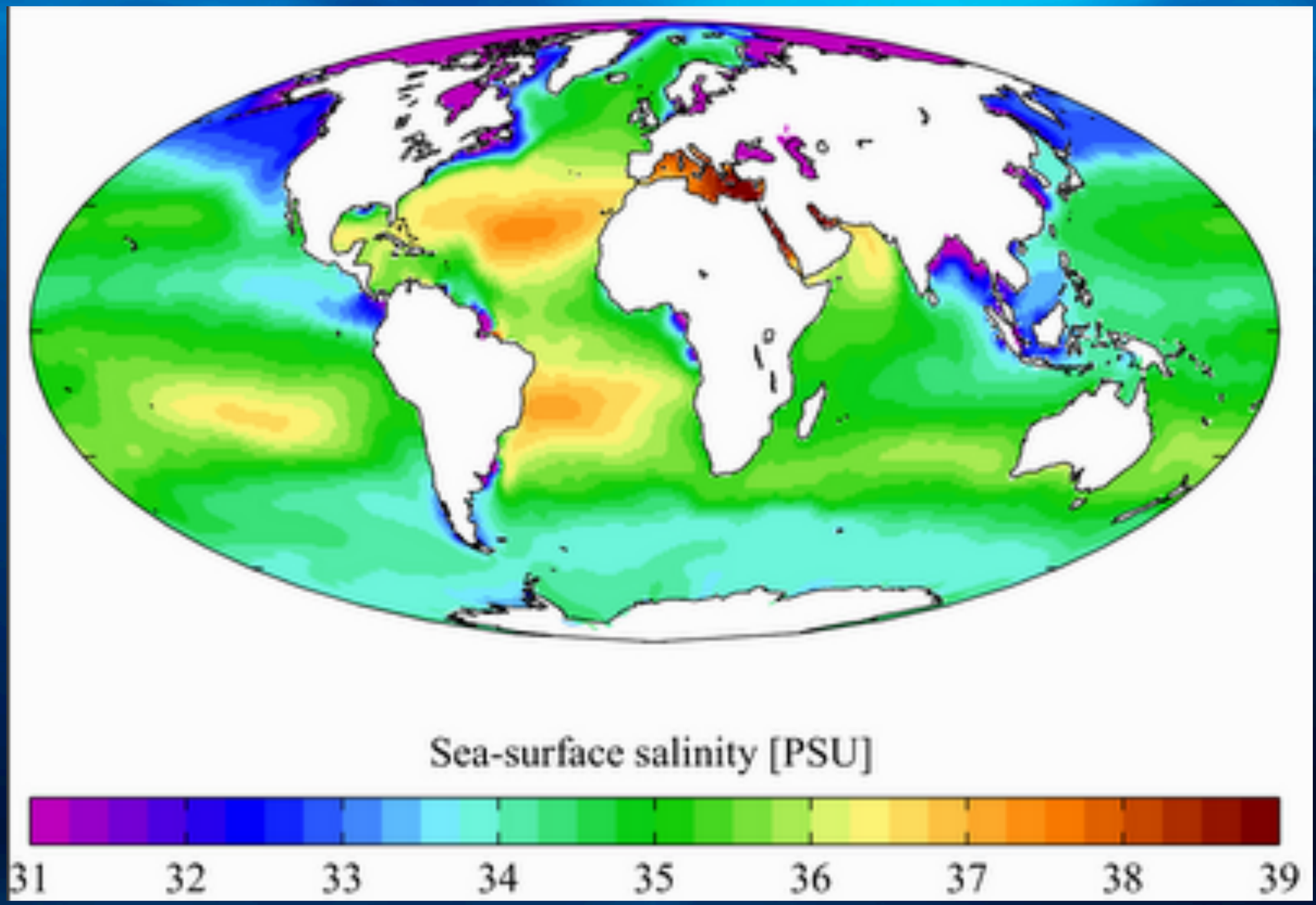
Salinity



How does the water cycle affect ocean salinity?



Where is the Salinity the highest?

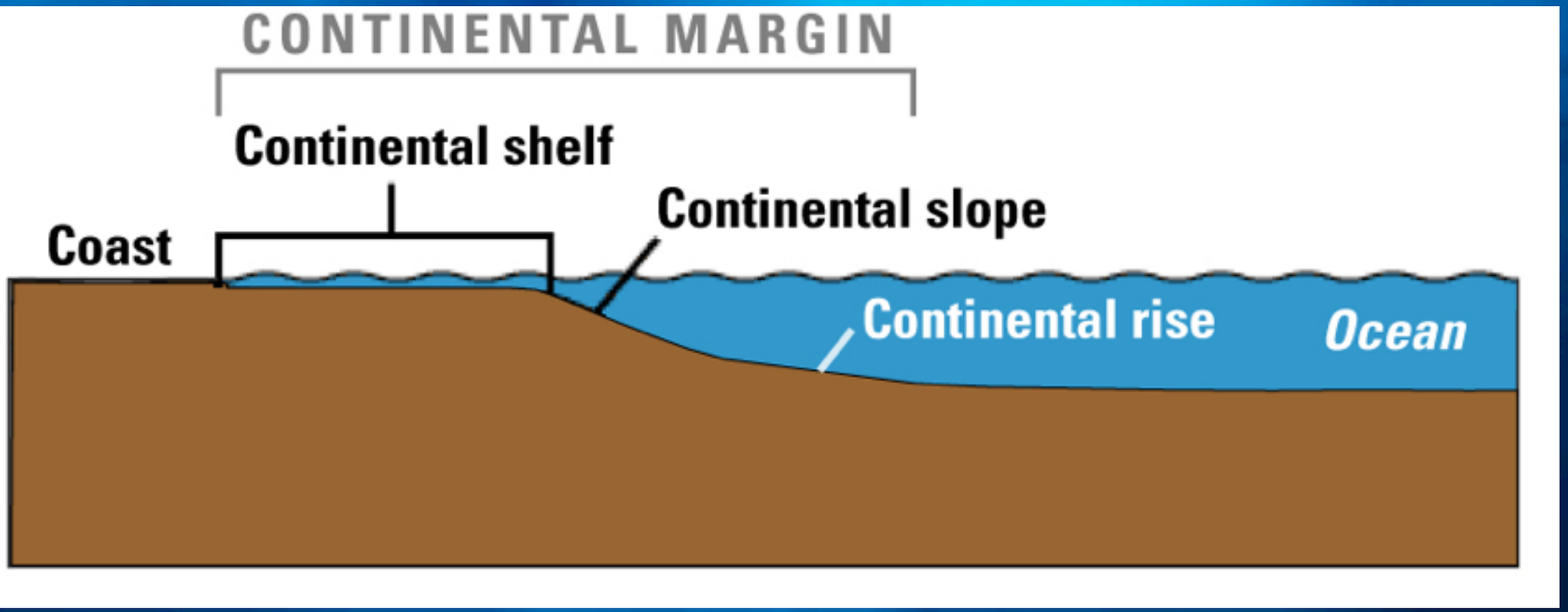


Where is the Salinity the lowest?

Why do people float in the Dead Sea?

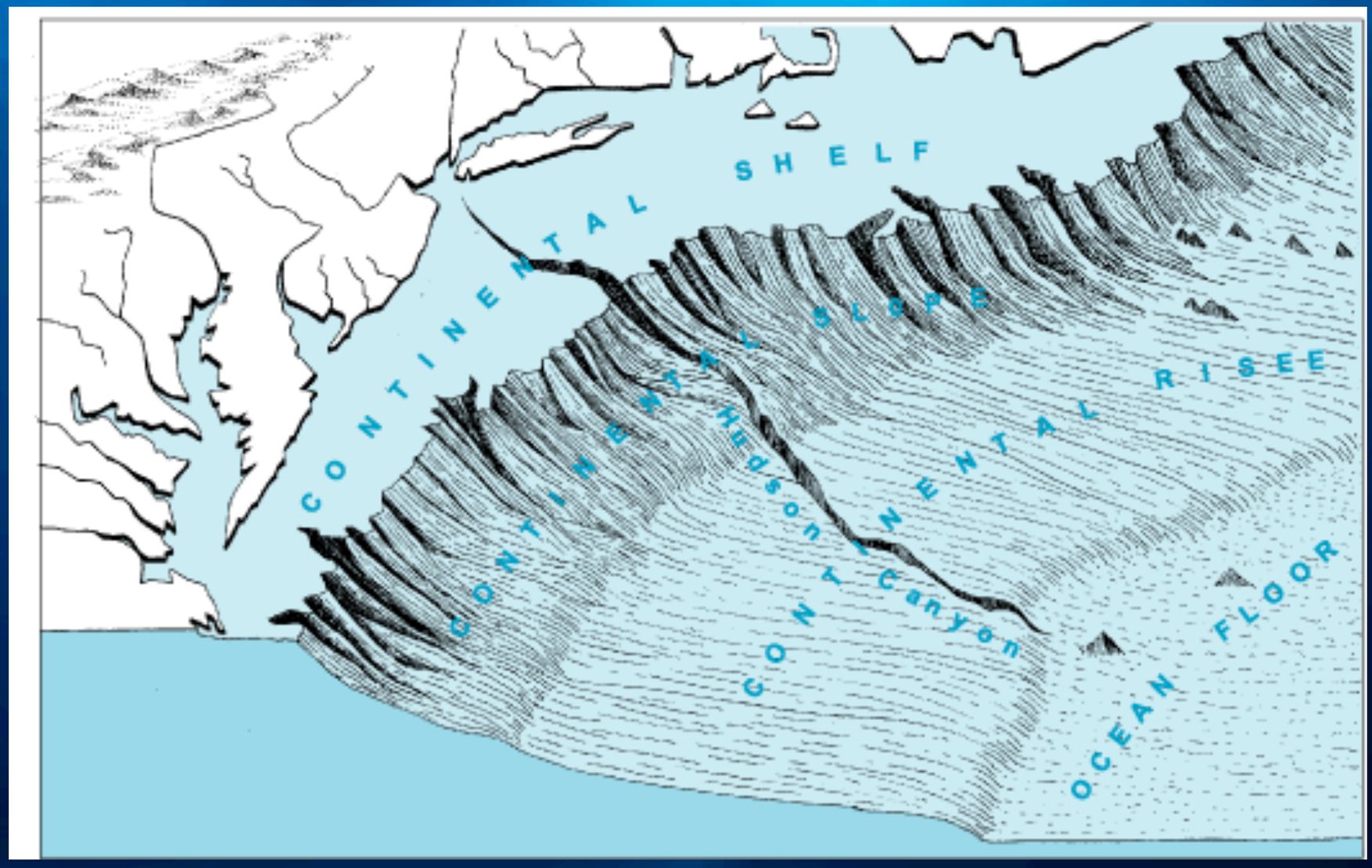
Dead Sea has a LOT of salt in it. Salt water is heavier (denser) than regular water. People can float in regular water, but since salt water is even denser, it is even easier to float in the Dead Sea.

Exploring the Shallow Ocean

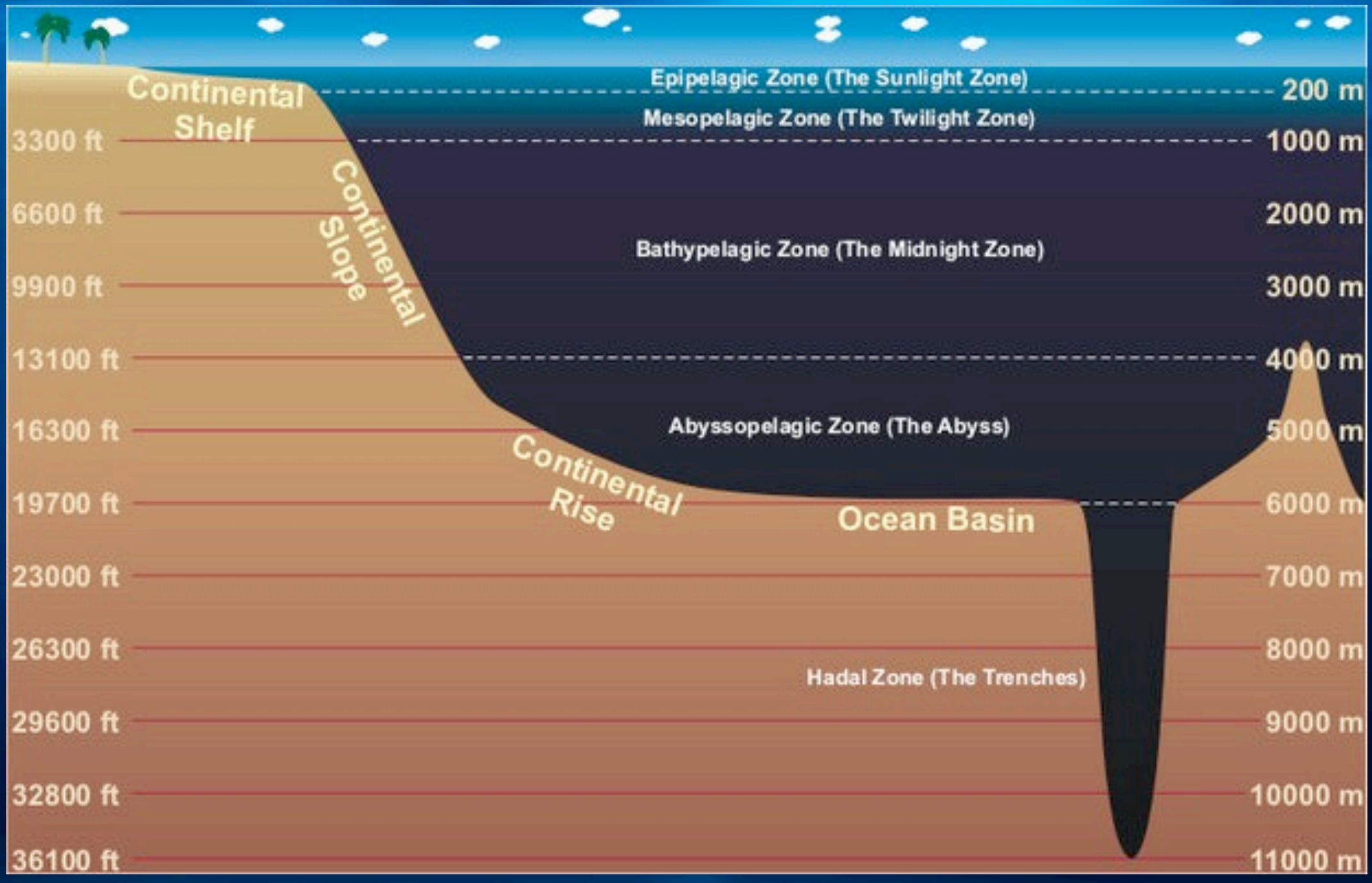


Continental Margin -

Shallow sea floor, located between the shoreline and the deep-ocean basin.



Ocean Depth


Epipelagic Zone (The Sunlight Zone)
Mesopelagic Zone (The Twilight Zone)
Bathypelagic Zone (The Midnight Zone)
Abyssopelagic Zone (The Abyss)
Hadal Zone (The Trenches)
Continental Shelf
Continental Slope
Continental Rise
Ocean Basin
3300 ft
6600 ft
9900 ft
13100 ft
16300 ft
19700 ft
23000 ft
26300 ft
29600 ft
32800 ft
36100 ft
200 m
1000 m
2000 m
3000 m
4000 m
5000 m
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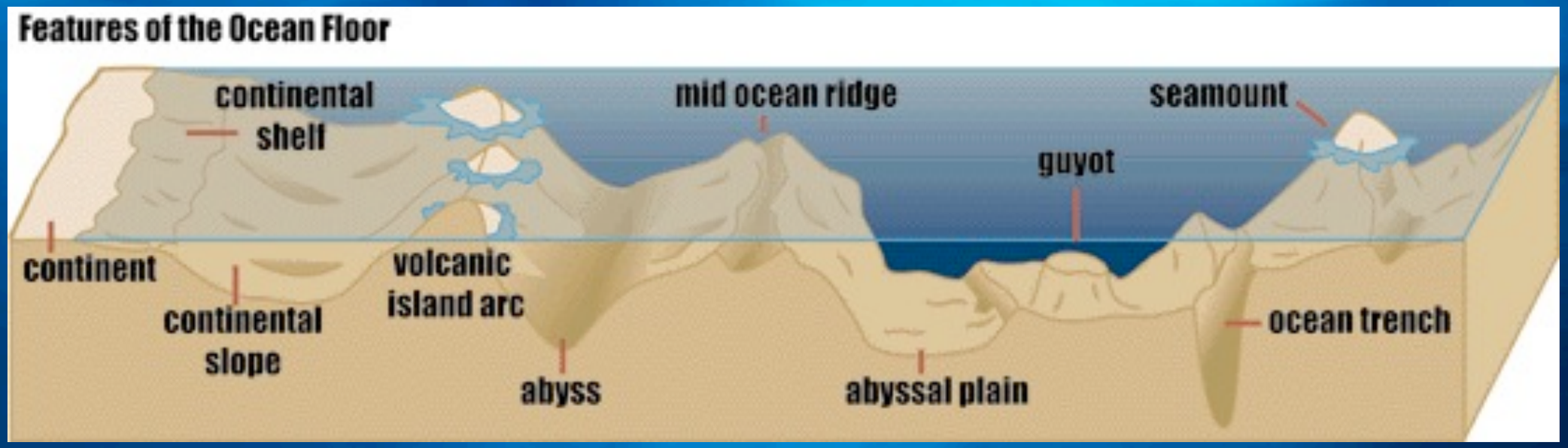
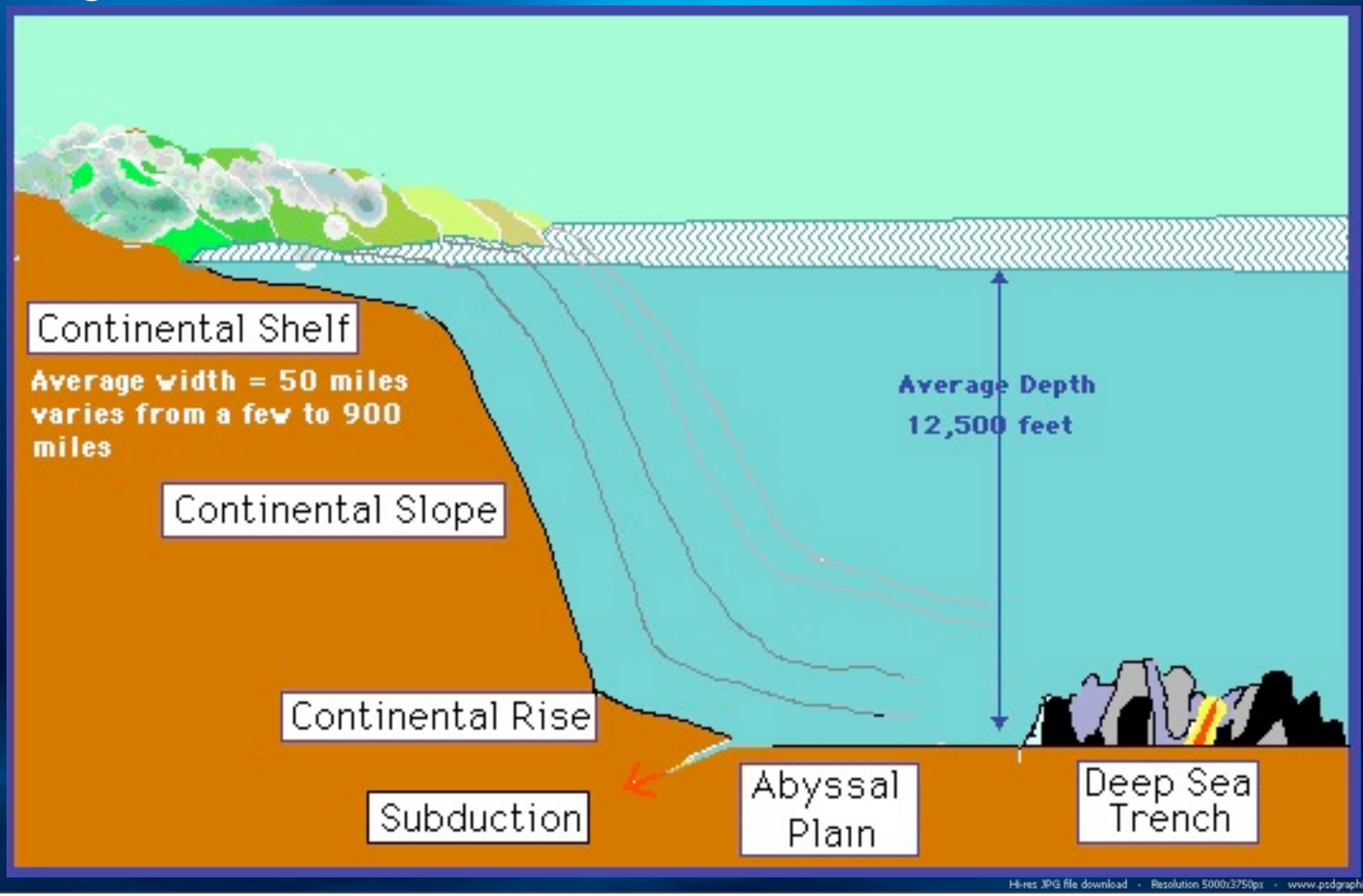
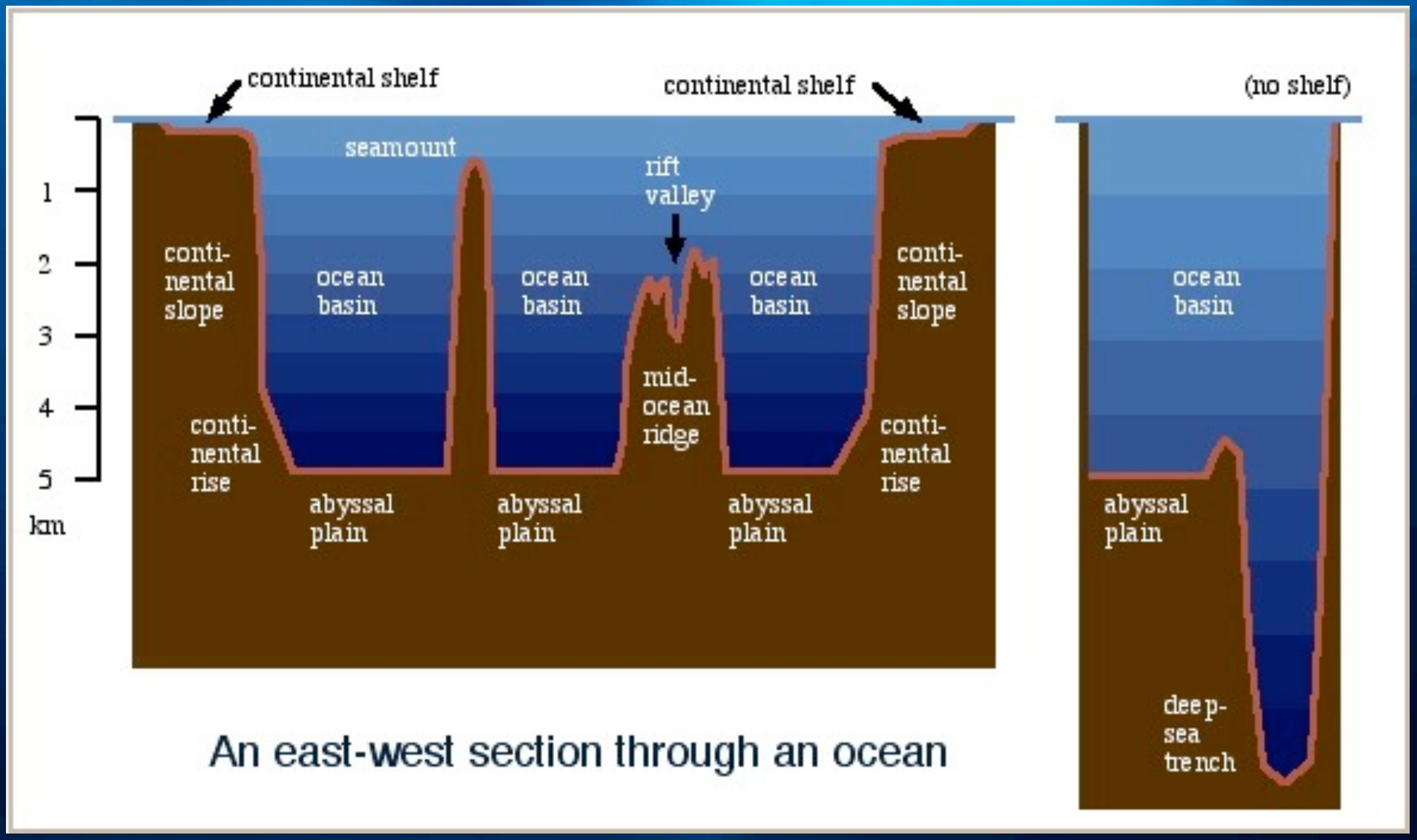
Exploring the Deep Ocean



Deep-ocean basin

Ocean floor under deep water beyond the continental margin

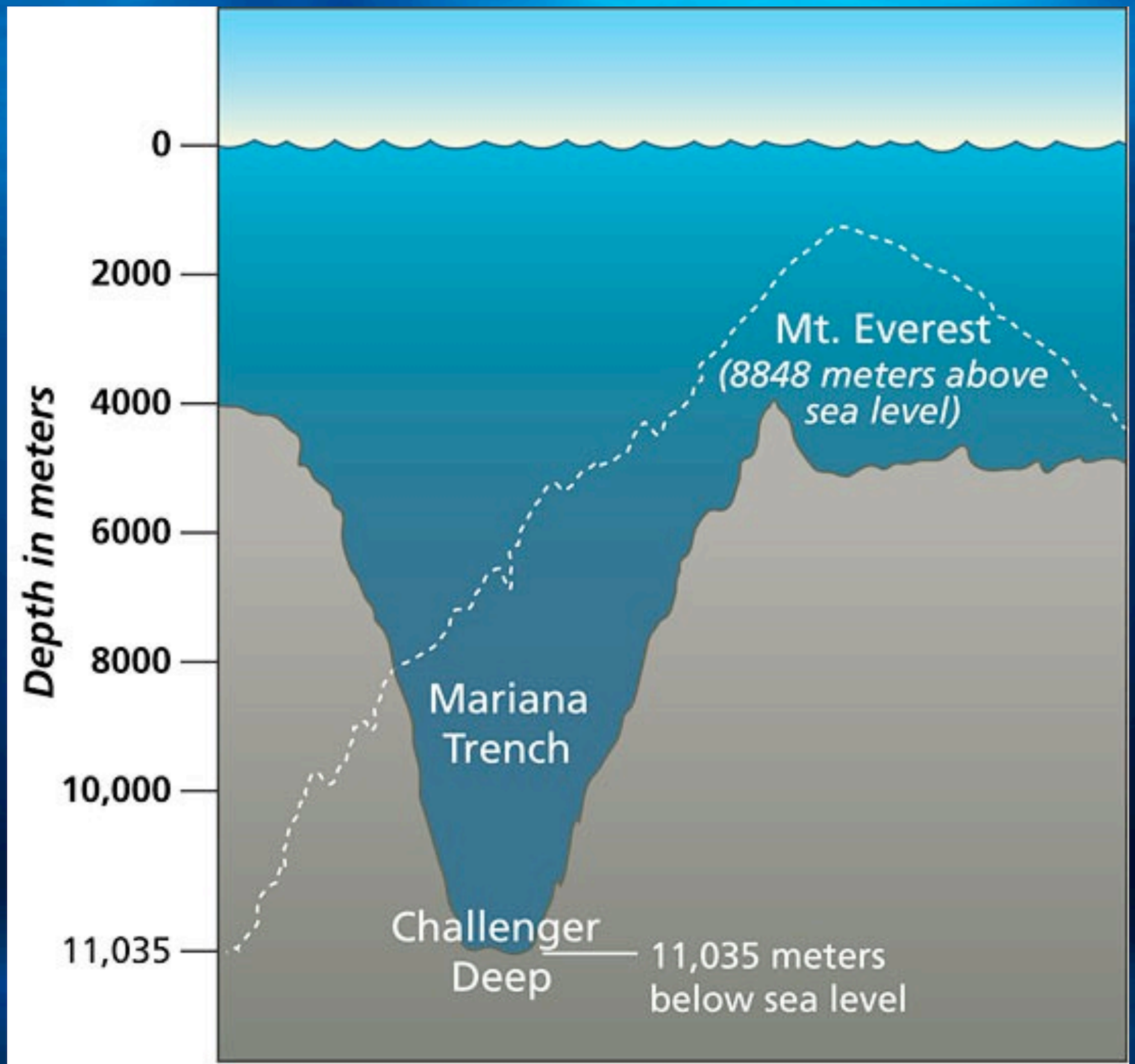




An east-west section through an ocean

Mariana Trench

Mariana Trench



How does water in the Ocean circulate?

Objectives:

- Explain thermal effects on the ocean
- Describe the Coriolis effect
- Explain the relationships between currents and climate
- Explain the El Niño phenomenon

Why does the water in the Ocean Circulate?

Sailors have know about ocean currents for centuries

Sailors have know that “rivers” flow in the seas since ancient times.

They used them to shorten voyages, or were delayed by trying to stem them.

If navigators do not correct to deflection by currents, they may be far away from where they think they are and meet disaster.

Ben Franklin and the Gulf

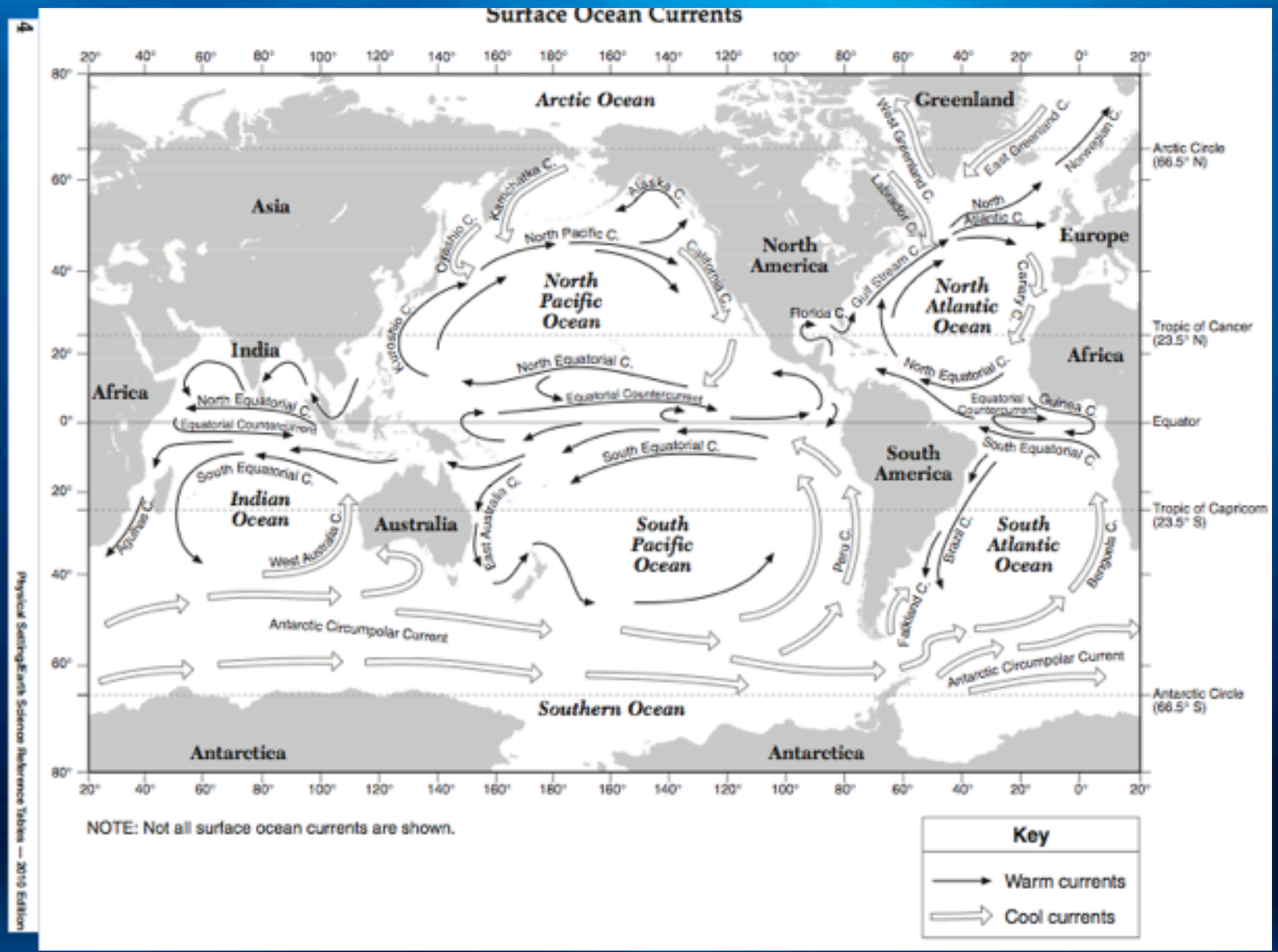
Ben Franklin always wondered why sailing from America to Europe took less time than going the other way.

Types of Ocean Currents

Surface Currents	Deep Water Currents
The upper 400 meters of the ocean (10%).	Thermal currents (90%) Streamlike movement far below the surface.

What is an Surface Current?

The horizontal movement of water in a well-defined pattern.

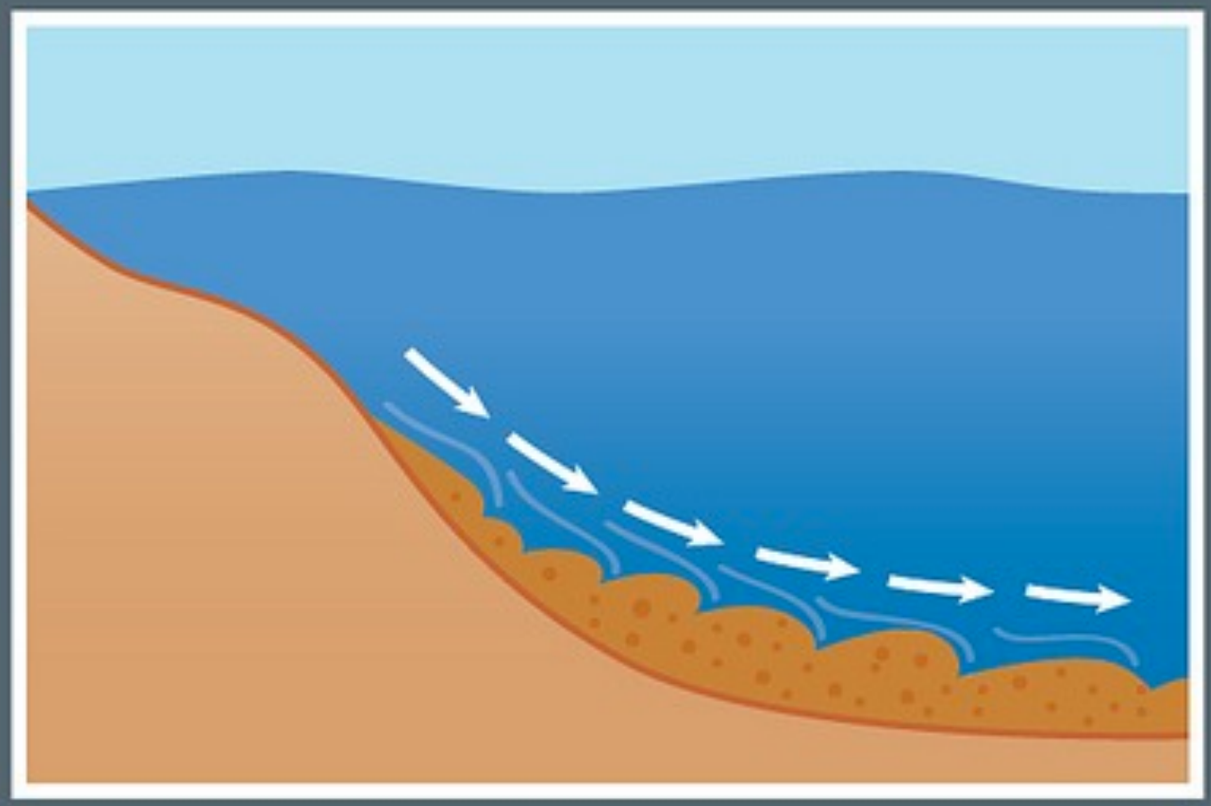


Surface Ocean currents

Controlled by:

(1) Earth's Rotation
(2) Location of the continents.
(3) Differences in water density

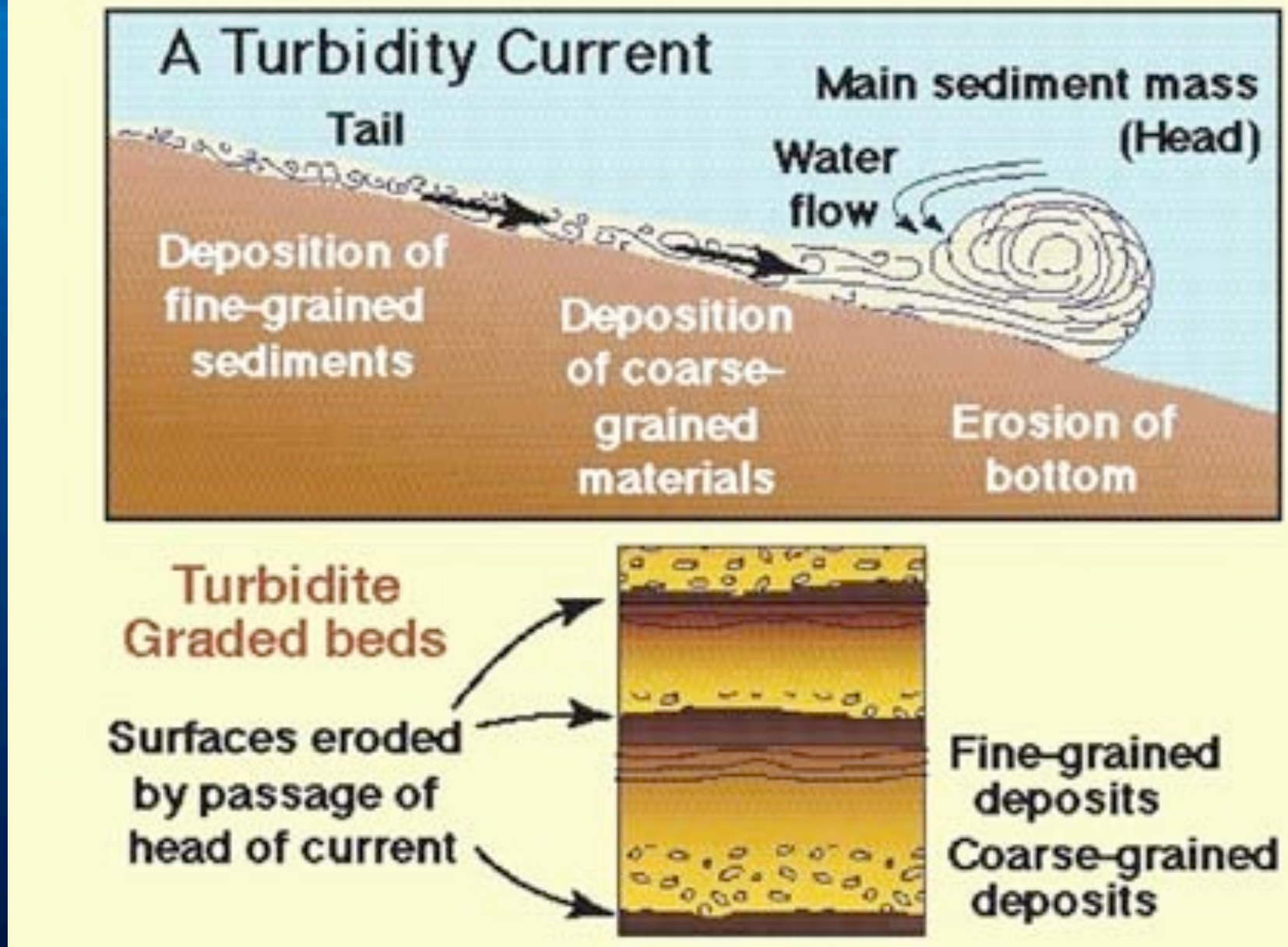
1. Turbidity Currents



Density driven

1 Turbidity currents, large amounts of sand and mud, move rapidly down an ocean slope.

Turbidity Currents

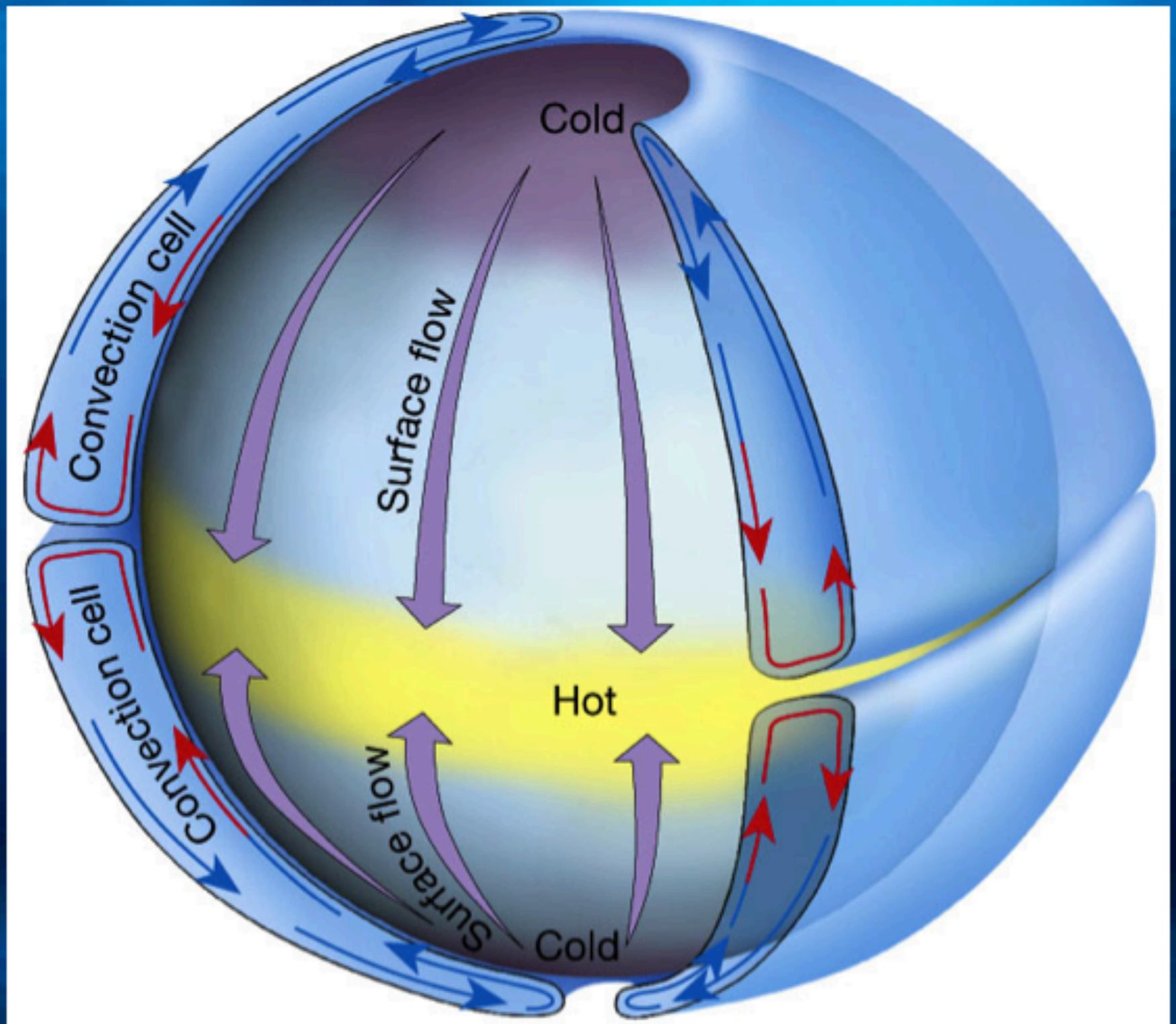


(2) Earths Rotation

The Coriolis Effect

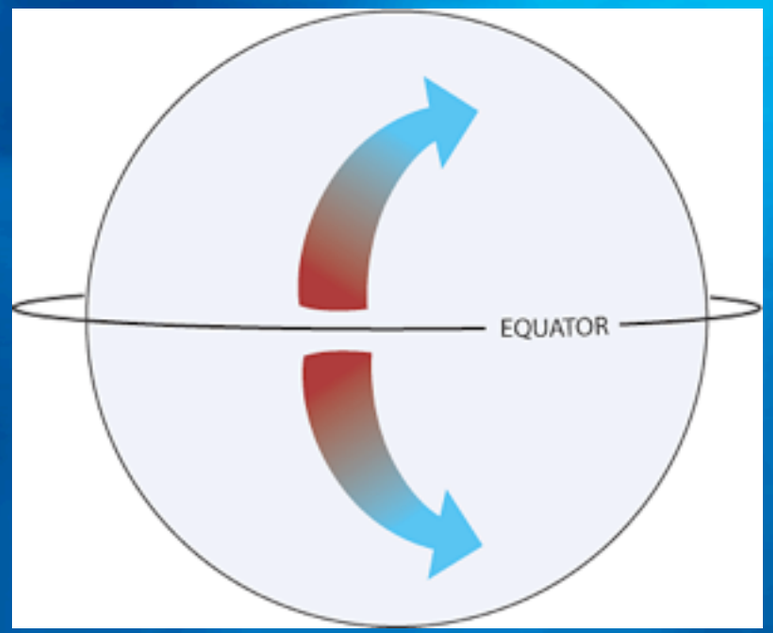
The apparent curving of the path of a moving object (ocean) from an otherwise straight path due to Earth's rotation.

Non-rotating Earth

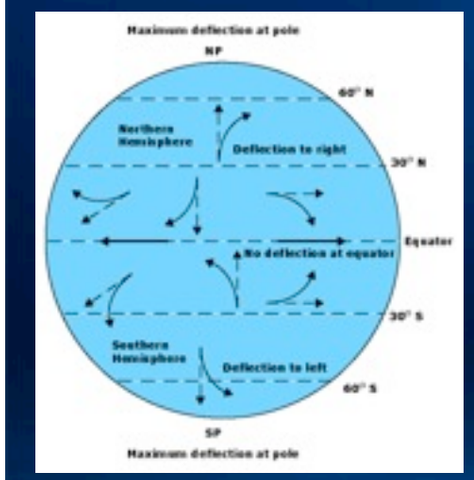


Coriolis Effect

Northern Hemisphere curvature to right



Southern Hemisphere curvature to left

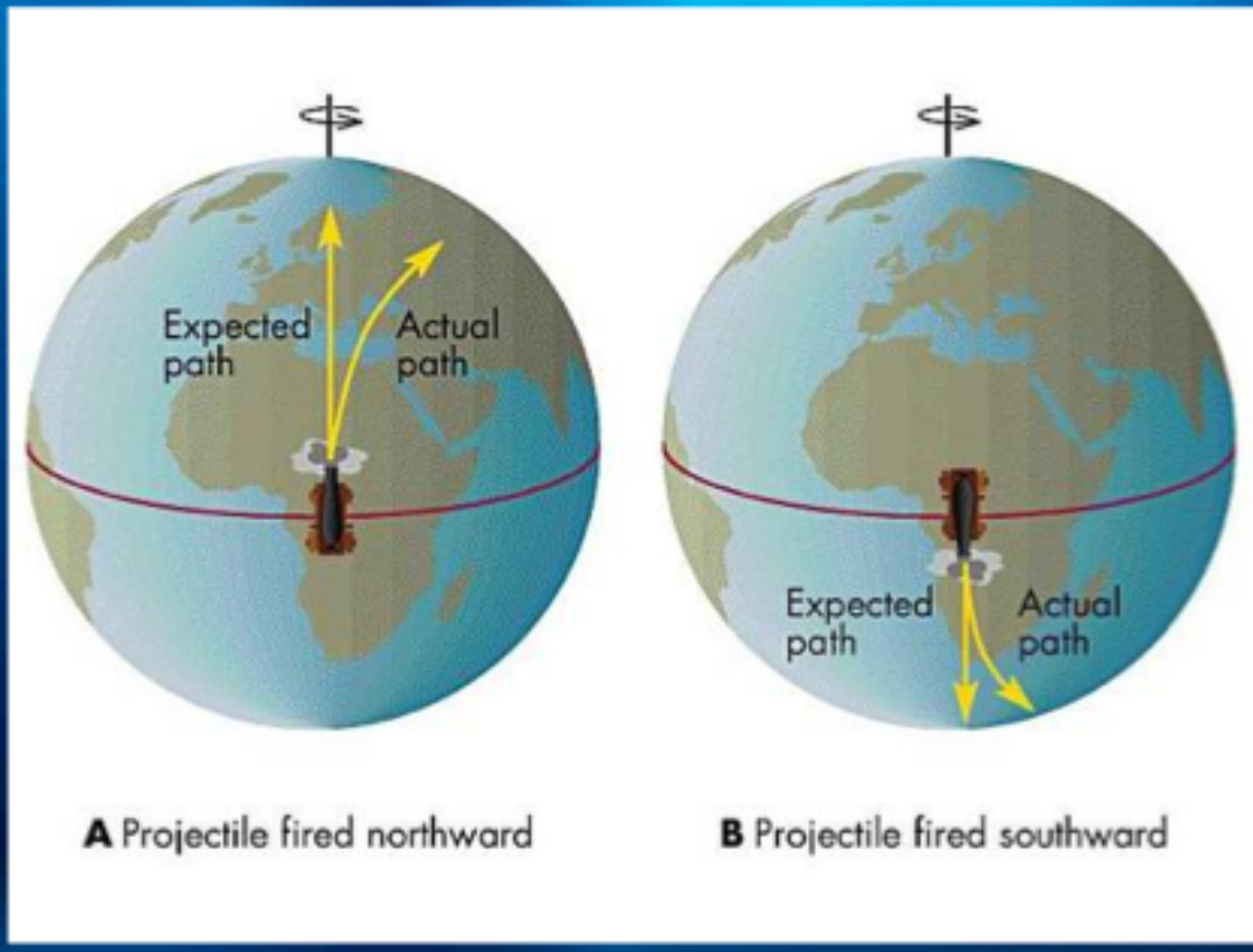


Changes with latitude:

No Coriolis effect at Equator

Maximum Coriolis effect at poles

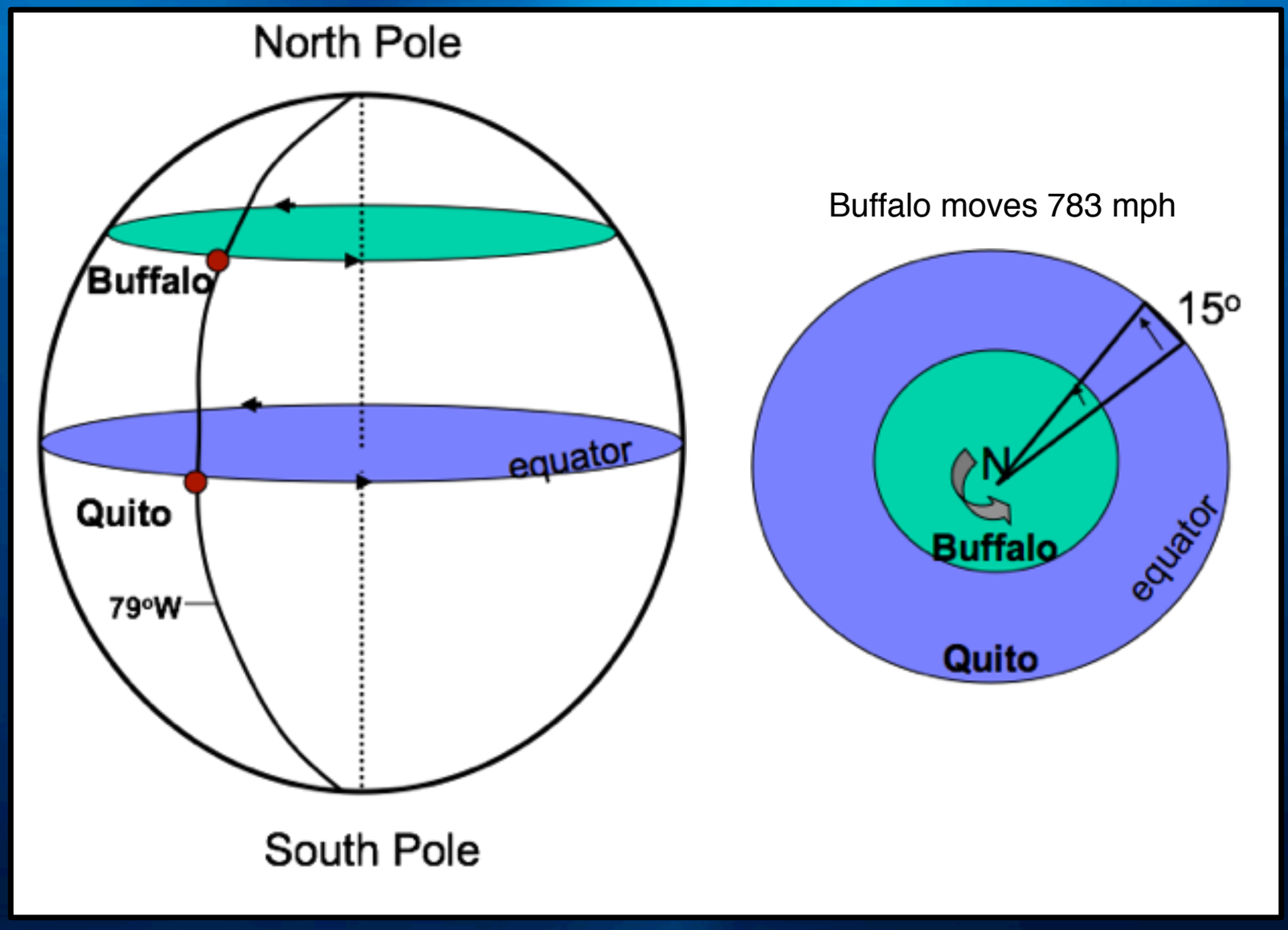
Coriolis Effect



A Projectile fired northward

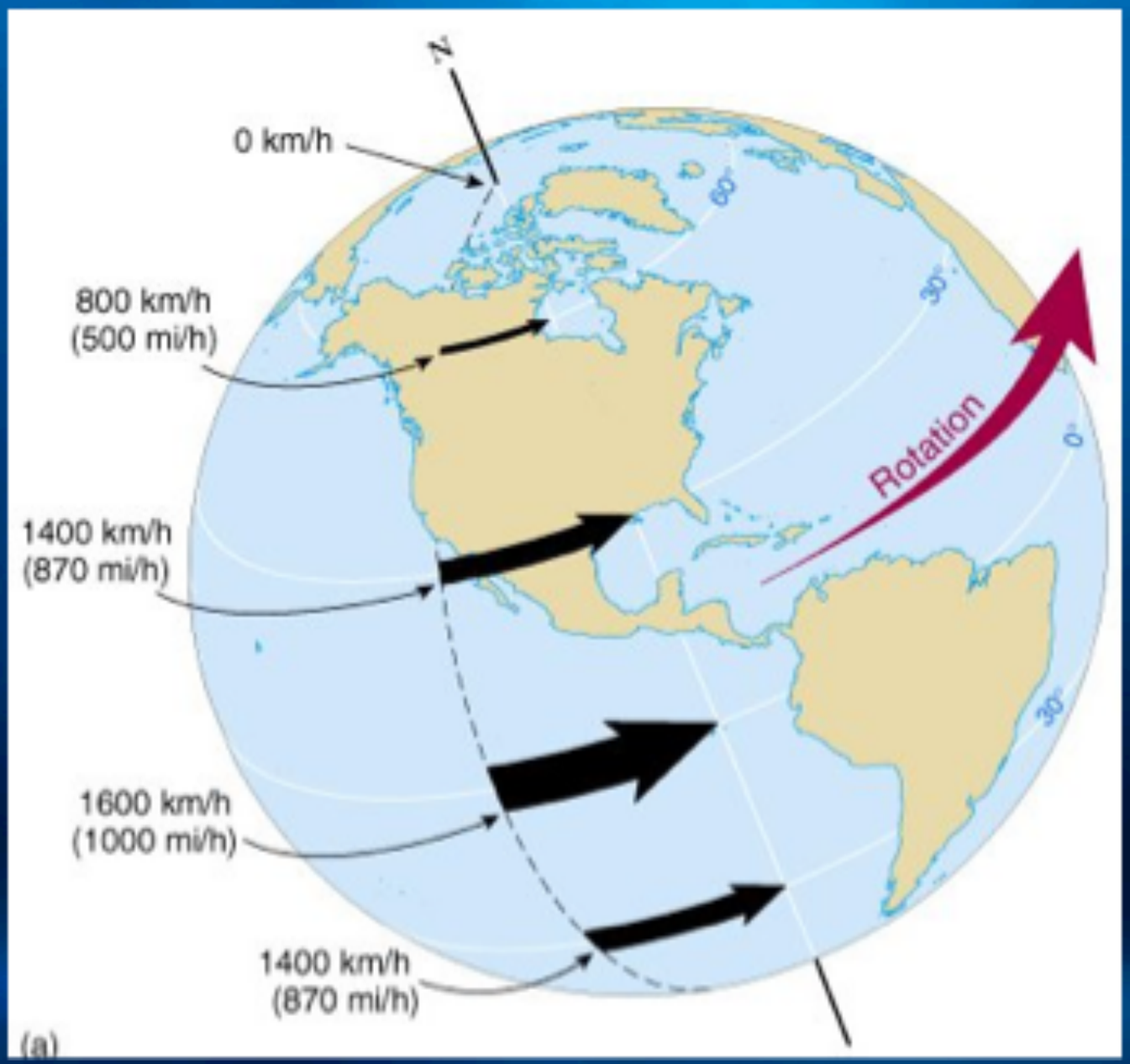
B Projectile fired southward

Coriolis Effect

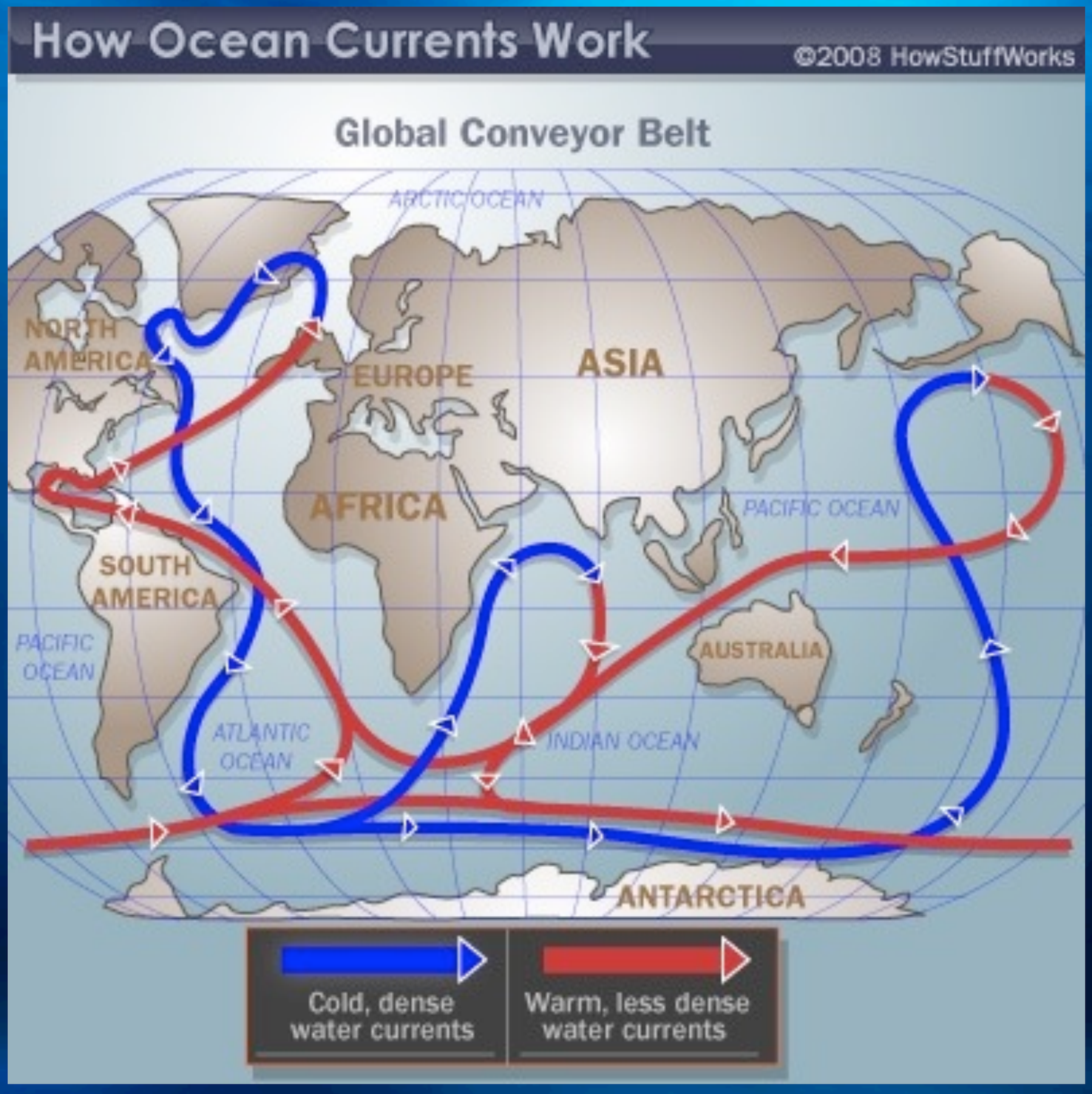


The Coriolis effect on Earth

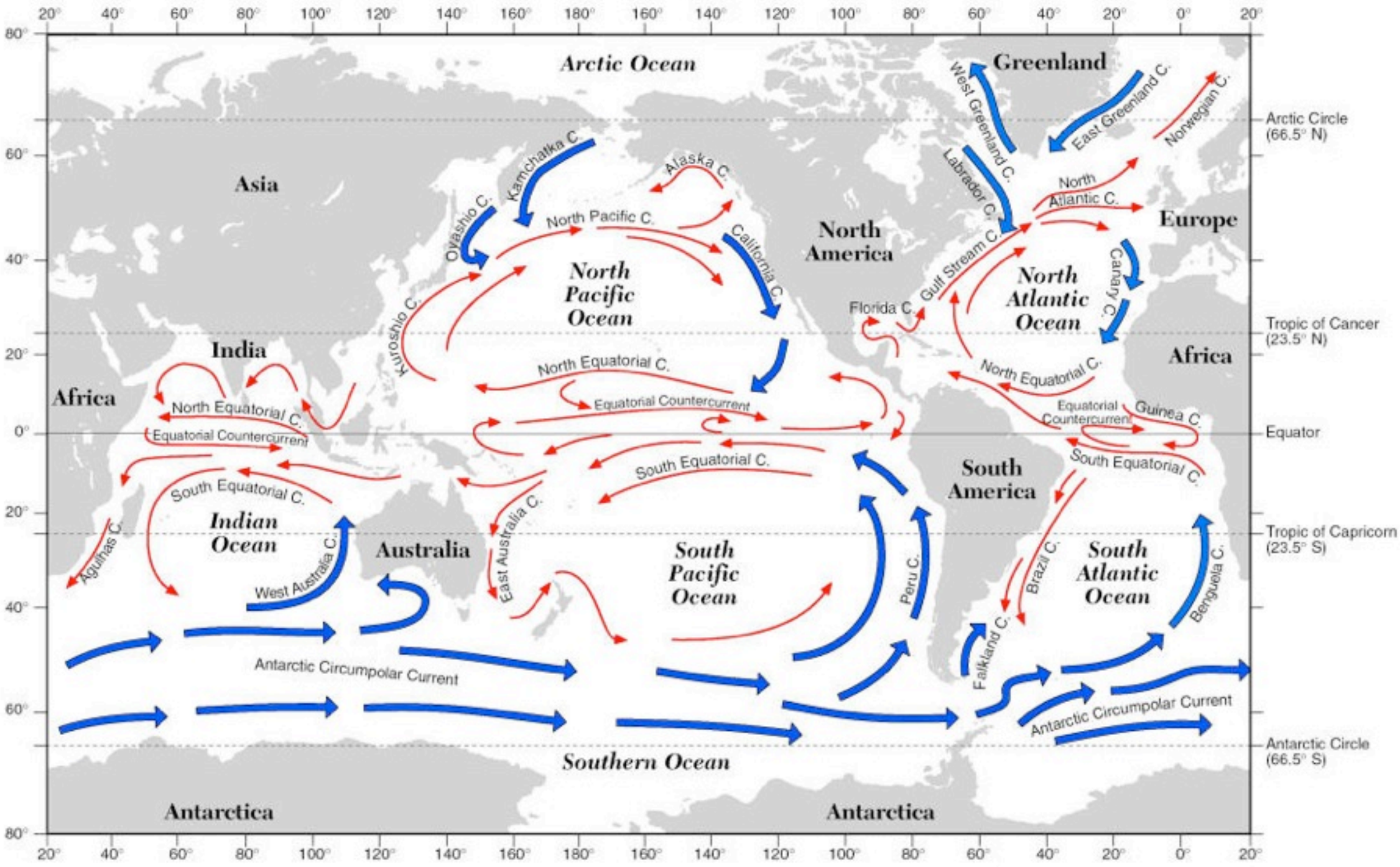
As Earth rotates, different latitudes travel at different speeds



Ocean Currents



Surface Ocean Currents

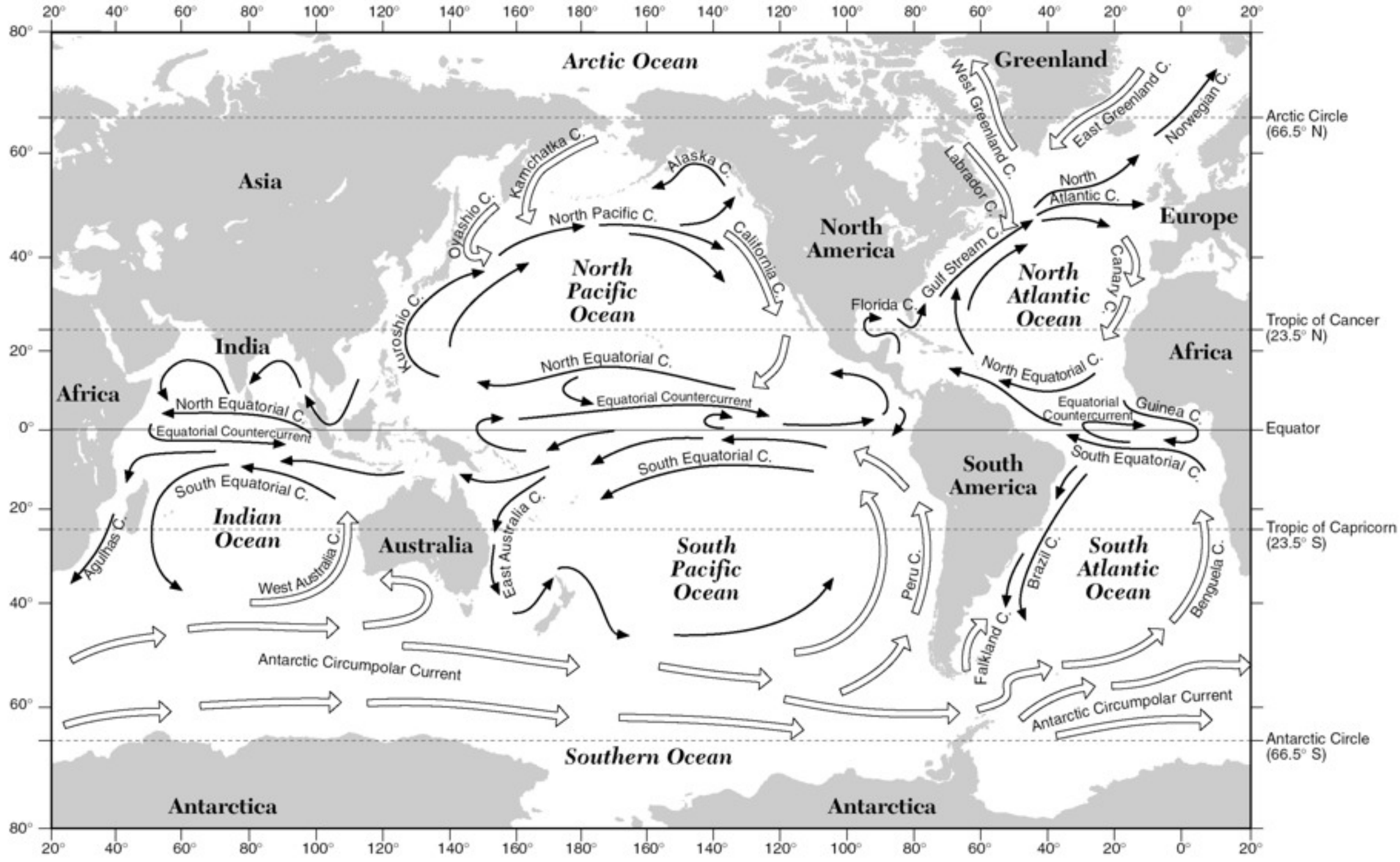


NOTE: Not all surface ocean currents are shown.

Key

- Warm currents
- Cool currents

Surface Ocean Currents



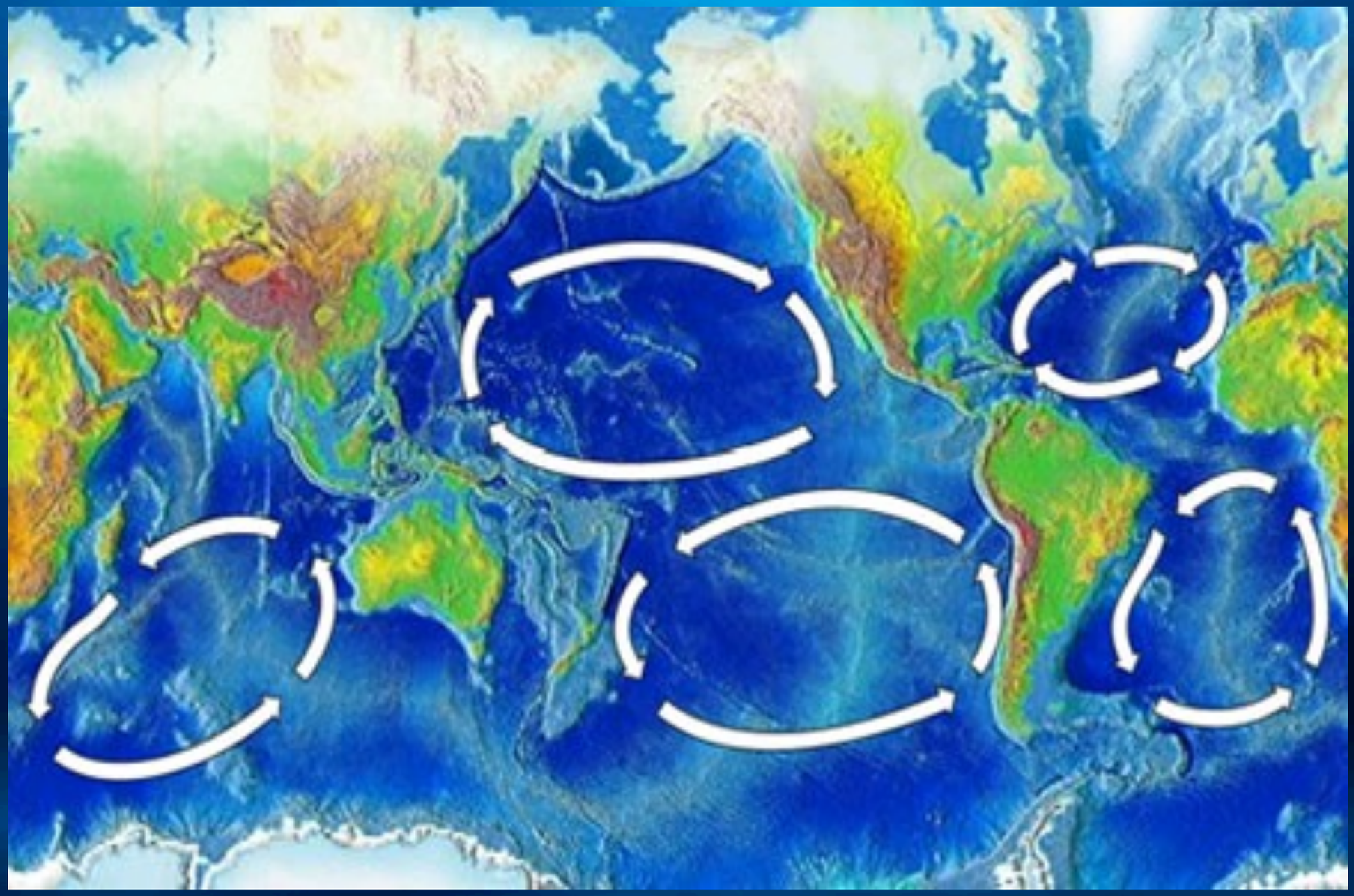
NOTE: Not all surface ocean currents are shown.

Key

- Warm currents
- Cool currents

Gyre

Huge circle of moving ocean water found above and below the equator.



THE FIVE GYRES

ALTHOUGH NOT WIDELY DISCUSSED THERE ARE IN FACT 5 MAIN GYRES IN THE WORLD'S OCEANS AND SEVERAL SMALLER GYRES THROUGHOUT ALASKA AND ANTARCTICA. THE MOST COMMONLY DISCUSSED GYRE IS THE NORTH PACIFIC GYRE, KNOWN AS THE GARBAGE PATCH DUE TO THE MASS OF MARINE DEBRIS THAT HAS COLLECTED THERE.

COLOUR KEY
- FISH LIFE
- MARINE LIFE
- PLASTIC
- FOOD CHAIN
- OCEAN HITCHHIKERS

Albatross fly huge distances to feed their young a deadly diet of plastic pellets.

A sea turtle found dead in Hawaii had over a 1000 pieces of plastic in its stomach and intestines.

Jelly-fish like creatures become entangled in lengths of plastic filament, or eat the small plastic particles floating in the water.

Floating plastic transports marine life outside of their normal habitat. Once they have invaded new habitats they can become possible nuisance species.

A single 1 litre drinks bottle could break down into enough small fragments to put one on every mile of beach in the entire world.

Plastic pellets are magnets for many toxic chemicals, in effect, becoming, poison pills.

Plastic fragments outnumber zoo plankton 40 to 1.

There are six pounds of plastic for every pound of algae.

THE NORTH PACIFIC GARBAGE PATCH IS TWICE THE SIZE OF TEXAS - APX 10,000,000 SQ NAUTICAL MILES (34,000,000 SQ KILOMETRES)

IT IS THE LARGEST GYRE ON EARTH AND CONTAINS ROUGHLY 3.5 MILLION TONS OF TRASH.

Plastic particles are pushed gently in a slow moving spiral towards the centre.

NORTH PACIFIC GYRE

107 plastic pieces were found in 1 sq foot on a southern beach in Bermuda.

61% of the plastic in the ocean is less than a mm.

EVERY OCEAN SAMPLE TEST CONDUCTED PRODUCED SOME FORM OF PLASTIC WASTE IN THE NORTH ATLANTIC.

NORTH ATLANTIC GYRE

Plastic will remain out at sea for 100's of years.

90-95% of ocean pollution is plastic. 10% of discarded plastic ends up in our ocean.

80% of this plastic pollution comes from land-based sources.

Plastic lost at sea is an environmental and potential human health hazard.

Fish get entangled in or ingest plastic and die.

Ocean Pollution affects at least 267 species worldwide.

LDPE, HDPE, foamed plastics & Polypropylene float on the oceans surface.

70% of discarded plastic sinks to the bottom of the ocean including Polycarbonate, polystyrene & PET.

A GYRE

A gyre is a place where currents meet and form a whirl pool type system - this forms a meeting place for ocean debris. Millions of tiny and large pieces of plastics accumulate here; due to the currents they remain trapped here, breaking down over time to become smaller and smaller pieces of plastic until they eventually become plastic dust.

This 'dust' will never go away but will instead stay in the ocean accumulating toxins and working its way into the food chain as more animals digest these invisible and dangerous items of plastic waste.

SUNLIGHT AND WAVE ACTION CAUSE THESE FLOATING PLASTICS TO FRAGMENT, BREAKING INTO SMALLER PARTICLES, BUT NEVER COMPLETELY DISAPPEARING.

SOUTH PACIFIC GYRE

Studies have found that Fulmars have an average of 30 pieces of plastic in their stomachs.

The plastics act as a sort of 'chemical sponge'. They contain Persistent Organic Pollutants (POPs). Animals eating these pieces of plastic debris will also be taking in highly toxic pollutants.

SOUTH ATLANTIC GYRE

1 million sea birds & 100,000 mammals & sea turtles die from plastic pollution every year.

Toxic chemicals enter the food chain via plastics.

HARD WHITE OR COLOURLESS SPHERULES OR PELLETS HAVE BEEN FOUND IN THIS GYRE (1-5MM IN DIAMETER).

INDIAN OCEAN GYRE

A typical 3,000 passenger cruise ship produces over eight tons of solid waste weekly, much of which ends up in the oceans.

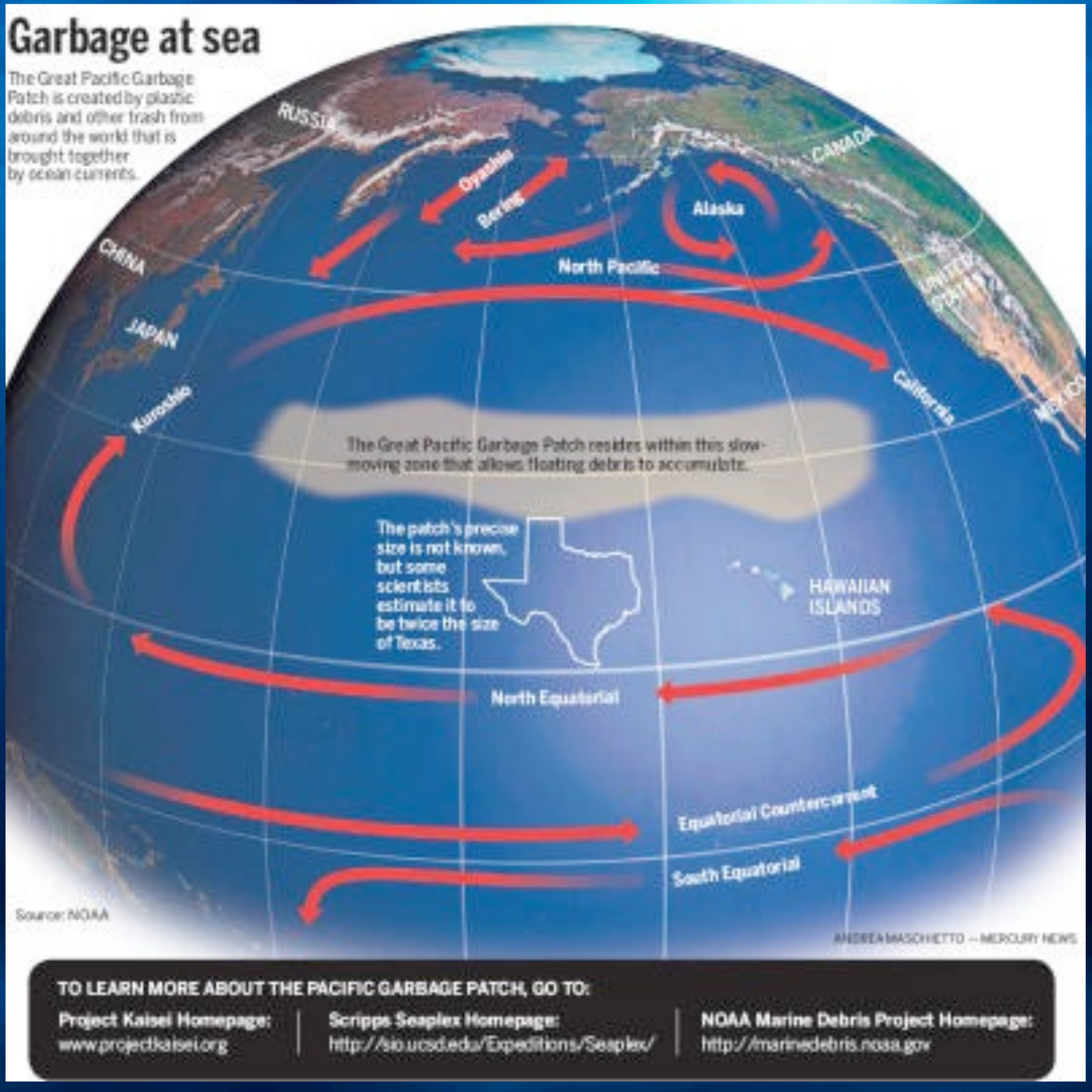
20% of plastic pollution comes from ships.

If fish are eating plastic, we are eating it too.

Big pieces of plastic look like jellyfish or squid, while small pieces look like fish eggs.

Garbage at sea

The Great Pacific Garbage Patch is created by plastic debris and other trash from around the world that is brought together by ocean currents.



TO LEARN MORE ABOUT THE PACIFIC GARBAGE PATCH, GO TO:

Project Kaisei Homepage:
www.projectkaisei.org

Scripps Seaplex Homepage:
http://sio.ucsd.edu/Expeditions/Seaplex/

NOAA Marine Debris Project Homepage:
http://marinedebris.noaa.gov

The Great Pacific Garbage Patch

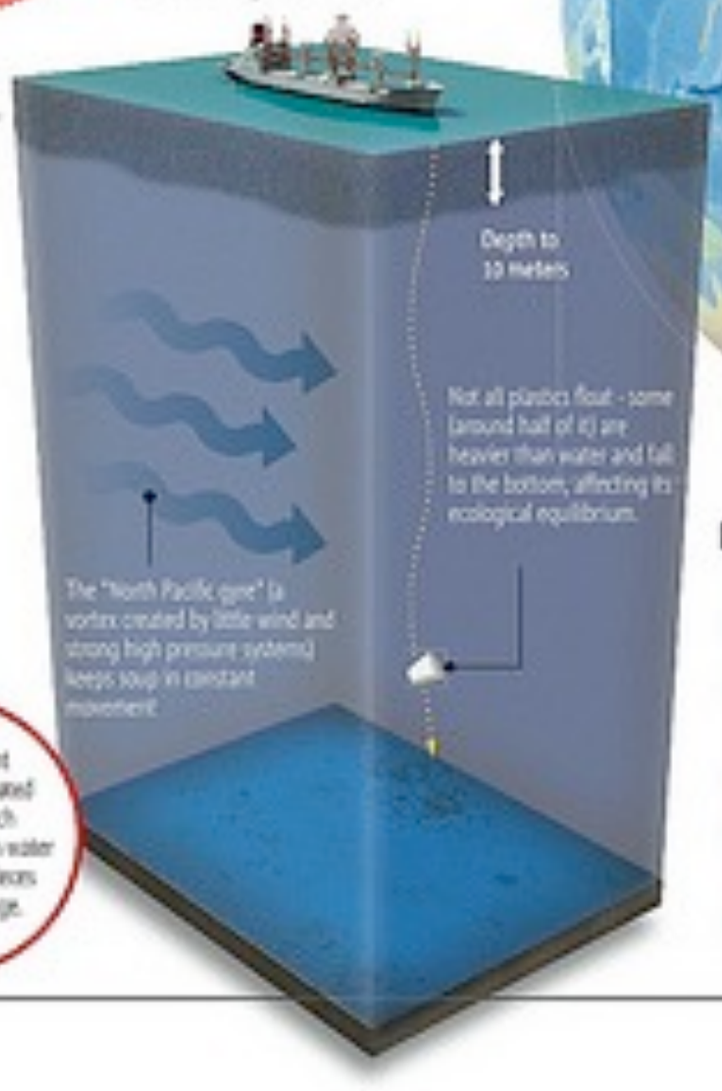
Is an area of marine debris, laying approximately 135° to 155°West and 35° to 42°North. Although it shifts every year and exact position is hard to tell. It lies within North Pacific Gyre and does not go anywhere, as it is confined by its currents.

The area

The Patch is around 2200 kilometers long and 800 kilometers wide

Plastic Soup

Consists of both larger and disintegrated plastic objects and particles, both on the surface, in the water column below it and on the bottom.



UN Environment Programme estimated recently that each square mile of ocean water contains 46,000 pieces of floating garbage.

How does it form?

Currents in the Pacific Ocean create a circular effect that pulls debris from North America, Asia and the Hawaiian Islands. Then it pushes it into a floating pile of 100 million tons of trash.

Where does it all come from?

80%
Land, brought by sewer systems and rivers to the sea.

20%
Ships and ocean sources like nets or fishing gear, many containers fall into the sea after severe storms.

Interesting facts

Less than 5% of plastic is recycled.
In the Central North Pacific Gyre, small pieces of plastic outweighed surface zooplankton by a factor of 6 to 1 in 1999. But the ratio in 2010 may already be 60 to 1.

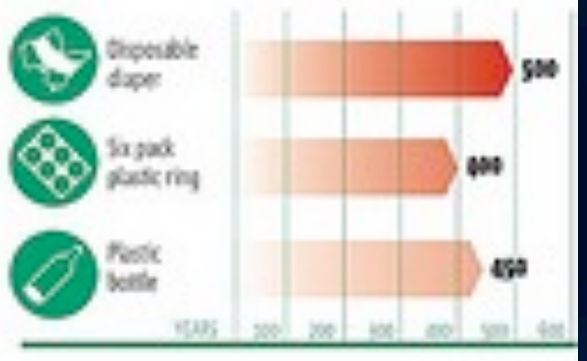
Photodegradation

Plastic never biodegrades, it doesn't break down into natural substances. But it goes through a photodegradation process, splits into ever smaller and smaller parts, which are still plastic.

Problems created by plastic:

- It fouls beaches worldwide and scares tourists away.
- Plastic entangles marine animals and drowns them, strangles them and makes them immovable.
- Plastic litter washed ashore destroys habitats of coastal species.
- Plastic litter gets inside ships propellers and keels, making ship maintenance more expensive.
- Plastic does not biodegrade, plastic things make an ideal vessel and enable invasive species to move to further regions.

How long does it take to photodegrade plastic:



An Uncharted Island

the great pacific garbage patch

although almost invisible to the naked eye, the "invisible" patch is twice the size of texas

the garbage is translucent and lies just below the water's surface, it is not detectable in satellite photo-graphs and can only be seen close up while on a boat.

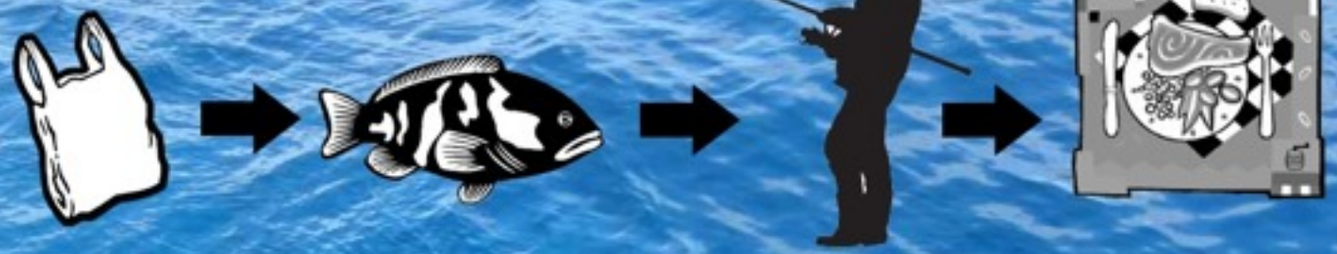
each year, hundreds of thousands of marine life are affected by the plastics swirling in the ocean. albatross, sea turtles and seals are a few example of species greatly affected by the patch. they consume plastics, mistakening them for food and eventualy die from toxins

royal albatross

sea turtle

seal

the "food chain"

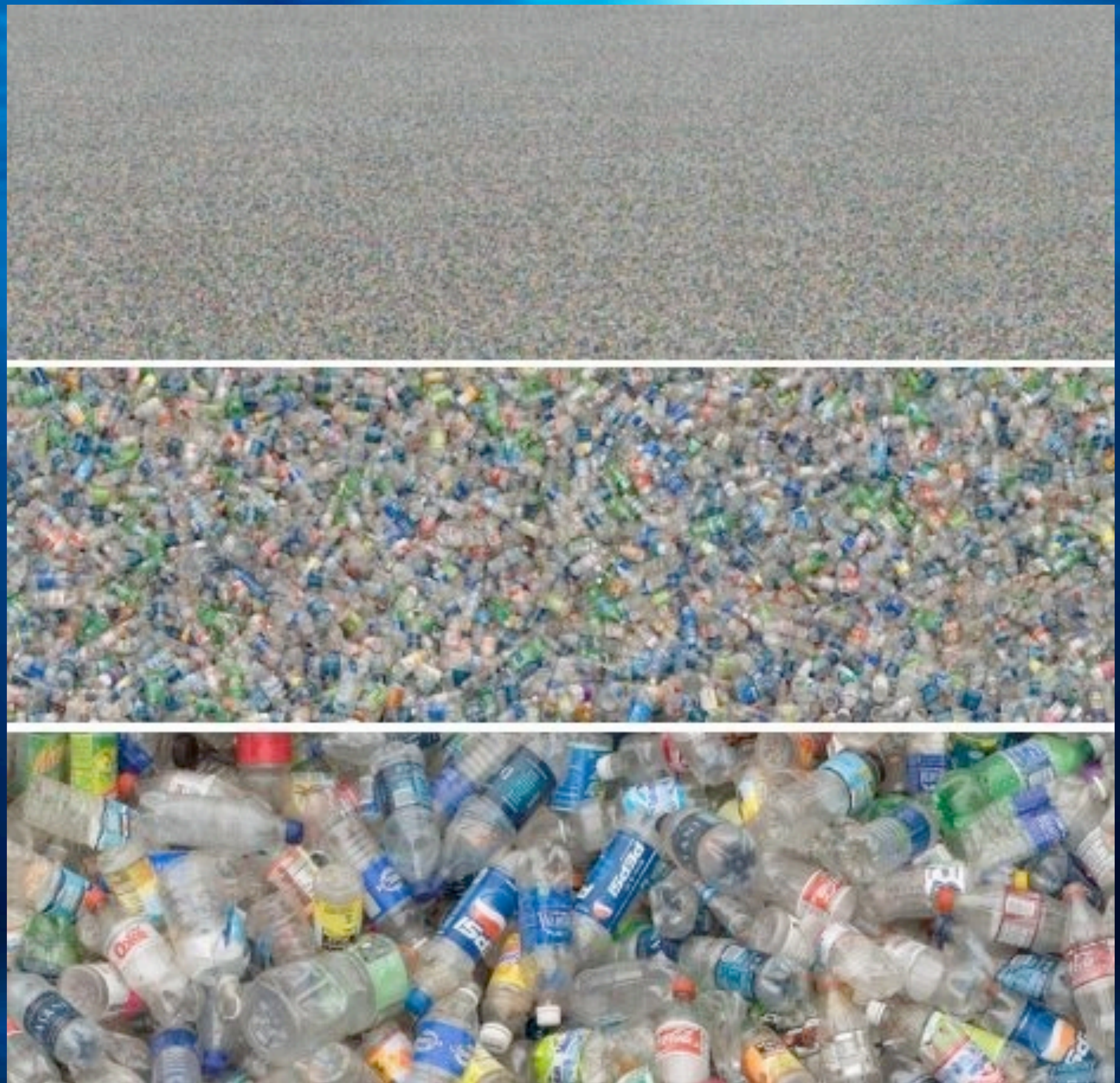


An oceanic gyre is any large-scale system of rotating ocean currents

the garbage that falls into the ocean gets carried by ocean currents in an oceanic gyre. the "great pacific garbage patch" is actualy a combina-tion of two large masses of accumulating trash in the west (between japan and hawaii) and in the east (between hawaii and california) Both these zones make up the garbage patch.

above are examples of only a fraction of things that end up in the ocean and float to the gar-bage patch. environmental researchers believe 90% of the trash in the patch is from plastic, which is not bio-degradable.

annually, 10% of 200 billion pounds of garbage ends up in the ocean
approx. 46,000 pieces of plastic litter are scattered on every square mile of the ocean
1/5 of the garbage in the ocean comes from ship dumping. the rest is from land
90% of the garbage (plastics) in the ocean are not bio-degradable. this means it never disappears

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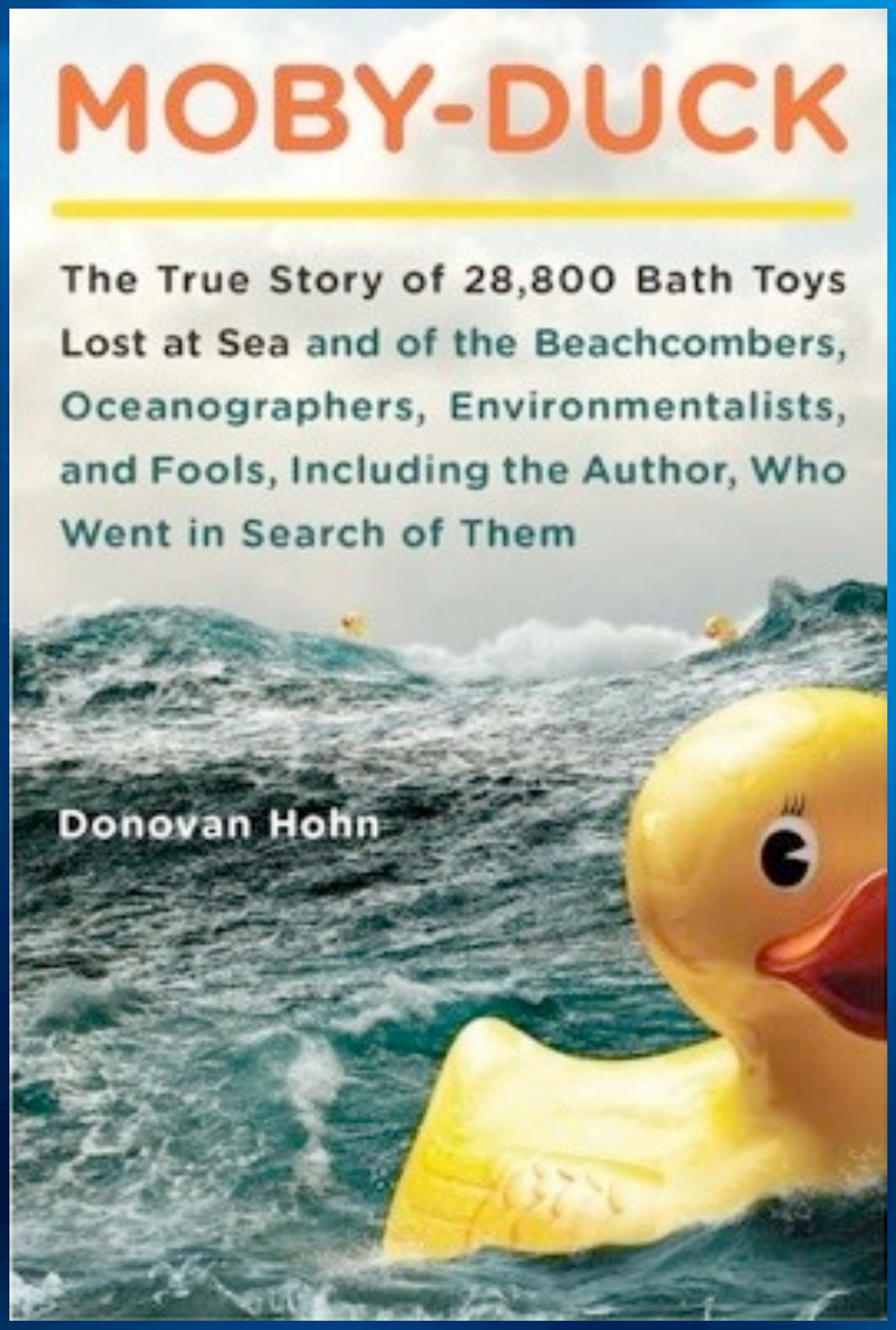
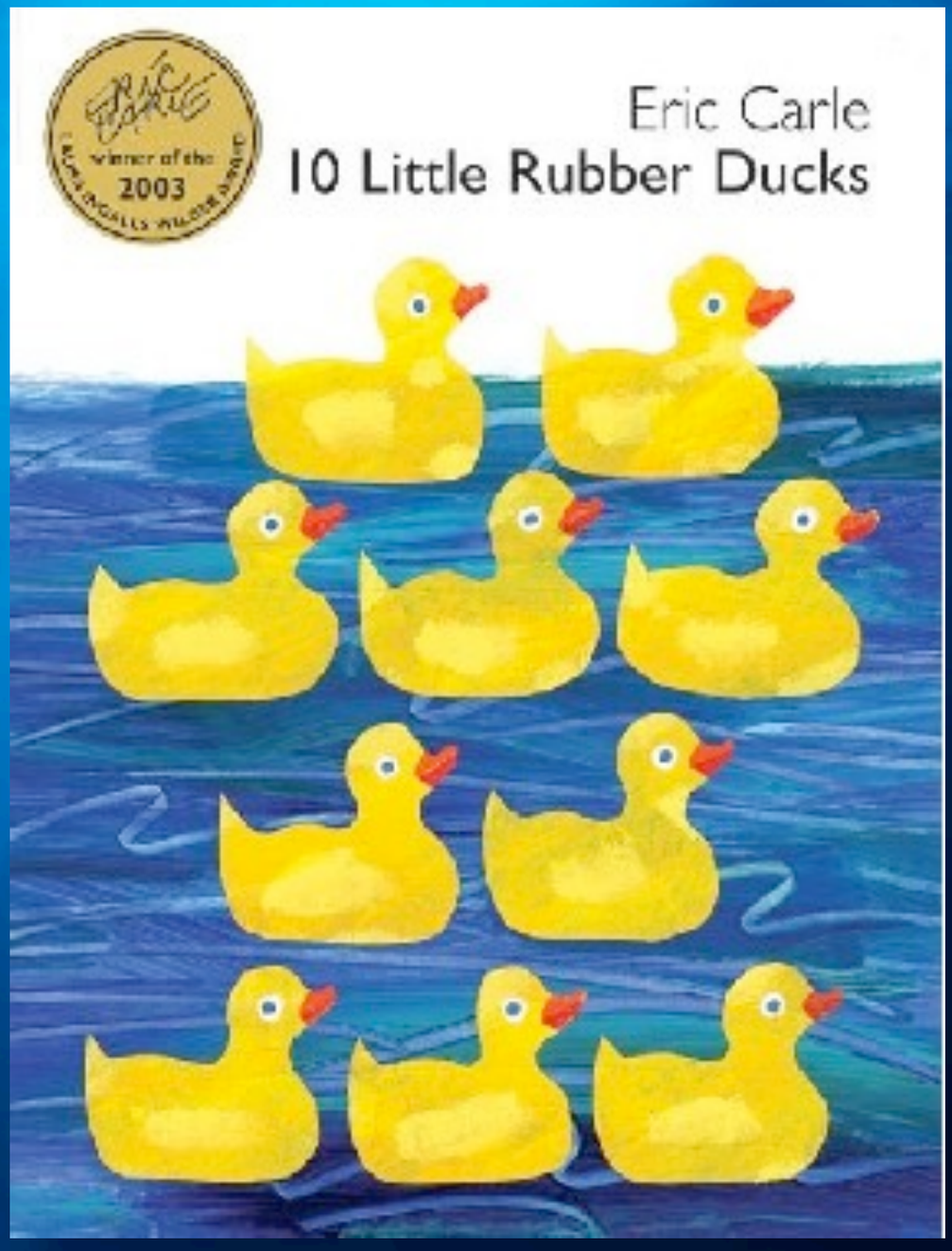
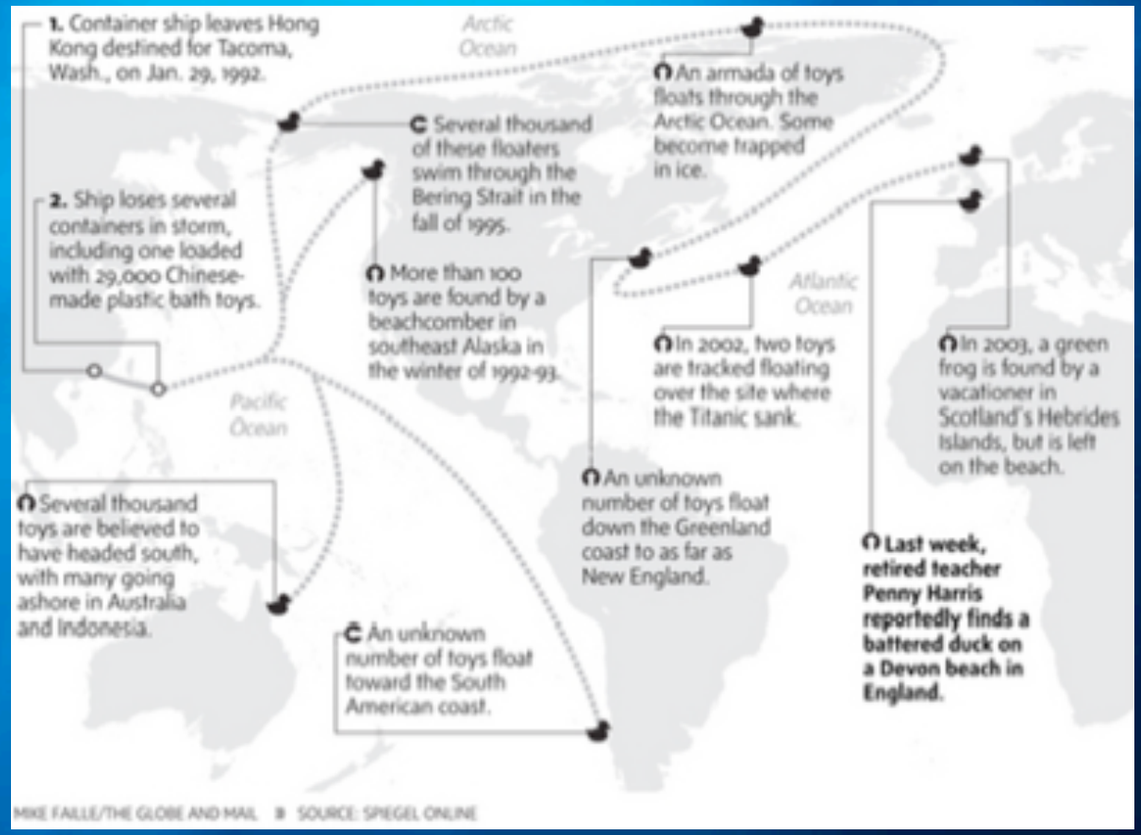
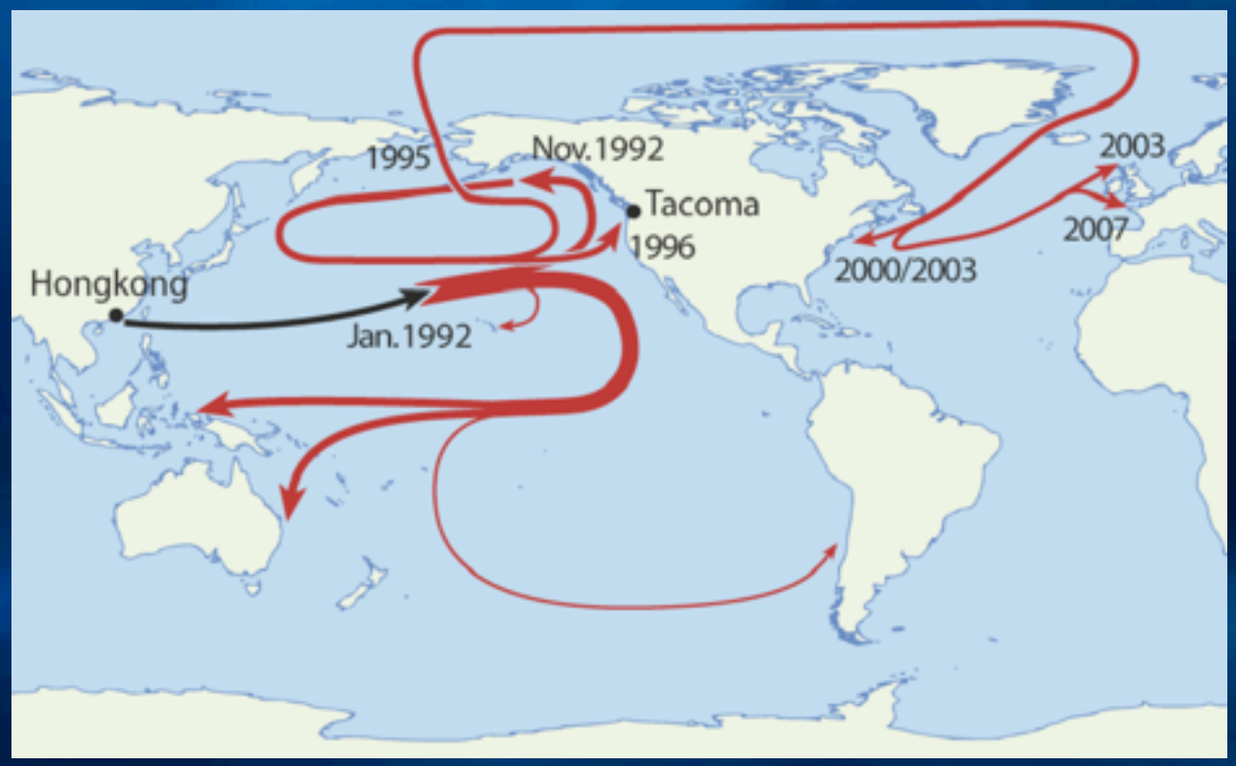
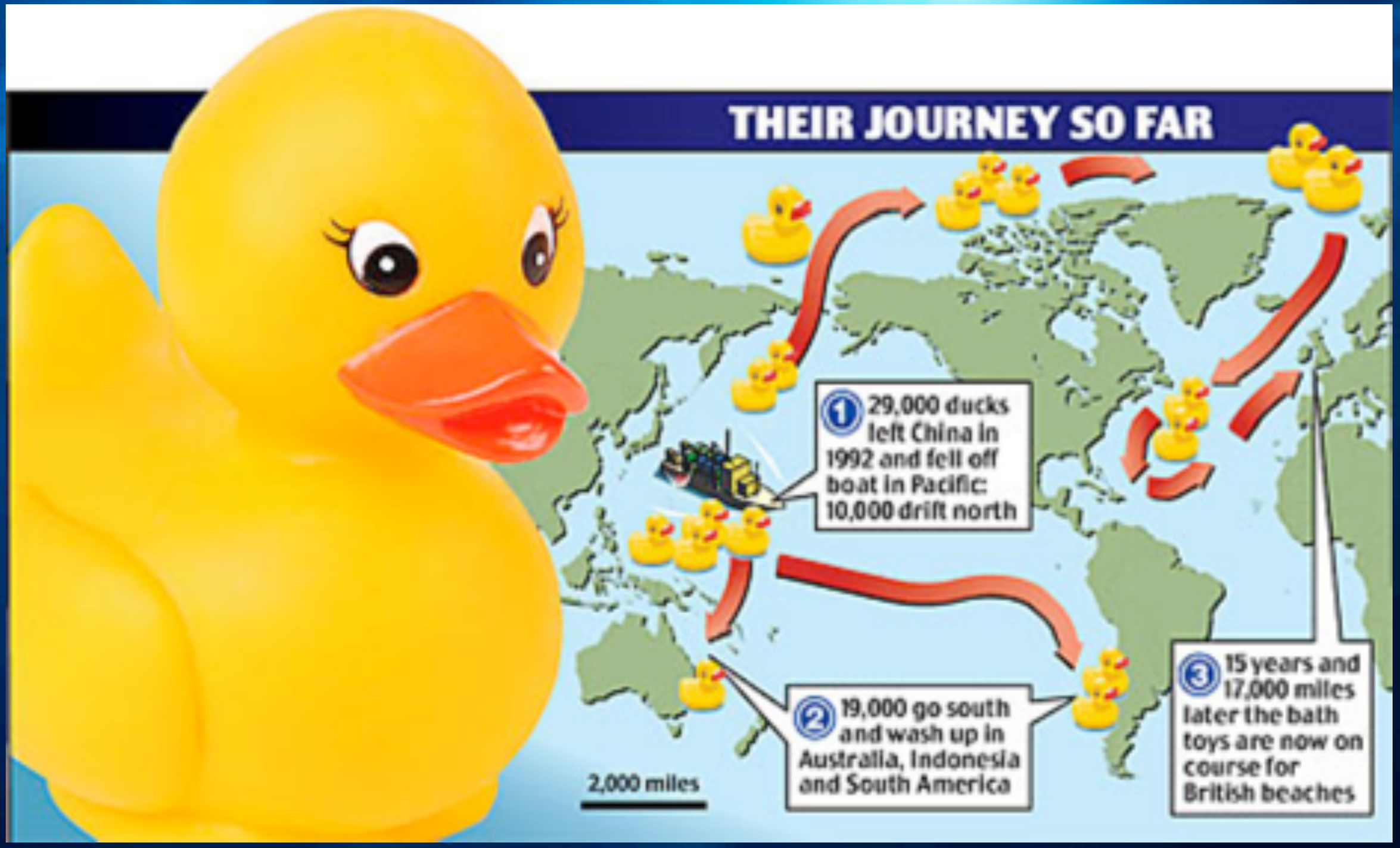




Roaming Rubber Duckies

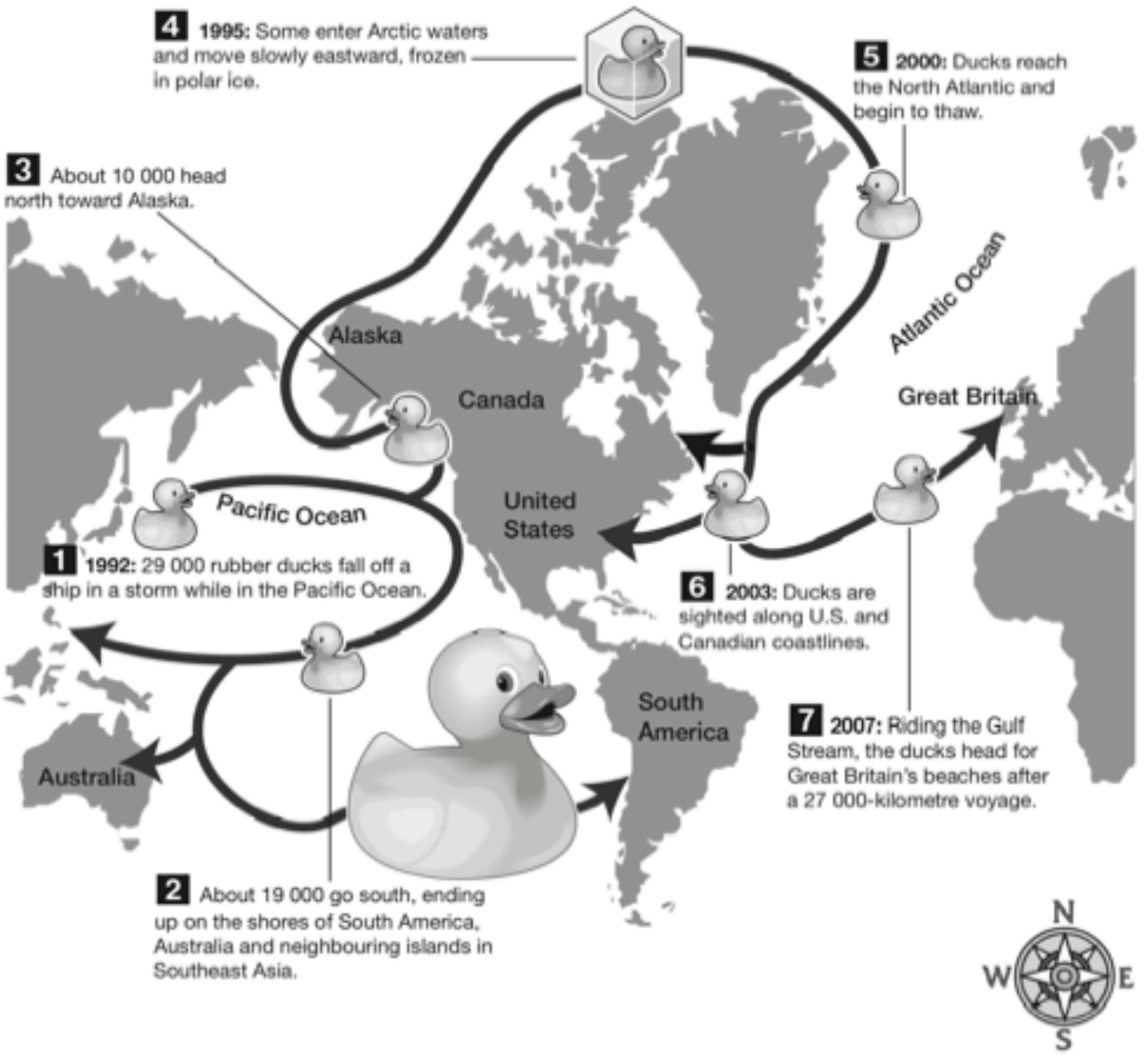




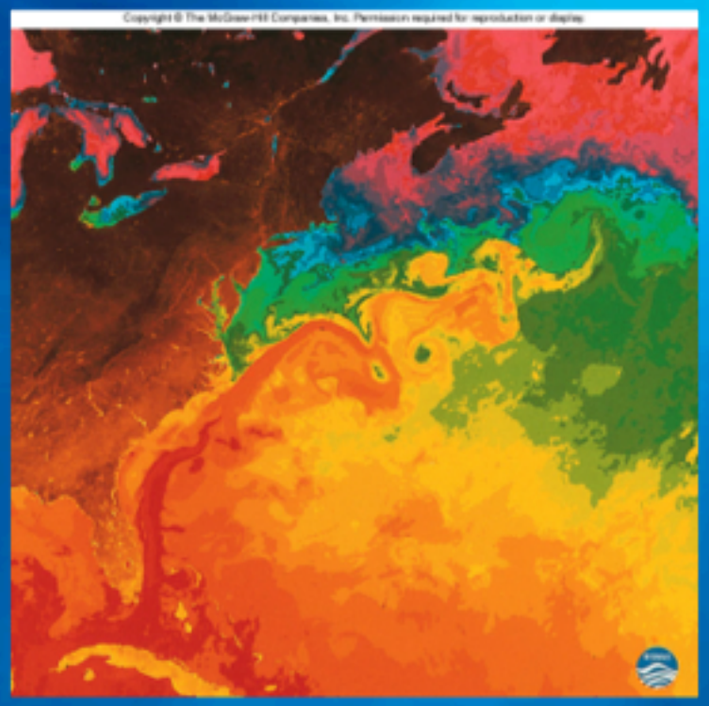


The Rubber Duck: A Researcher's Best Friend

In 2007, scientists and beachcombers were awaiting the arrival of a group of rubber ducks on British shores. The ducks fell off a cargo ship into the Pacific Ocean in 1992. Researchers charting the world's ocean currents are interested in the journey of these bath toys. The ducks are so valuable that researchers are offering a $100 reward to anybody who finds one.



Why is Ocean Circulation Important?



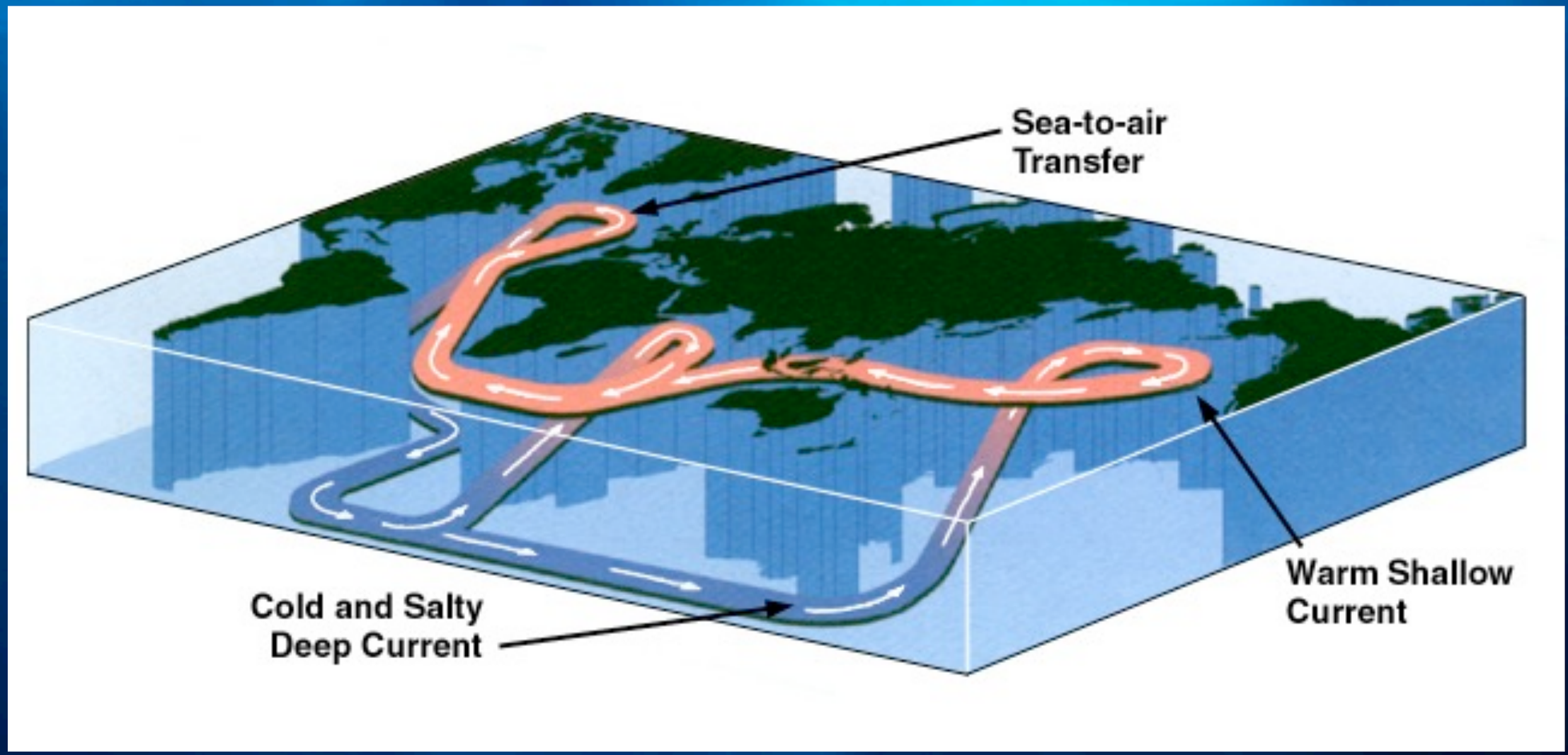
Transports heat from the Equator to poles

Transport nutrients and organisms

Influences weather and climate

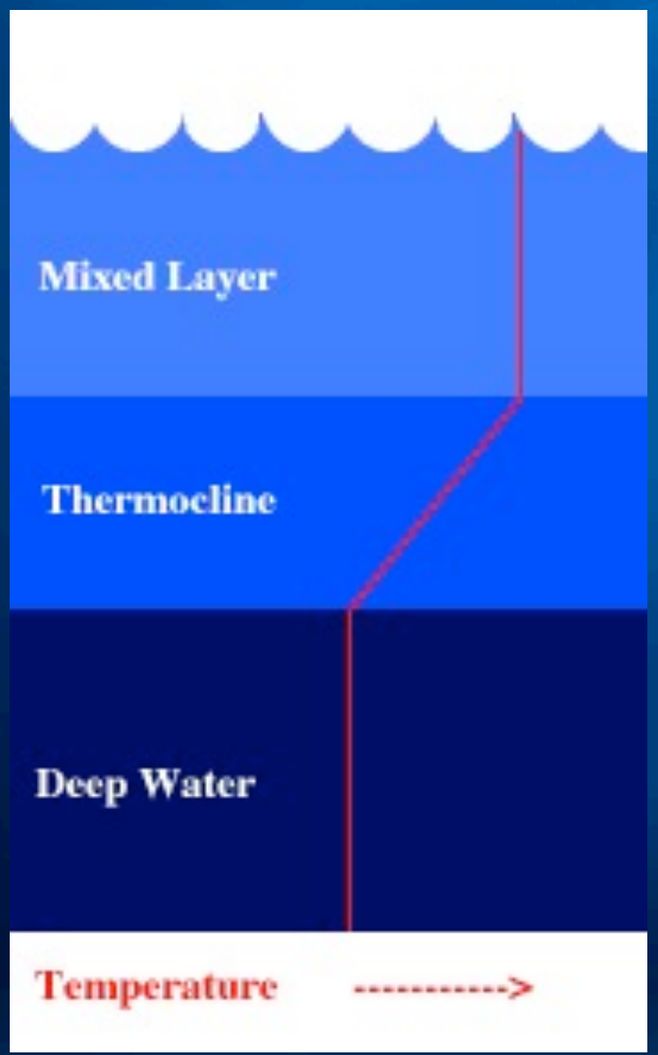
Influences commerce

Deep current



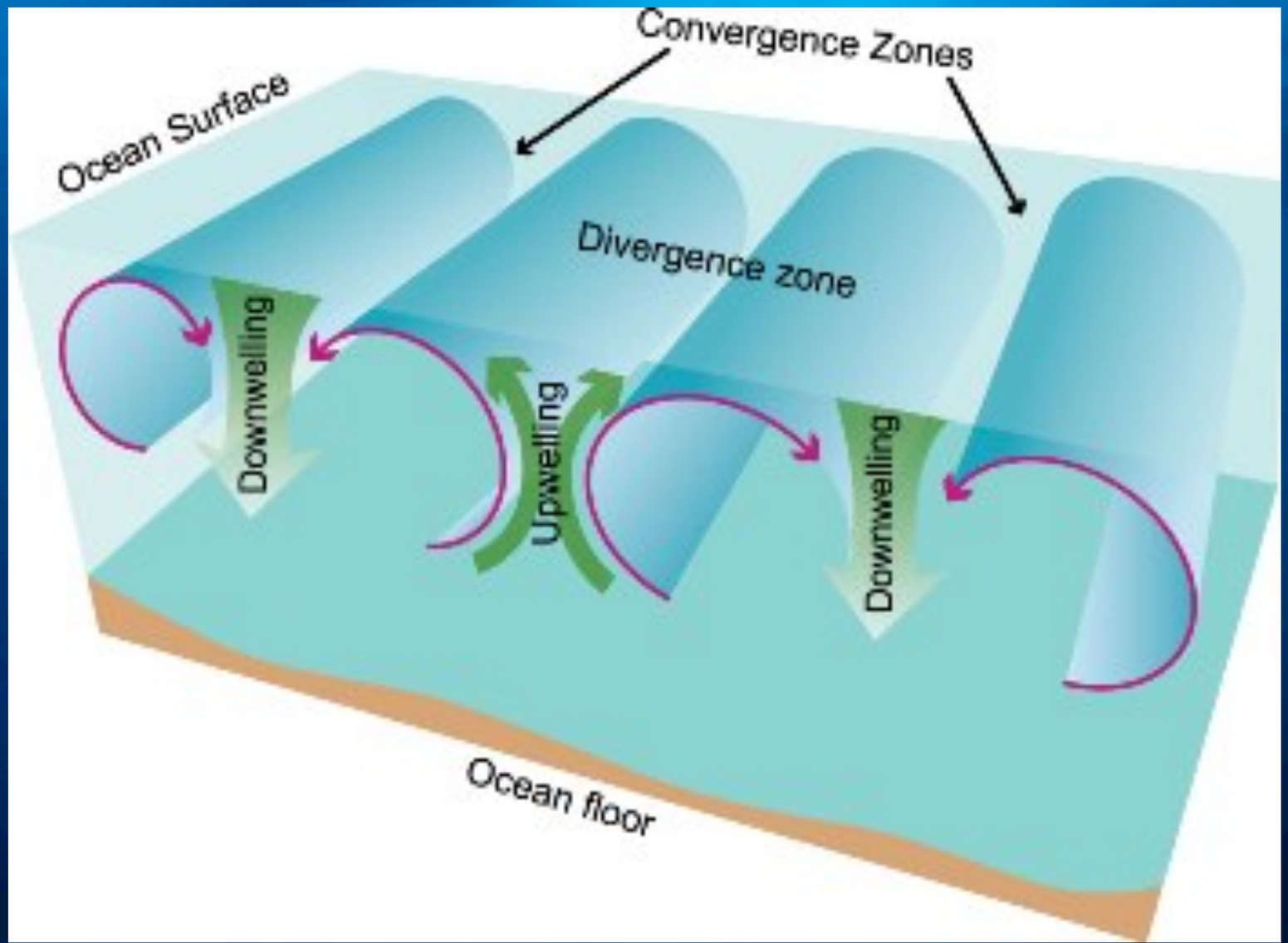
Thermocline

Transition layer between the mixed layer at the surface and the deep water layer



Upwelling and Downwelling

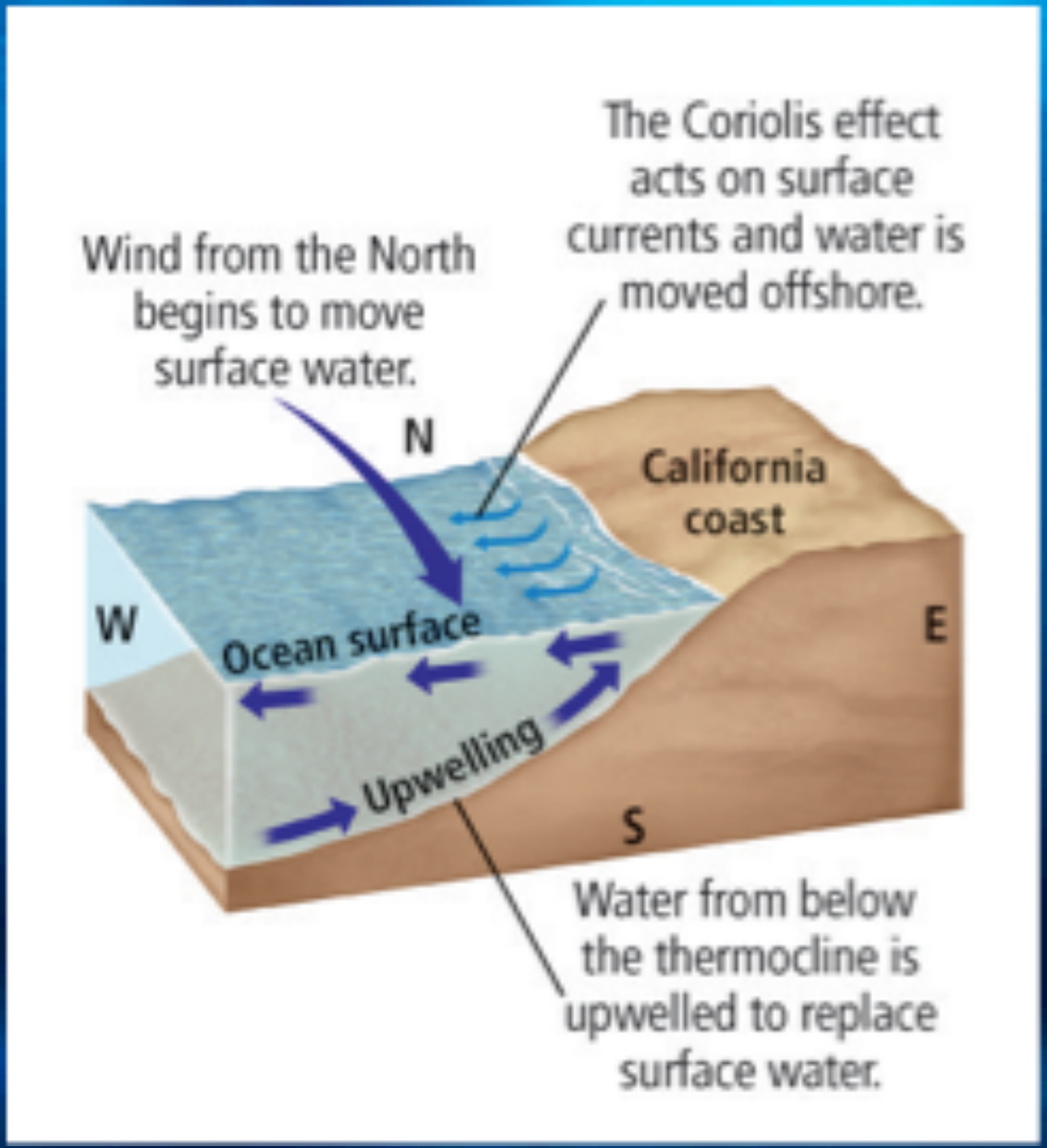
Vertical movement of water ()



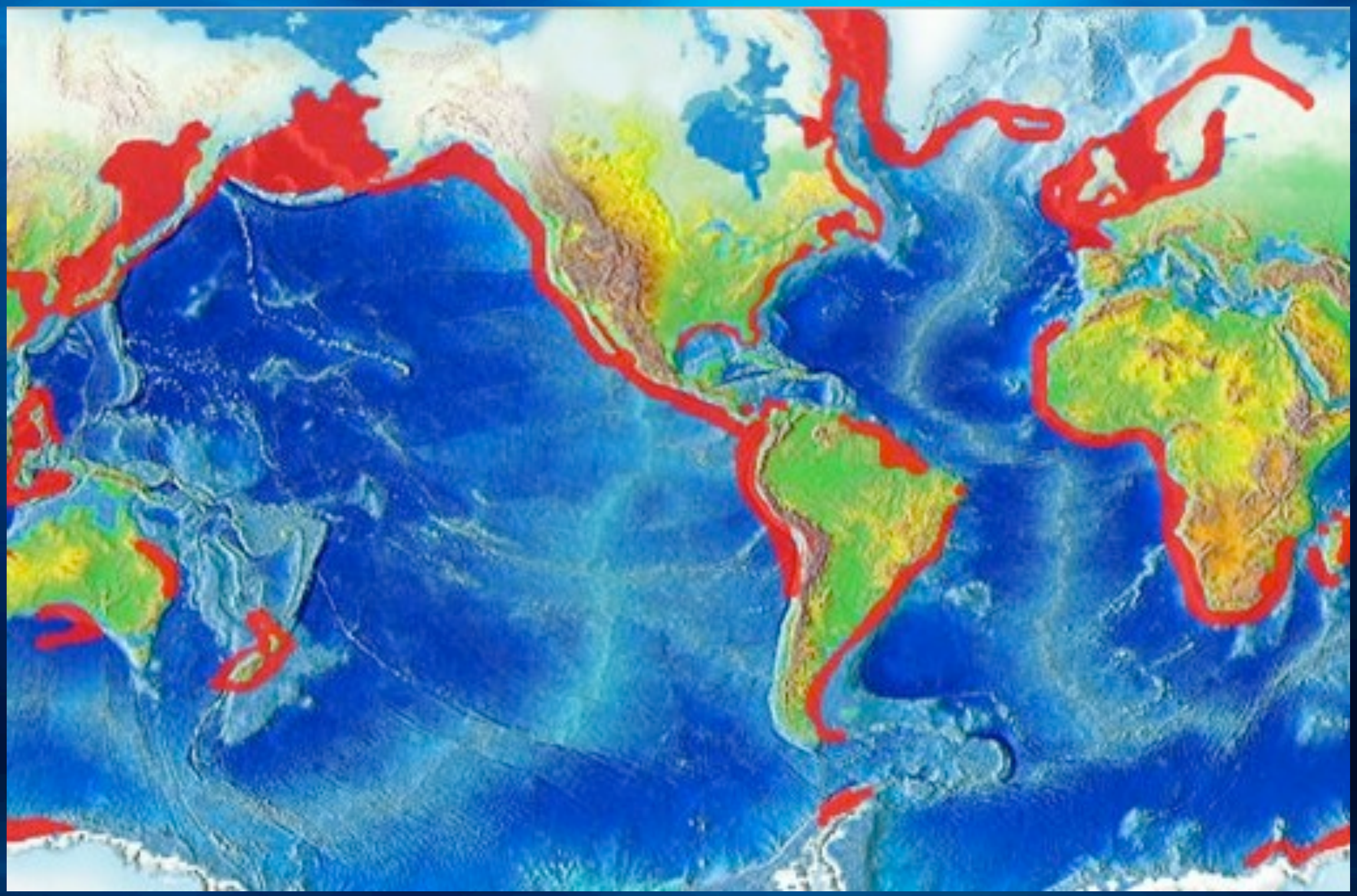
Upwelling

Movement of deep water to surface
Hoists cold, nutrient-rich water to surface
Produces high productivities and abundant marine life

Upwelling

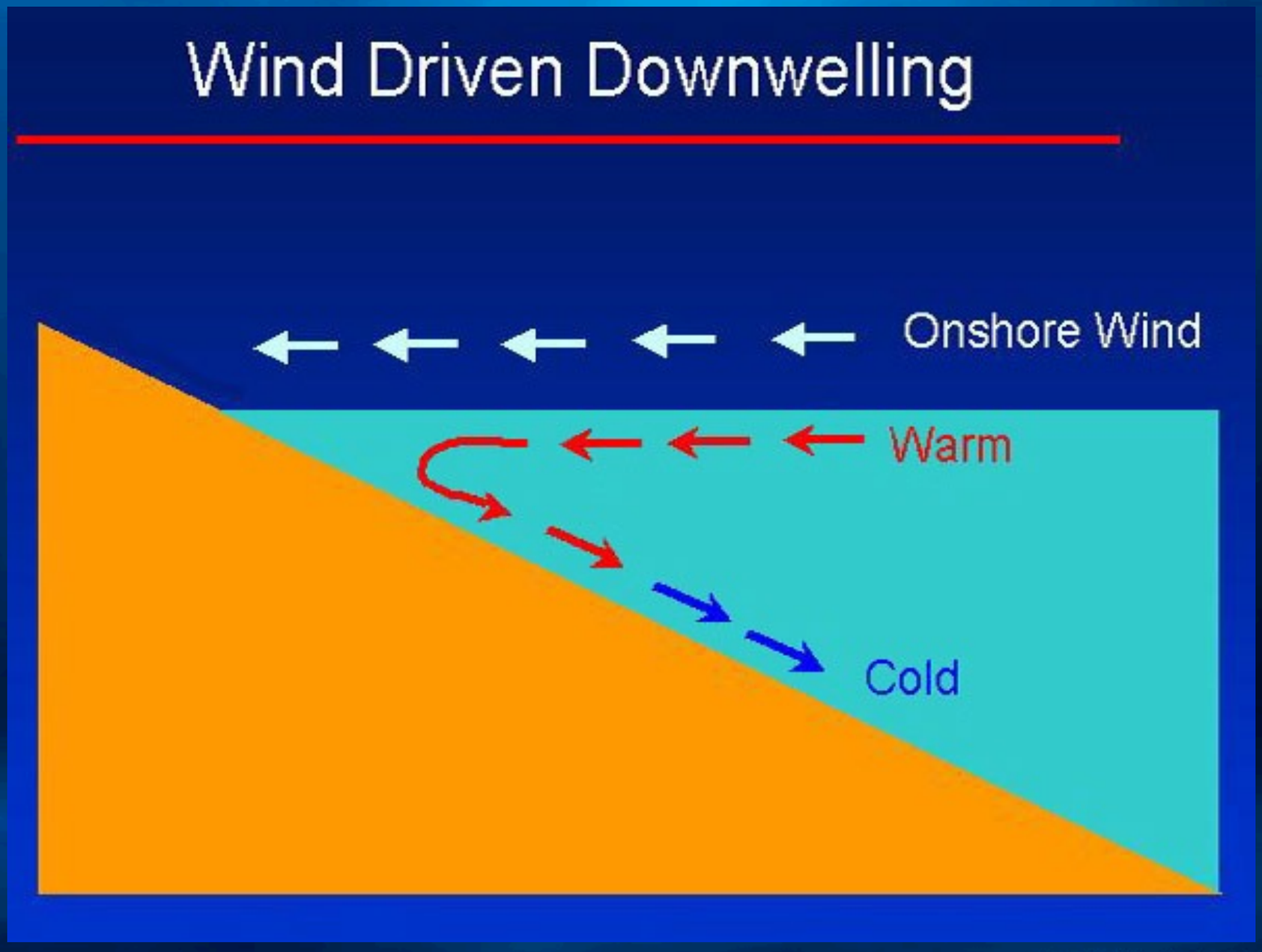


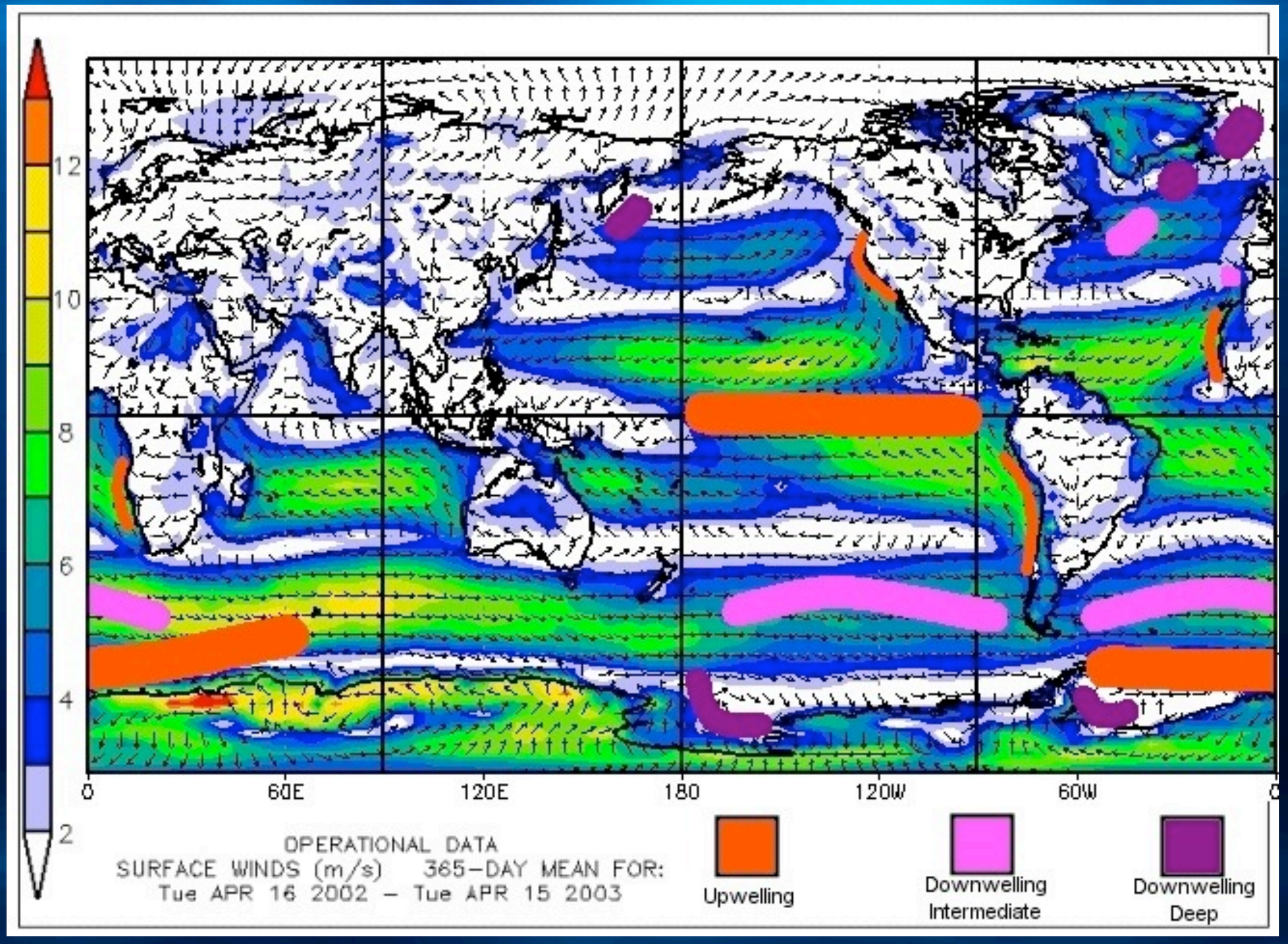
Earth's Major upwelling regions



Downwelling

Moves warm, nutrient-depleted surface water down
Not associated with high productivities or abundant marine life

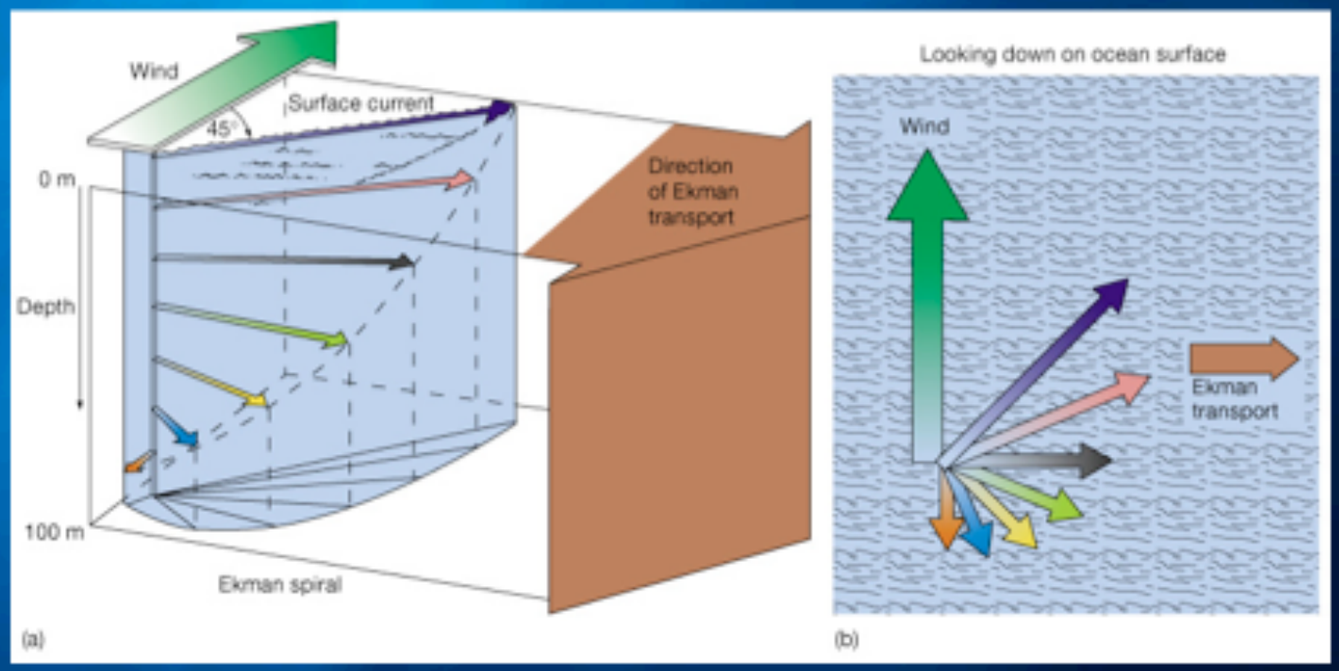




Ekman Spiral

Describes the speed and direction of flow of surface waters at various depths

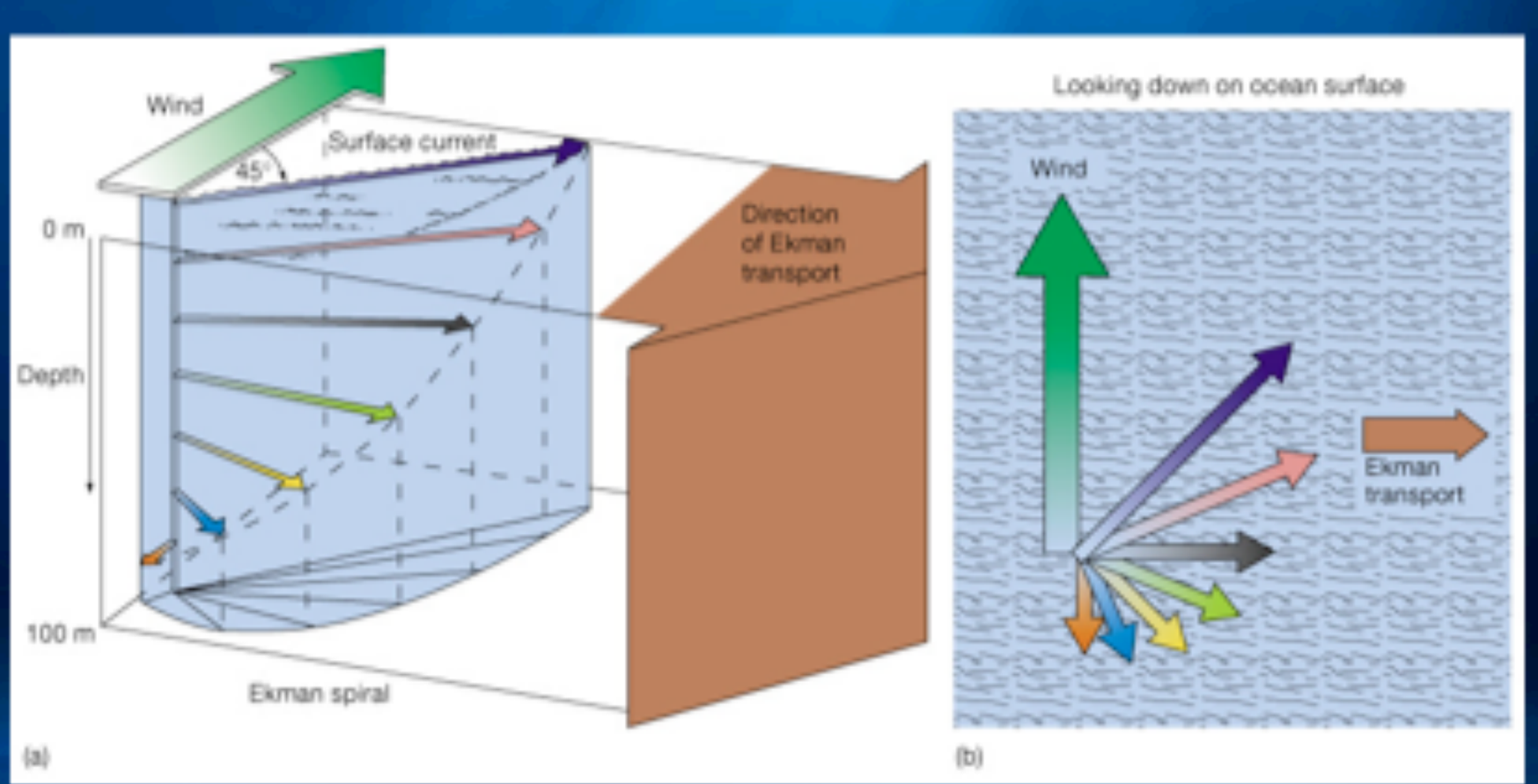
Factors:
Wind
Coriolis effect



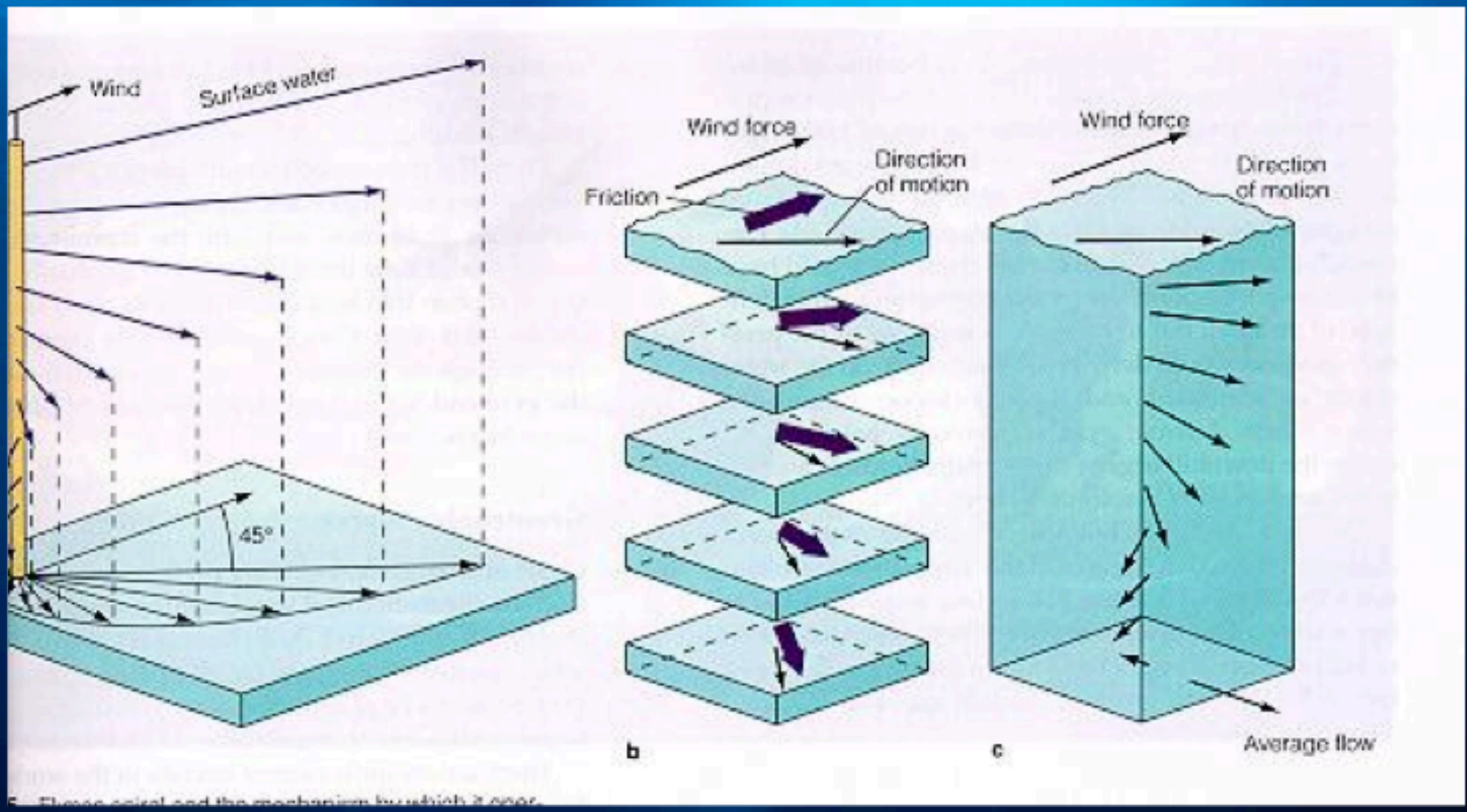
Ekman Transport

The overall water movement due to Ekman spiral

Ideal transport is 90° from the wind



Ekman Transport



Ekman Transport

Surface current deflects 45° from wind direction

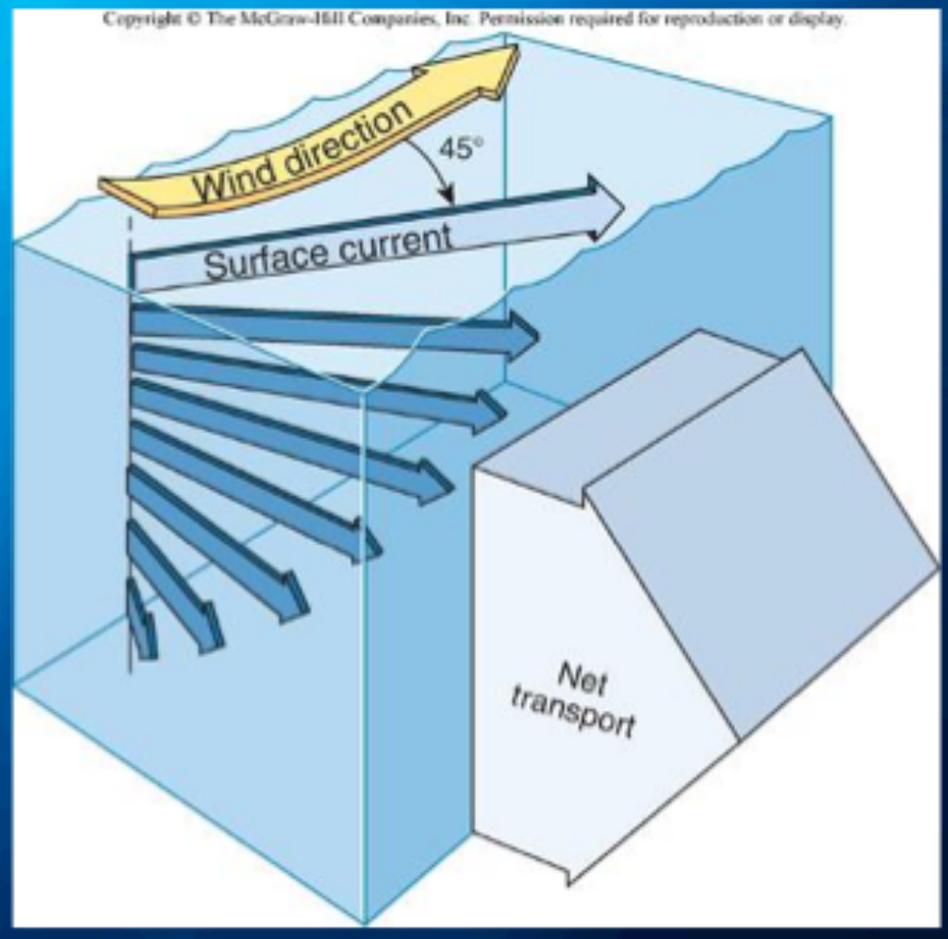
Deflection angle increases with depth (spiral)

Effect of wind decreases with depth (friction)

Net water transport is 90° from wind direction

Right – North. Hemisphere,

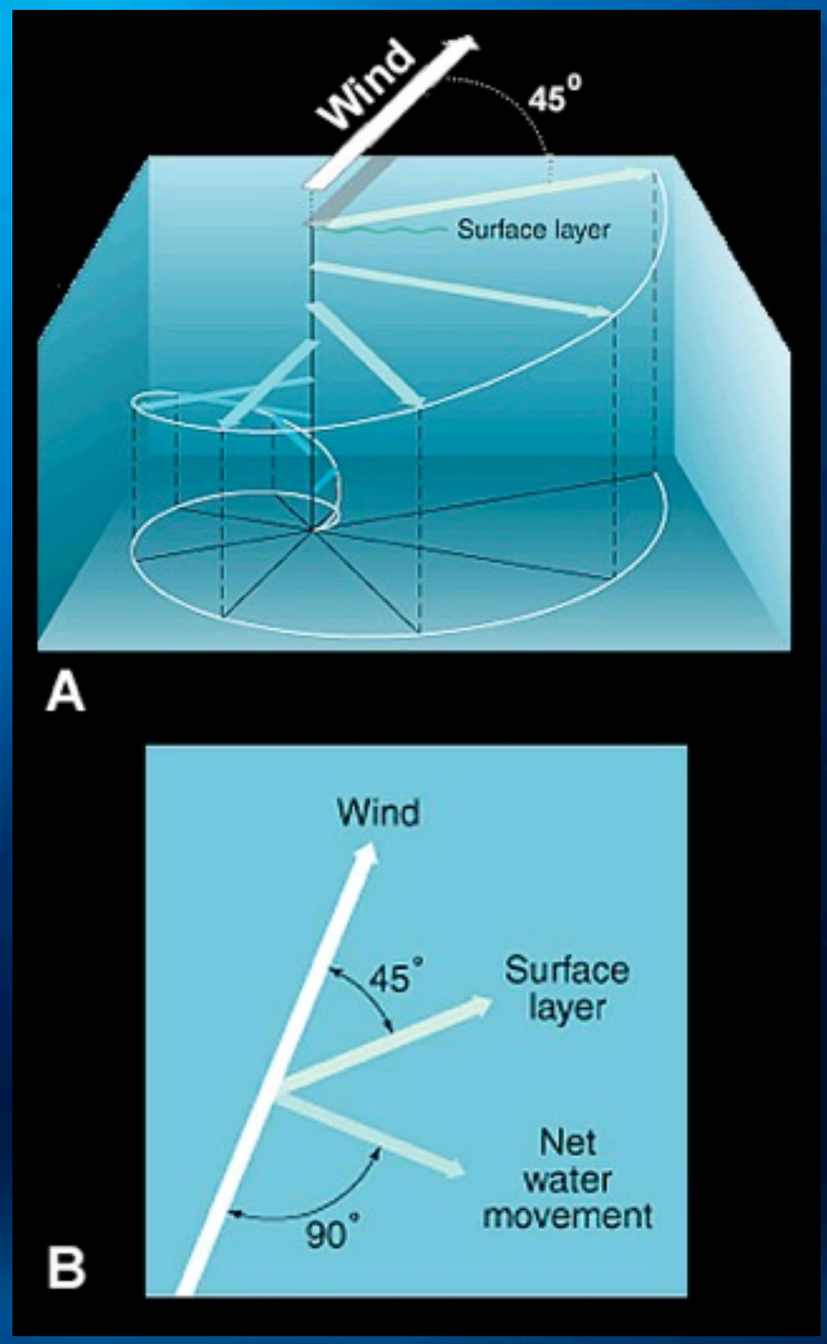
Left – South. Hemisphere



Ekman Transport

As Arctic explorer Fridtjof Nansen tried to get
to the North Pole in 1893, he noticed that the
sea ice in the Arctic Ocean was not moving in the same direction as the wind. It was always moving to the right of the wind direction.
Nansen didn't know why this was happening.
Today we do. It is called **Ekman transport.**

As wind blows across the ocean, it moves
water at the surface. Because the Earth rotates, water moves to the right of the wind in
the Northern Hemisphere and to the left of the
wind in the Southern Hemisphere.



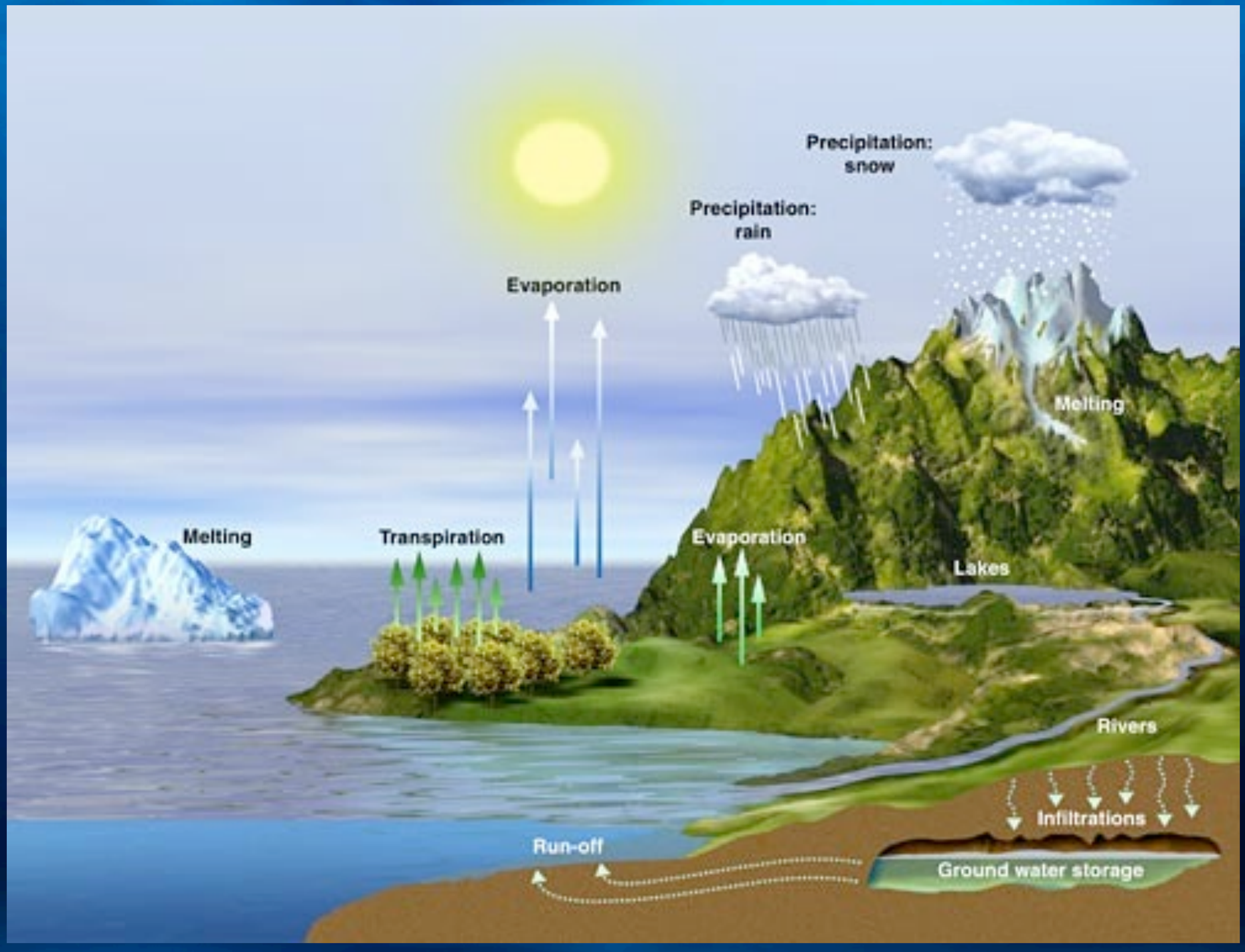
What causes the movement of polar waters?

Differences in density.

What determines the density of water?

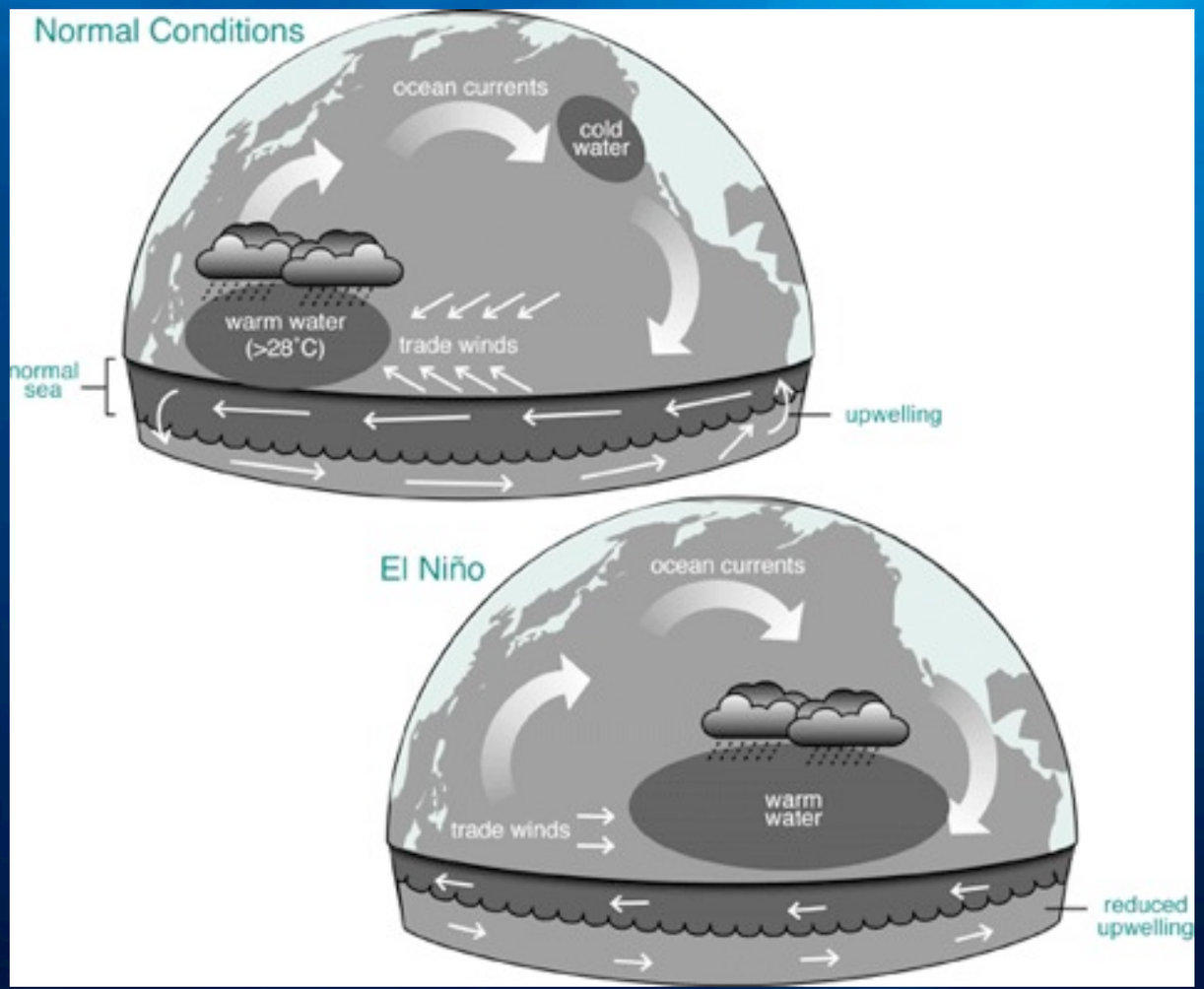
Currents and Climate

How can the ocean effect climate?



El Nino

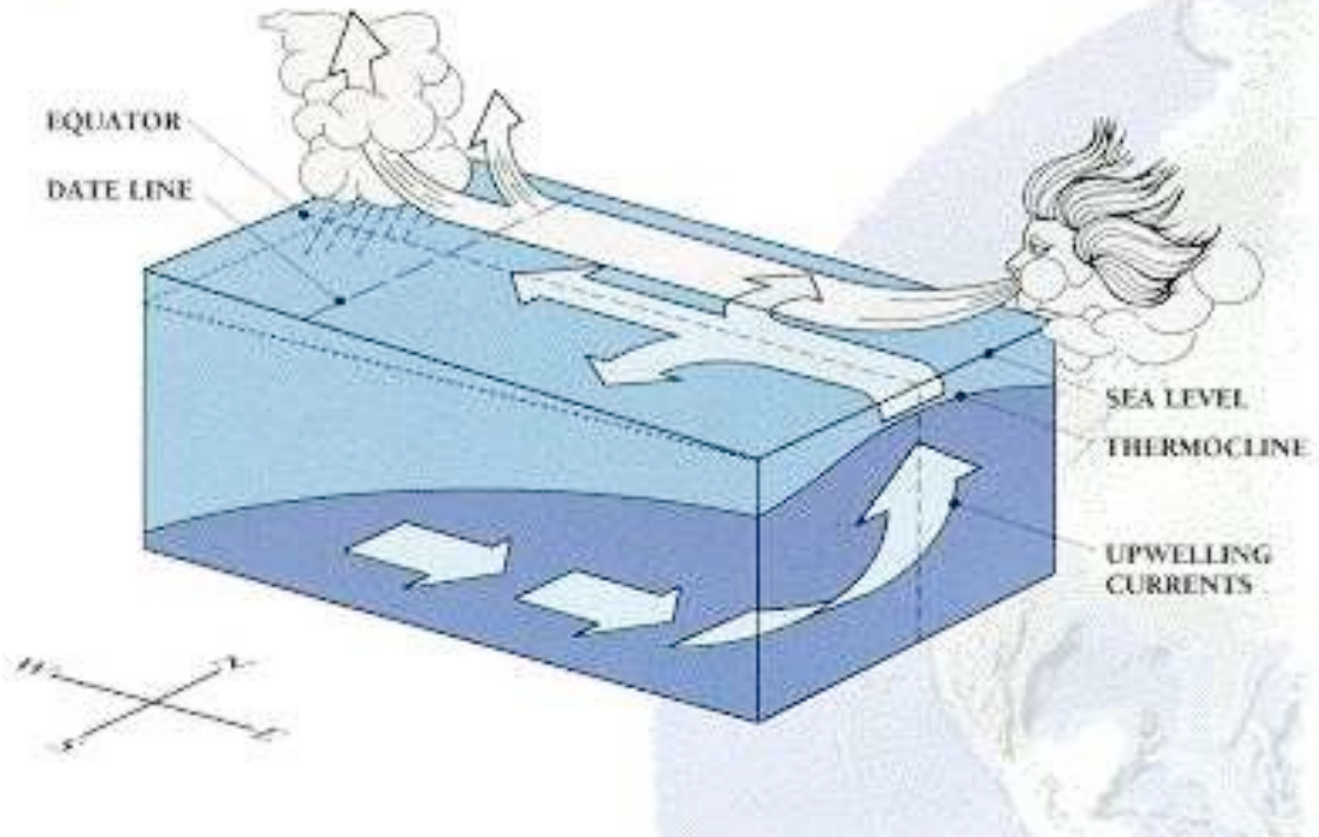
Warming of the ocean current along the coasts of Peru and Ecuador.



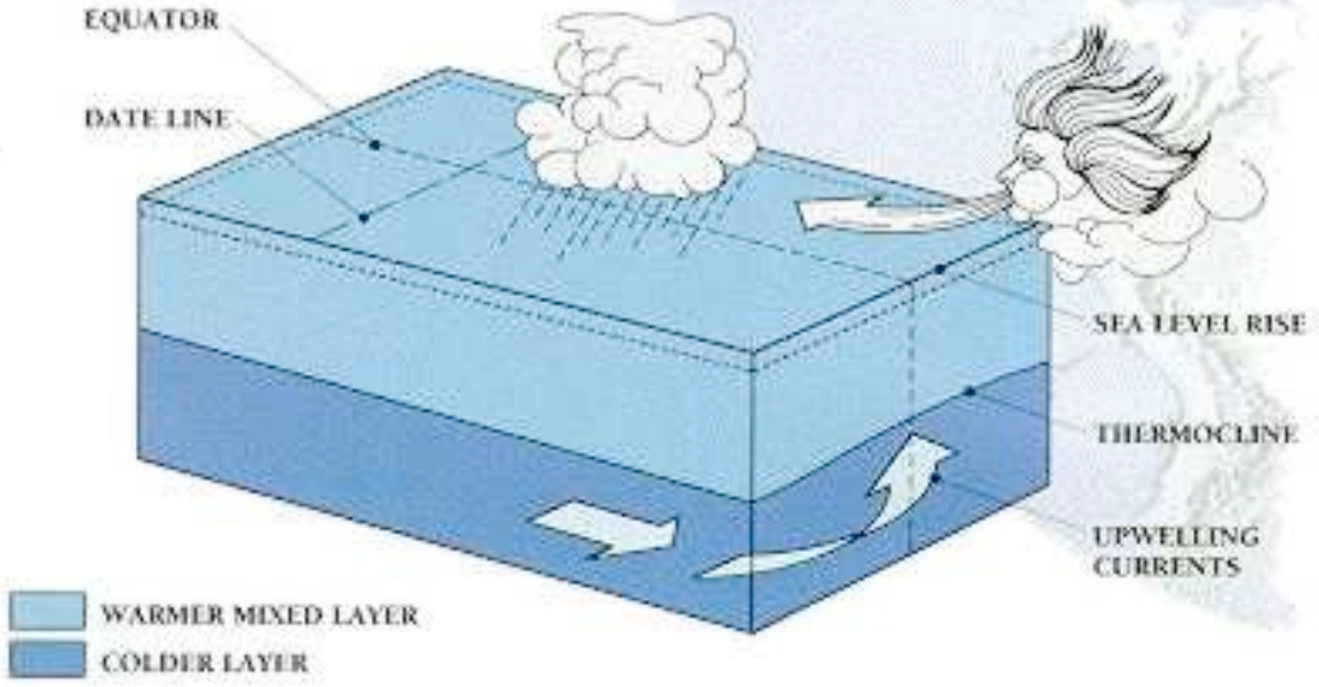
Generally occurs every 3 to 7 years

Associated with changes in the weather worldwide.

Normal Conditions

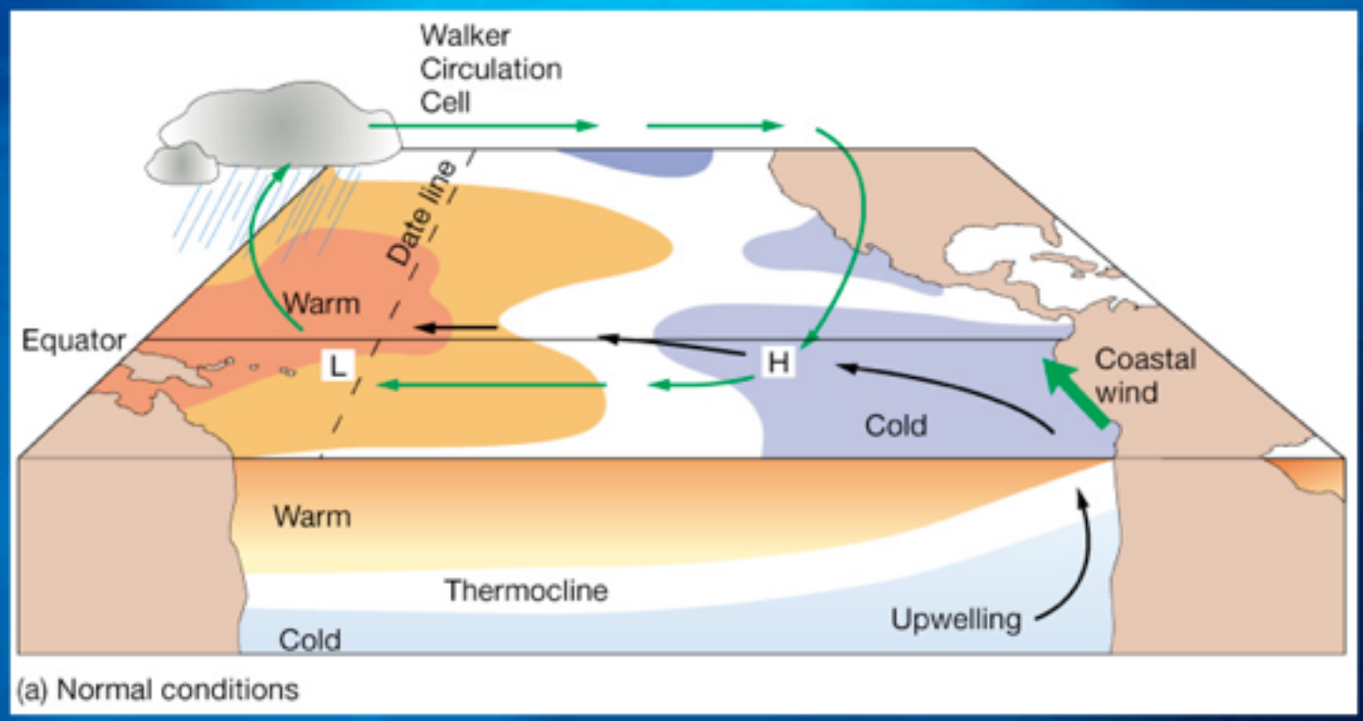


El Niño Conditions



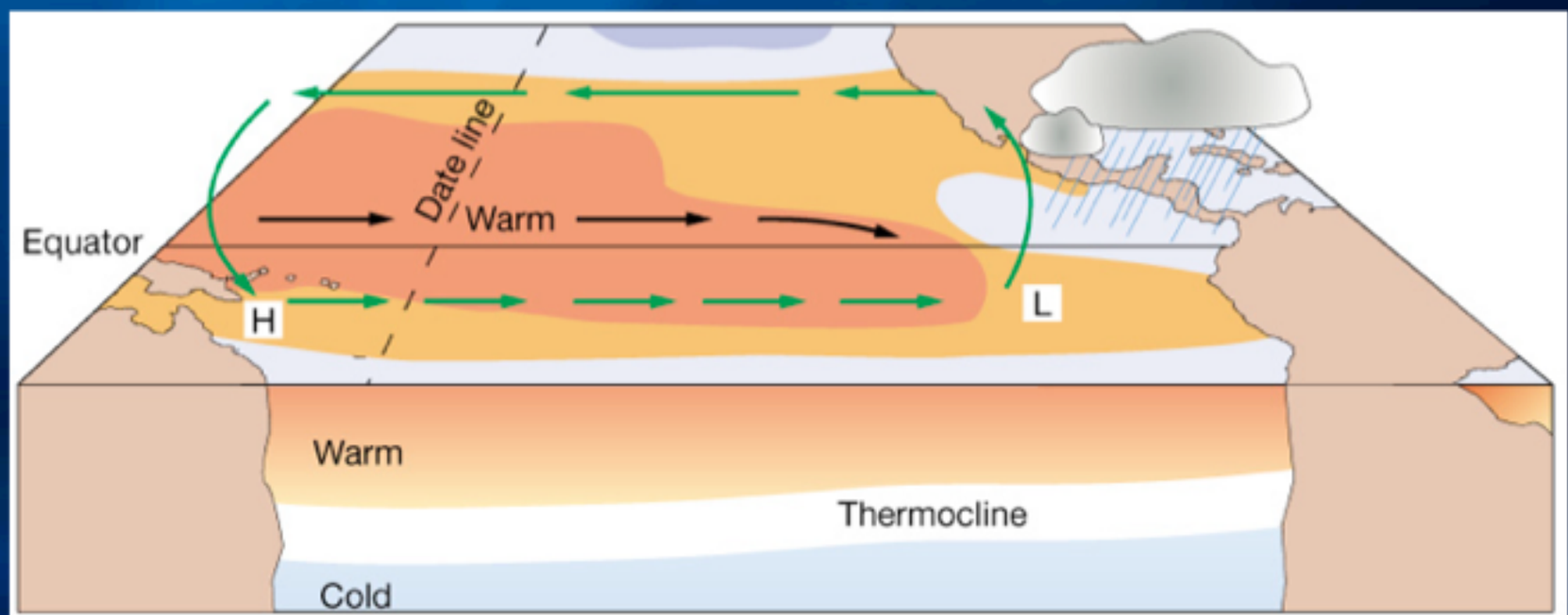
Currents and Climate

Normal conditions in the Pacific Ocean



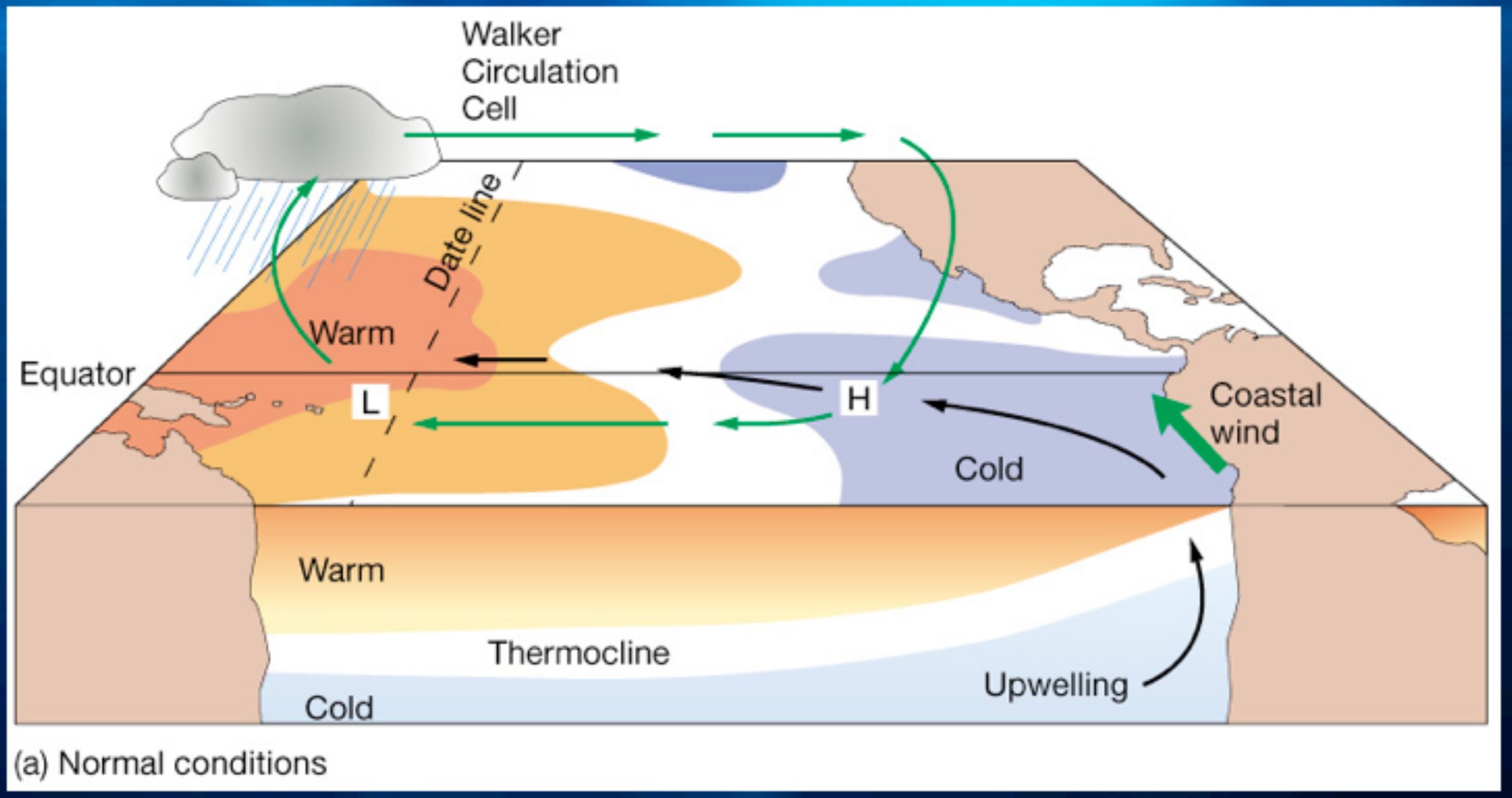
(a) Normal conditions

El Niño conditions



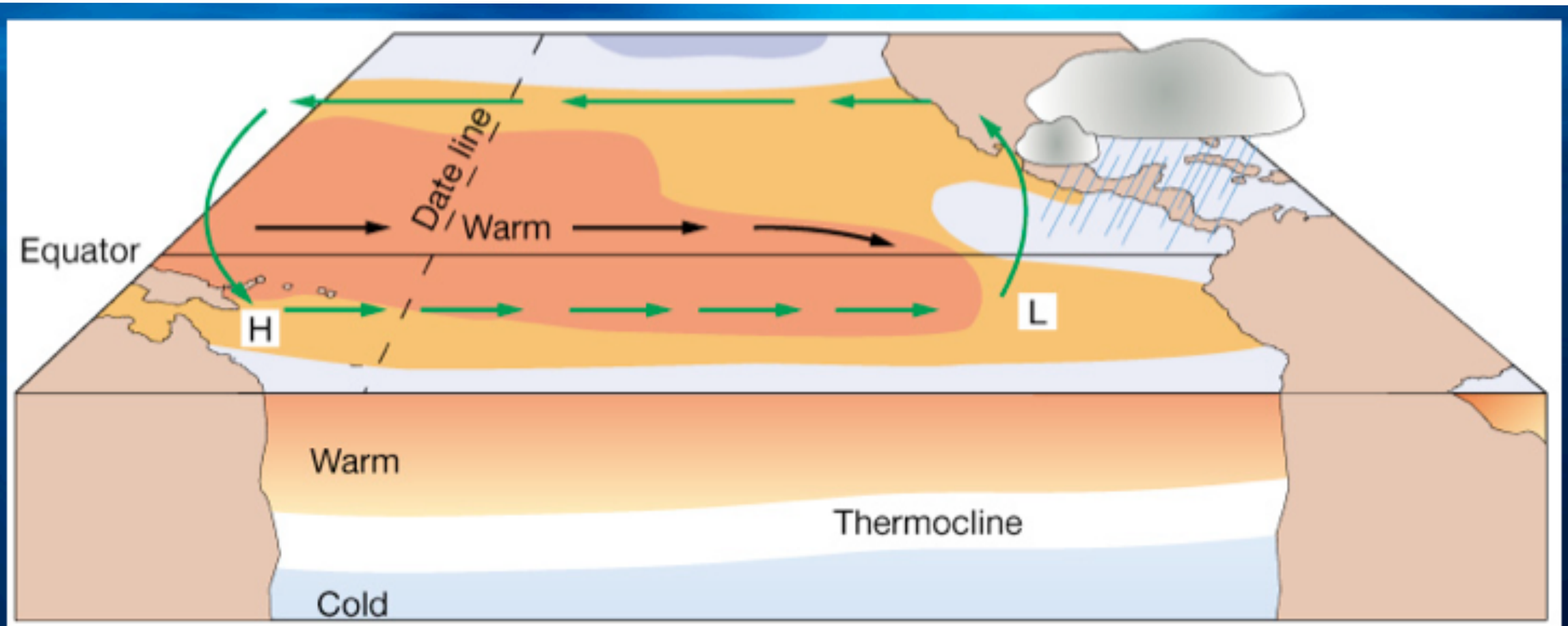
(b) El Niño conditions

Normal conditions in Pacific Ocean



(a) Normal conditions

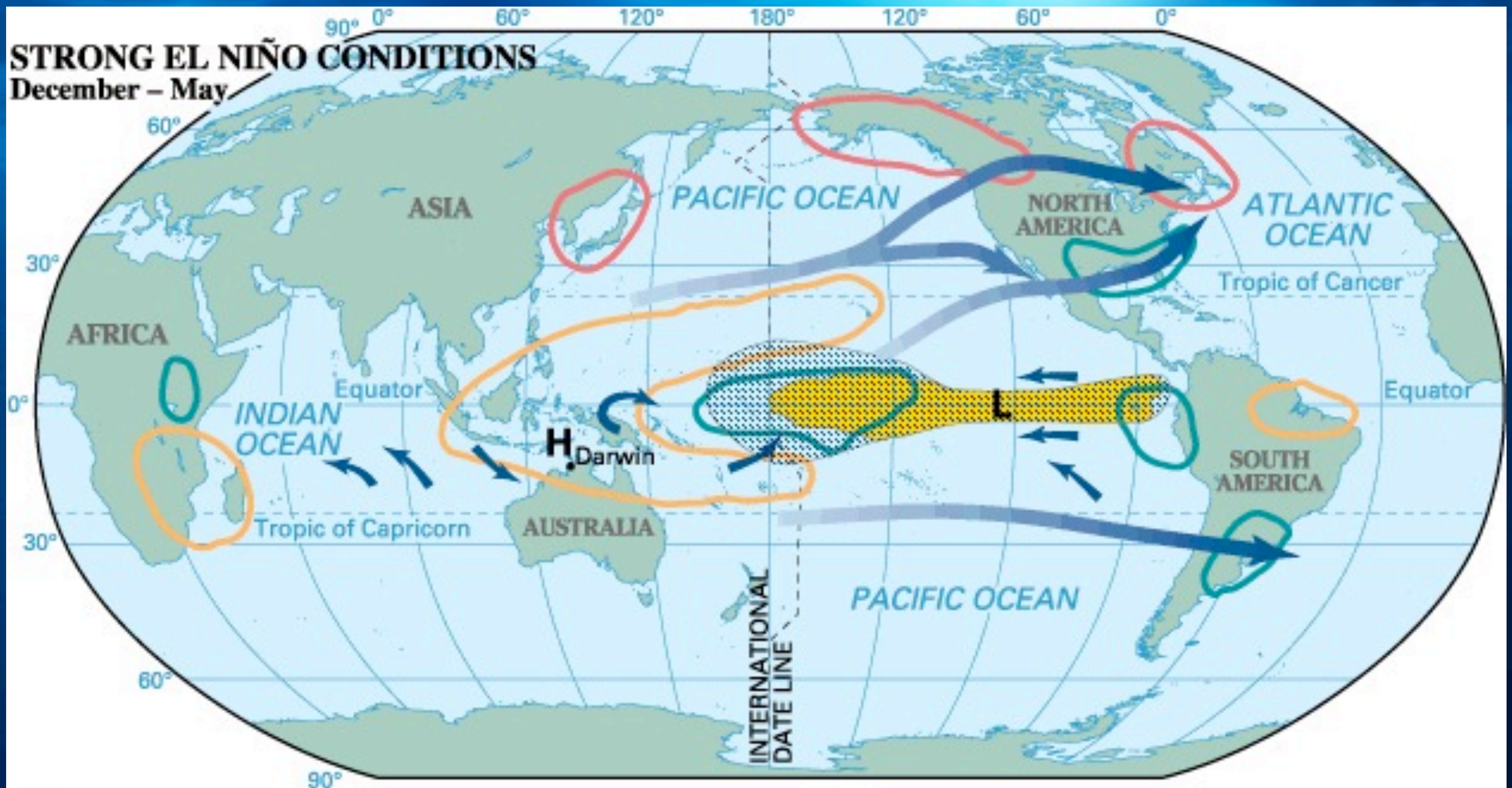
El Niño conditions



(b) El Niño conditions

STRONG EL NIÑO CONDITIONS

December – May



H High pressure area establishes around Darwin, Australia.

L Low pressure area extends over the eastern tropical Pacific.

Easterly trade winds across the entire tropical Pacific weaken substantially. Winds in the western tropical Pacific reverse direction and begin blowing eastward.

Warm water, usually over the western tropical Pacific, is displaced eastward over the central and eastern tropical Pacific.

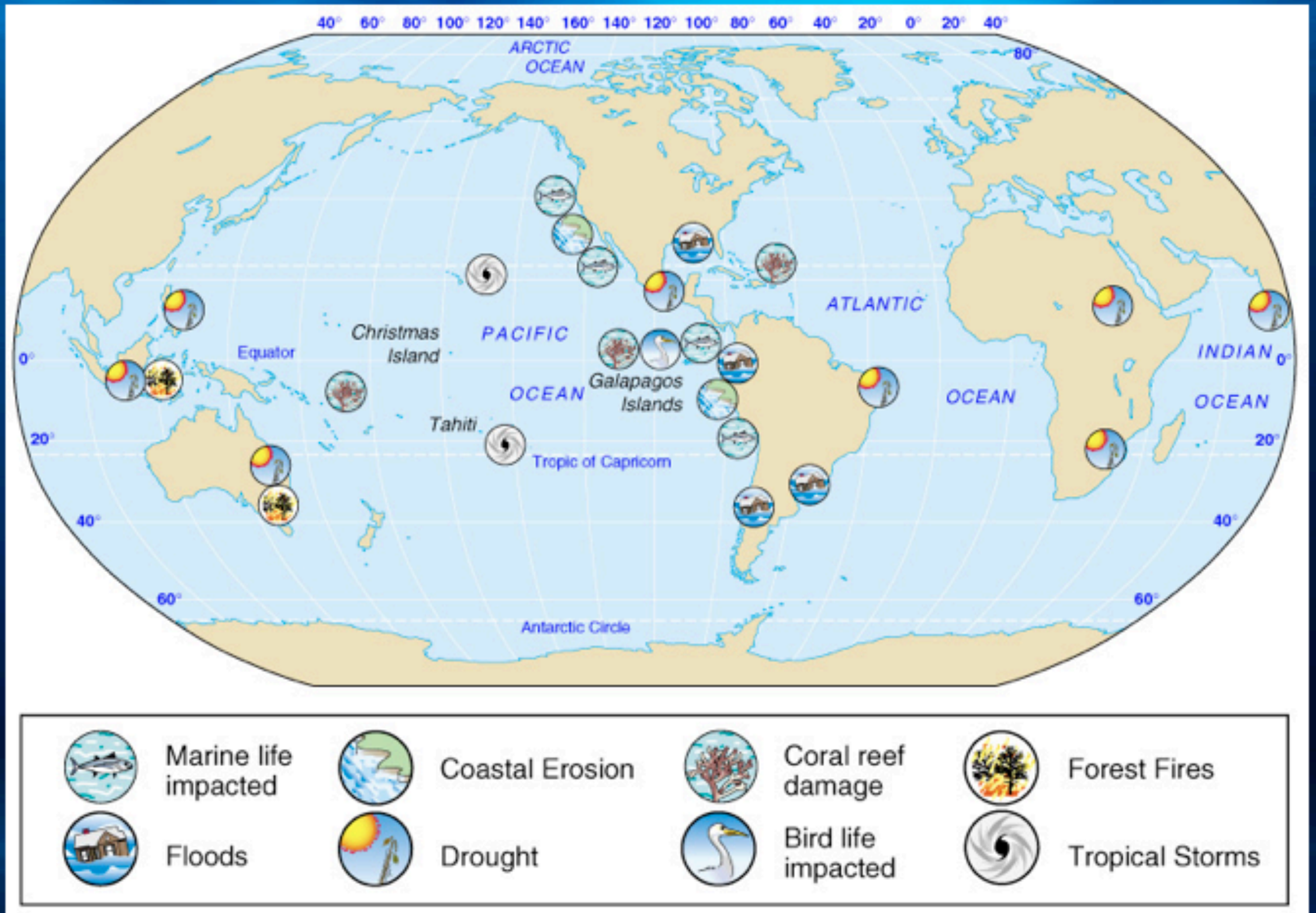
Tropical thunderstorms intensify dramatically over the warm water area. Meanwhile, the western tropical Pacific is robbed of its usual storms.

Jet streams are diverted for thousands of kilometres by the tropical thunderstorms. They strengthen and feed more storms wherever they flow.

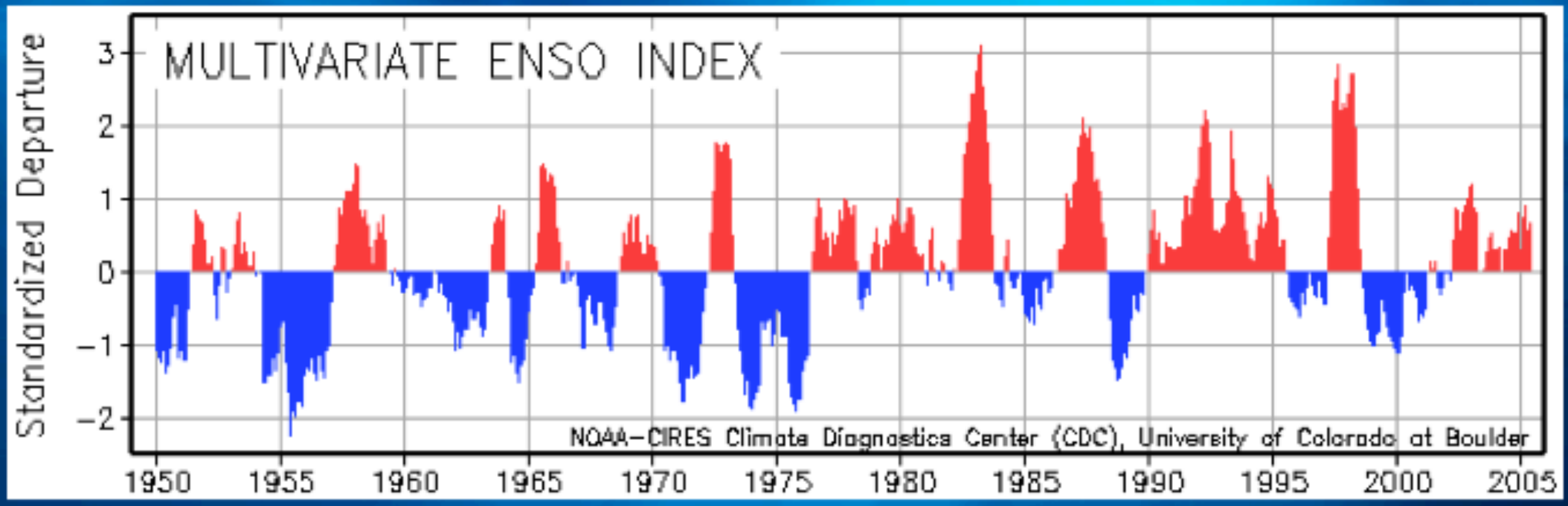
Many areas around the globe become abnormally warm, wet, or dry.

warm wet dry

Effects of severe El Niños

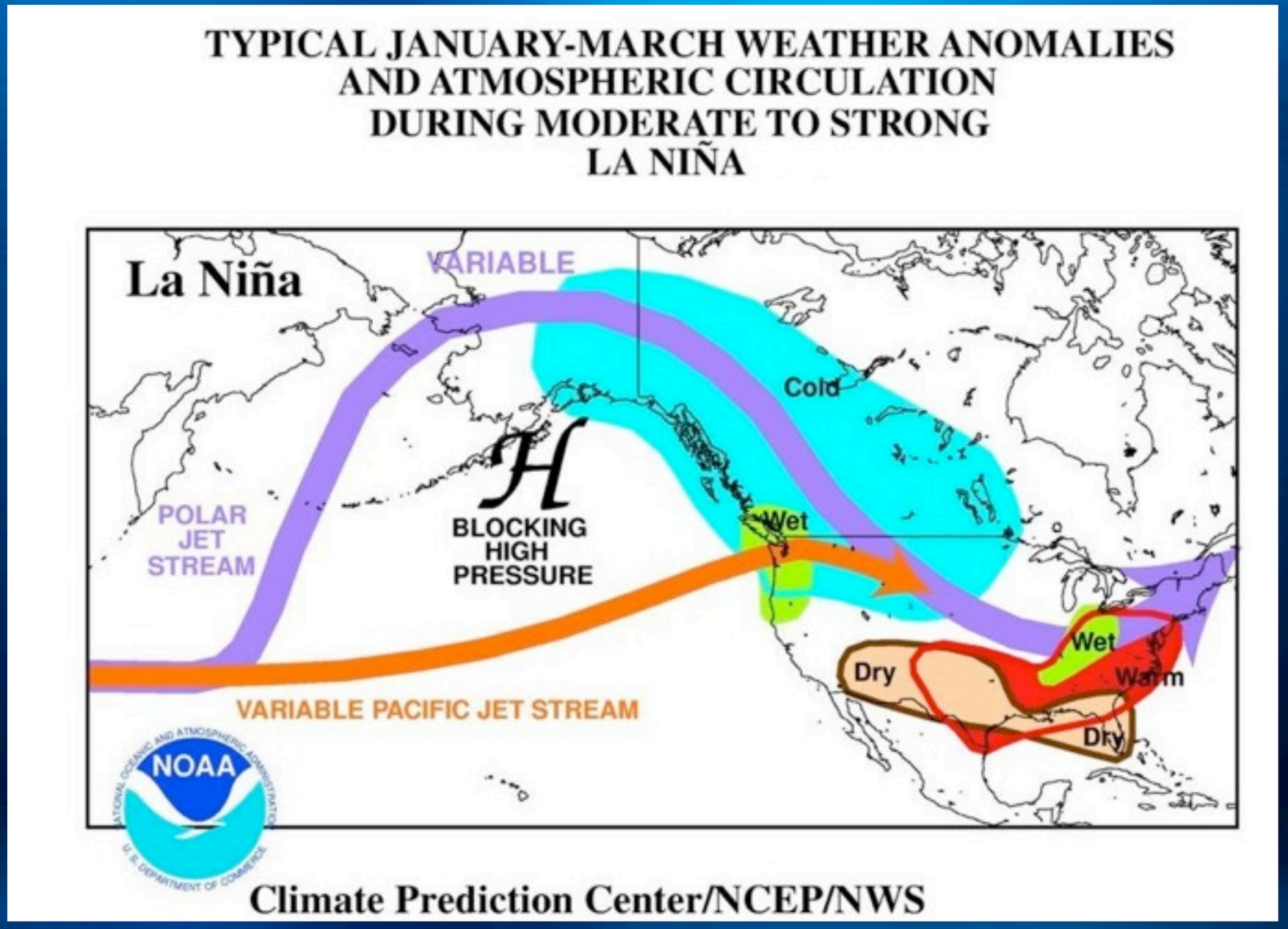


El Niño events over the last 55 years

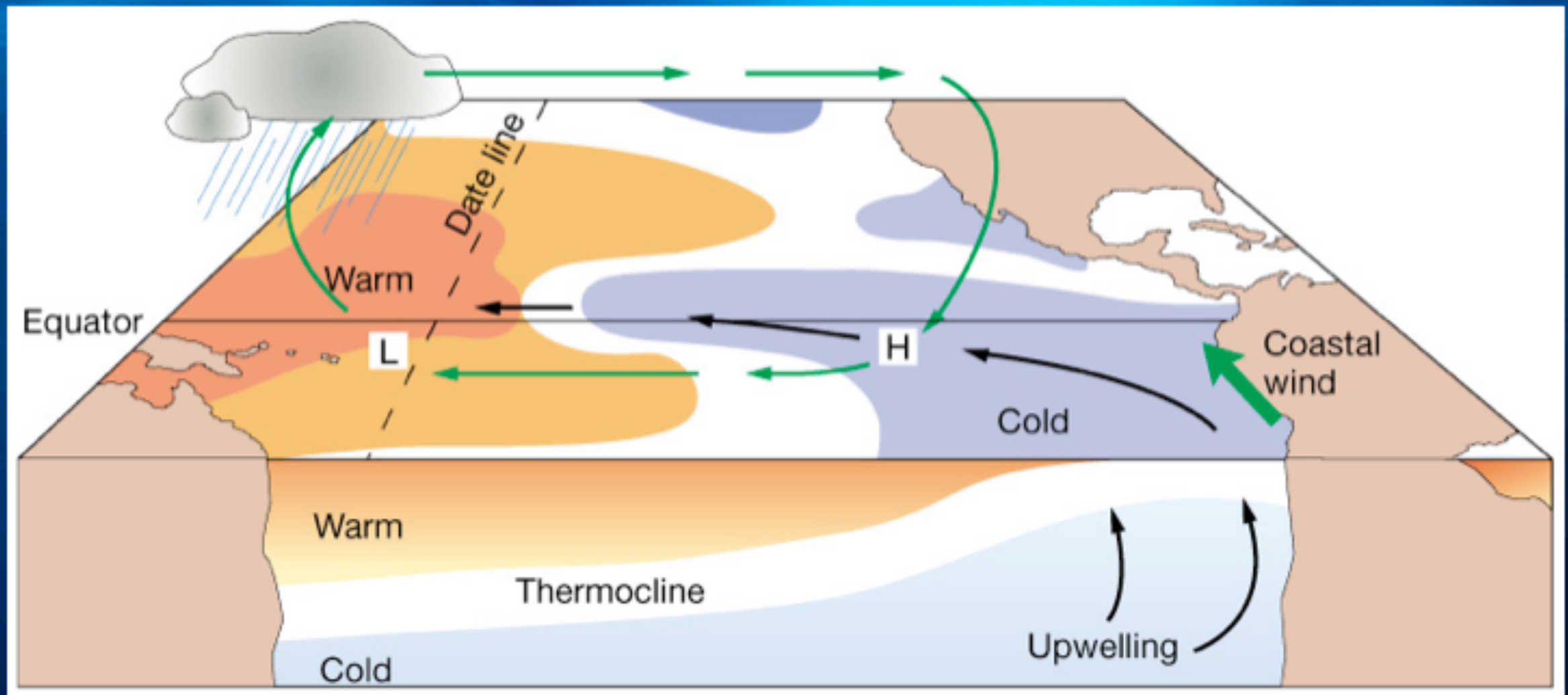


La Nina

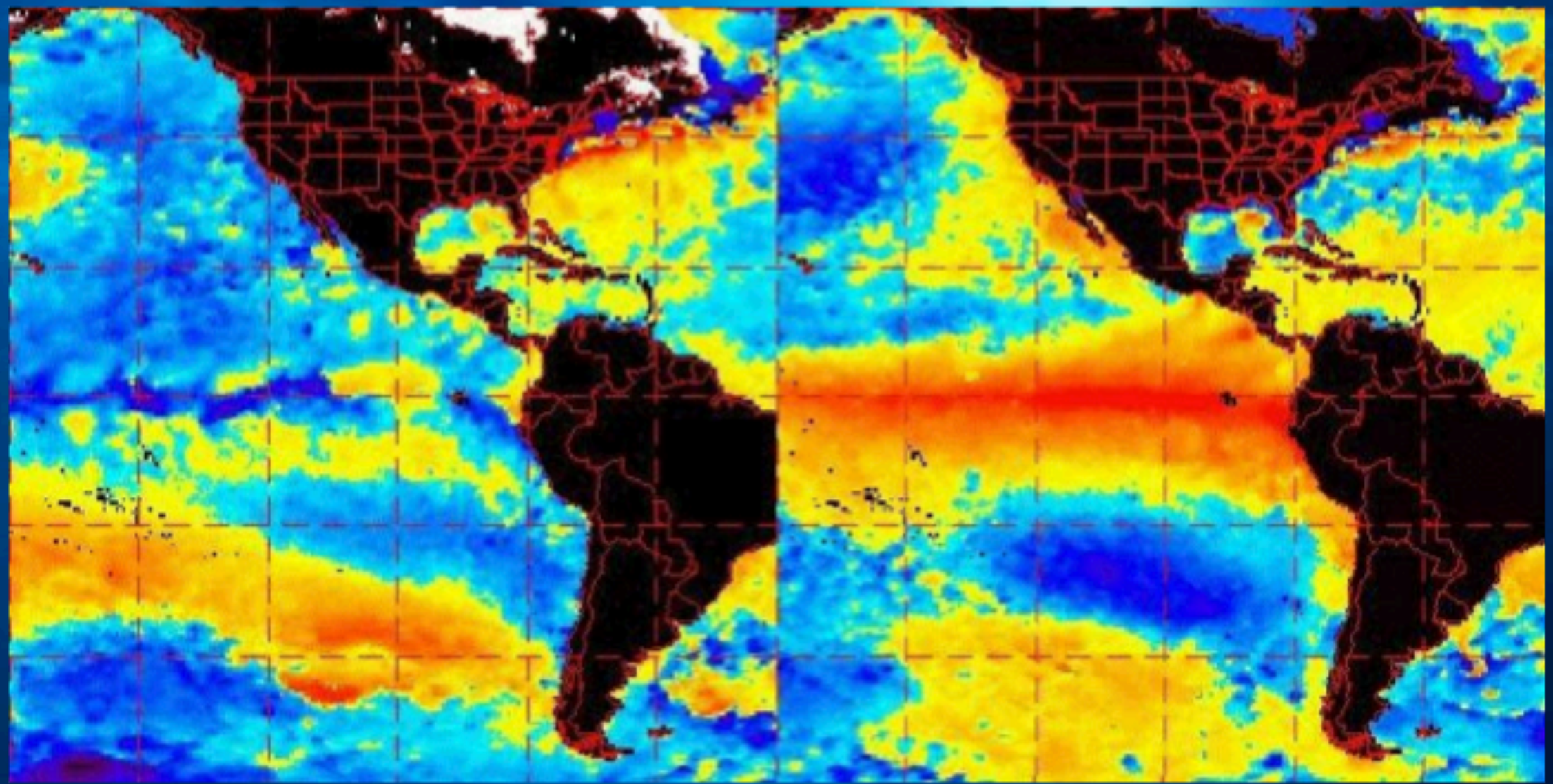
Associated with cooler than normal water temperatures in the Equatorial Pacific Ocean



La Niña conditions



(c) La Niña conditions



Non El Niño

El Niño

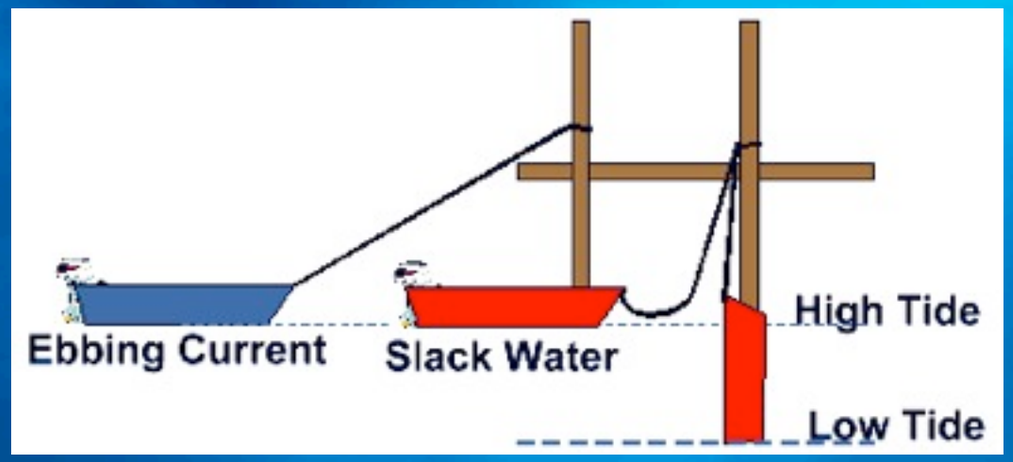
What are the Tides?

Objectives:

- Define tides and tidal range
- Explain how tides are affected by gravity
- Explain the moon's role in tidal movement
- Explain spring and neap tides

What causes Tides?

Tides



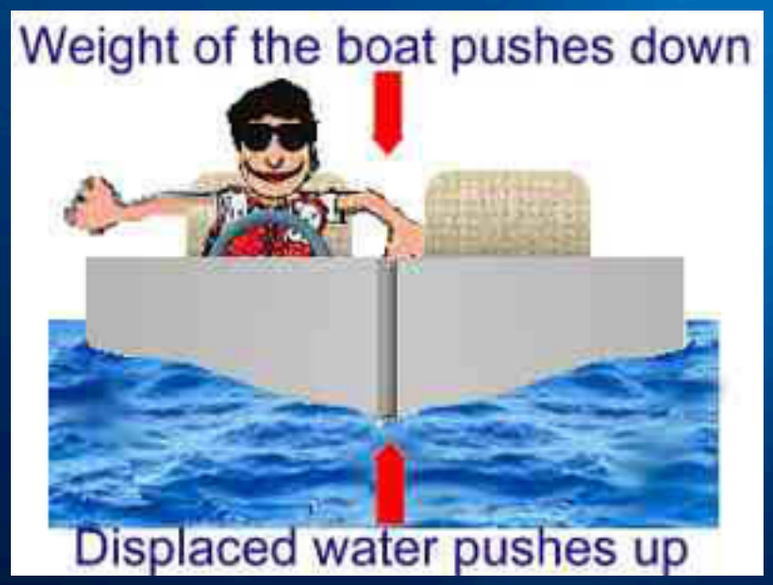
Objectives:

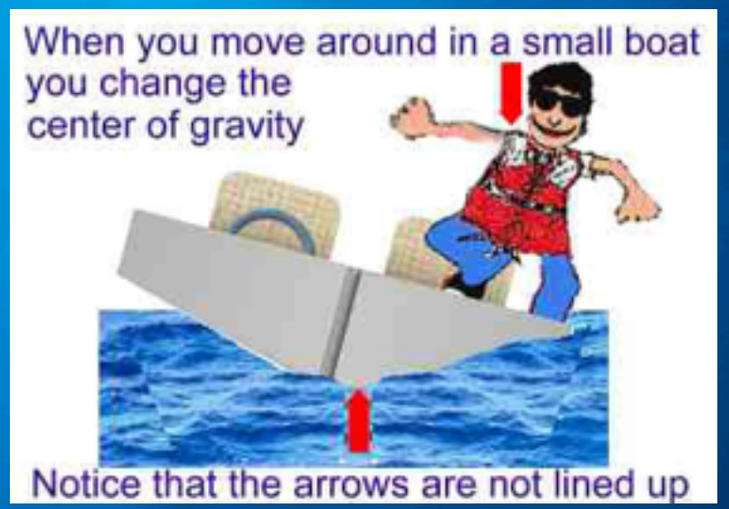
Explain why objects float

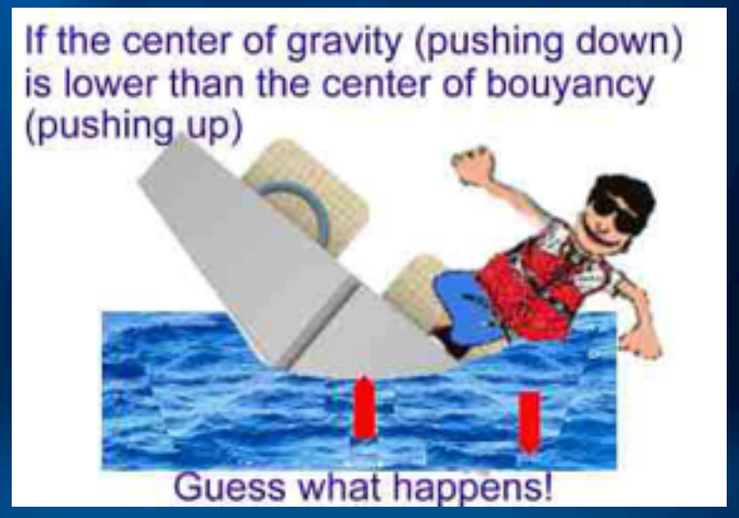
D**escribe** how the gravitational pull of the moon causes tides.

Buoyancy

The ability or tendency to float in water.







Tides

Periodic rise and fall of the water level in the oceans.

(1) High tide - water level is highest.

(2) Low tide - water level is lowest.

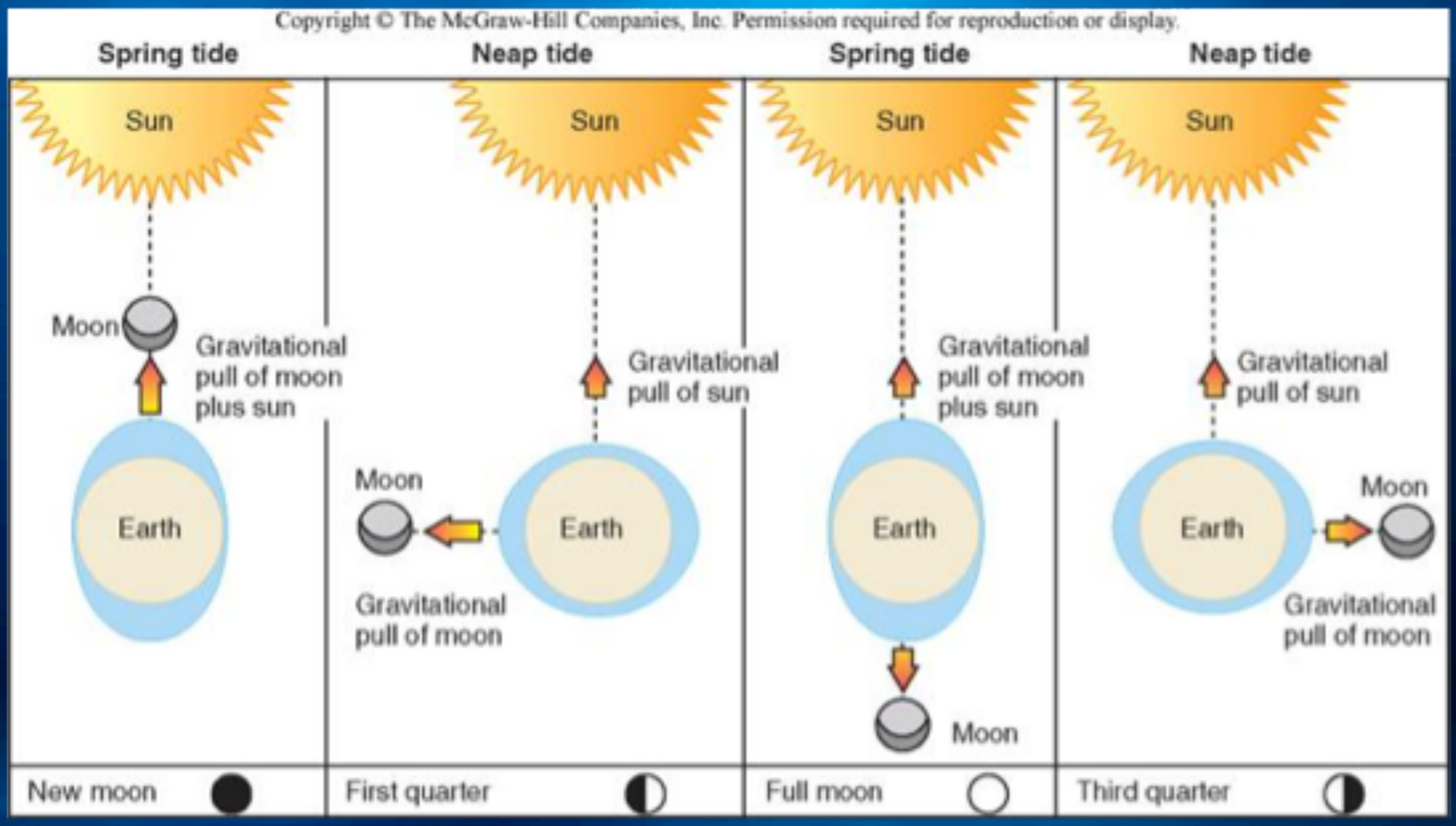
What Causes Tides?

(1) The moon:

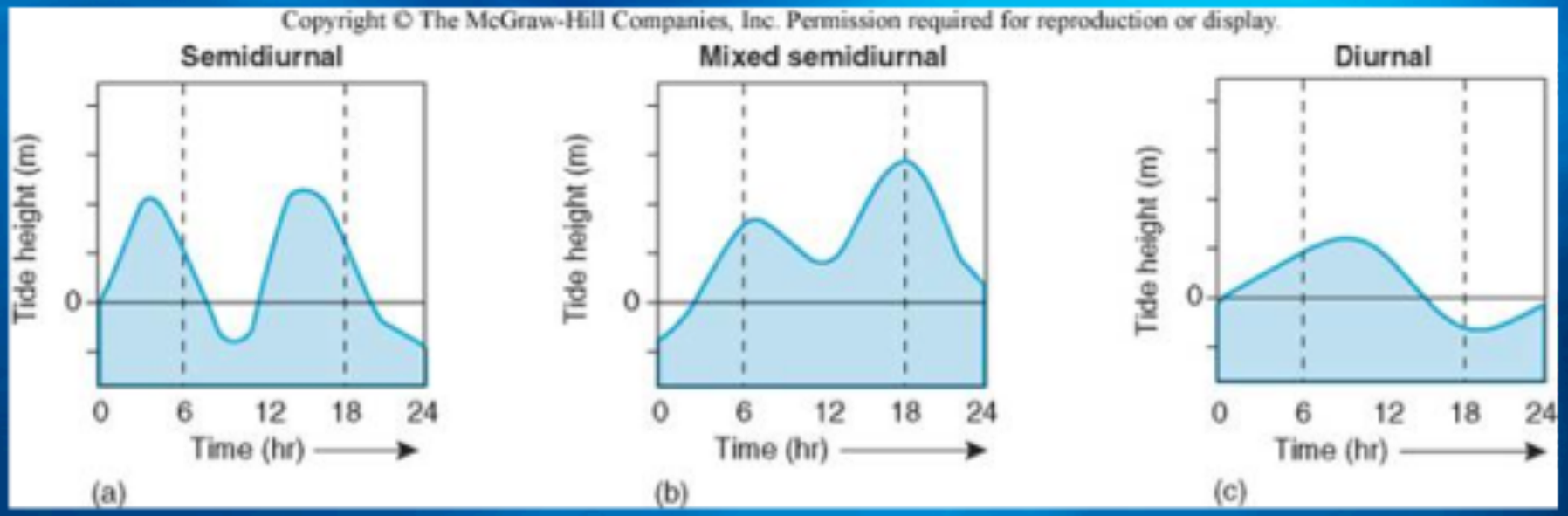
The **Gravitational** pull is strongest on the side of Earth that is closest to the moon.

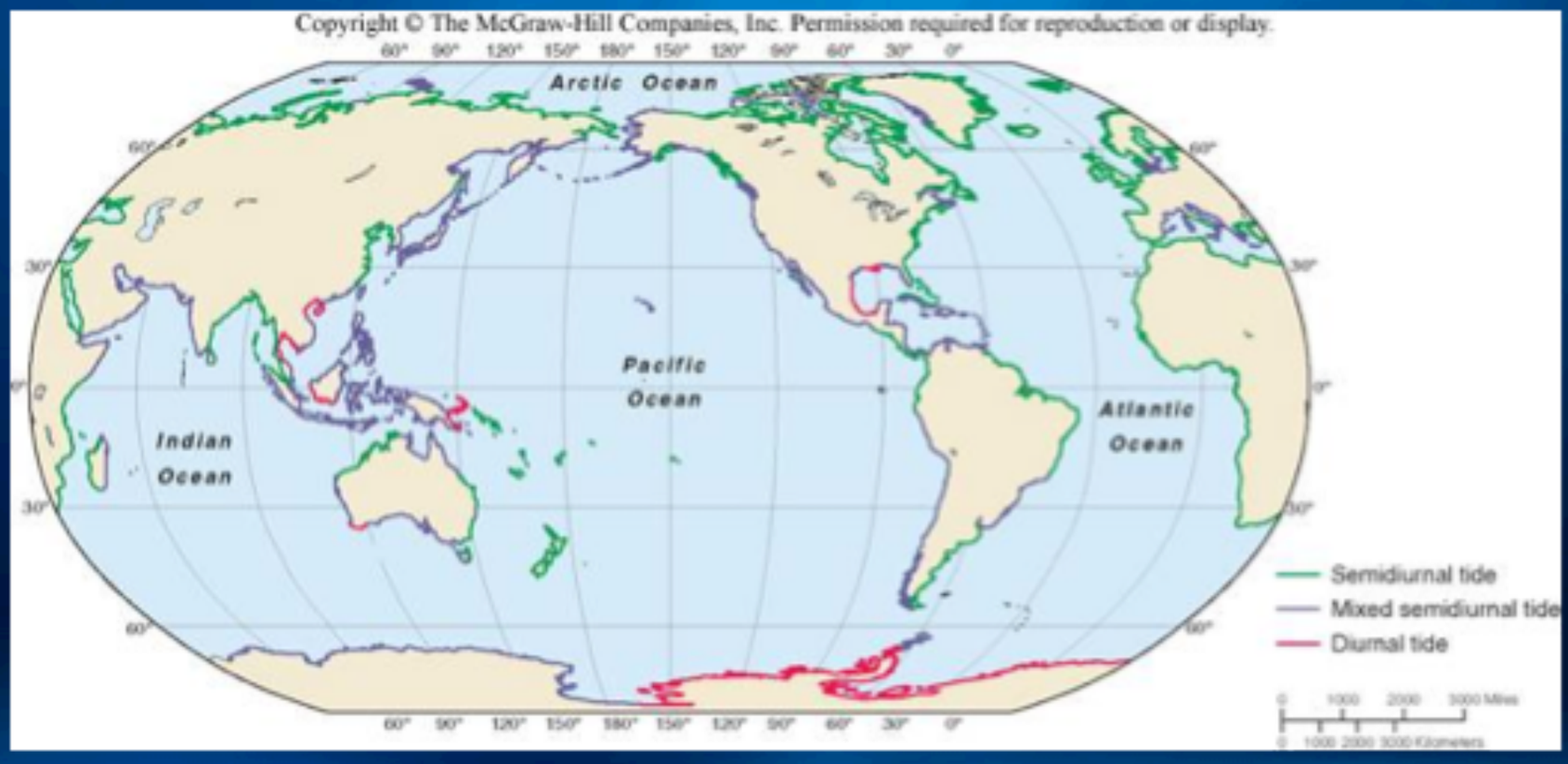
What Causes Tides?

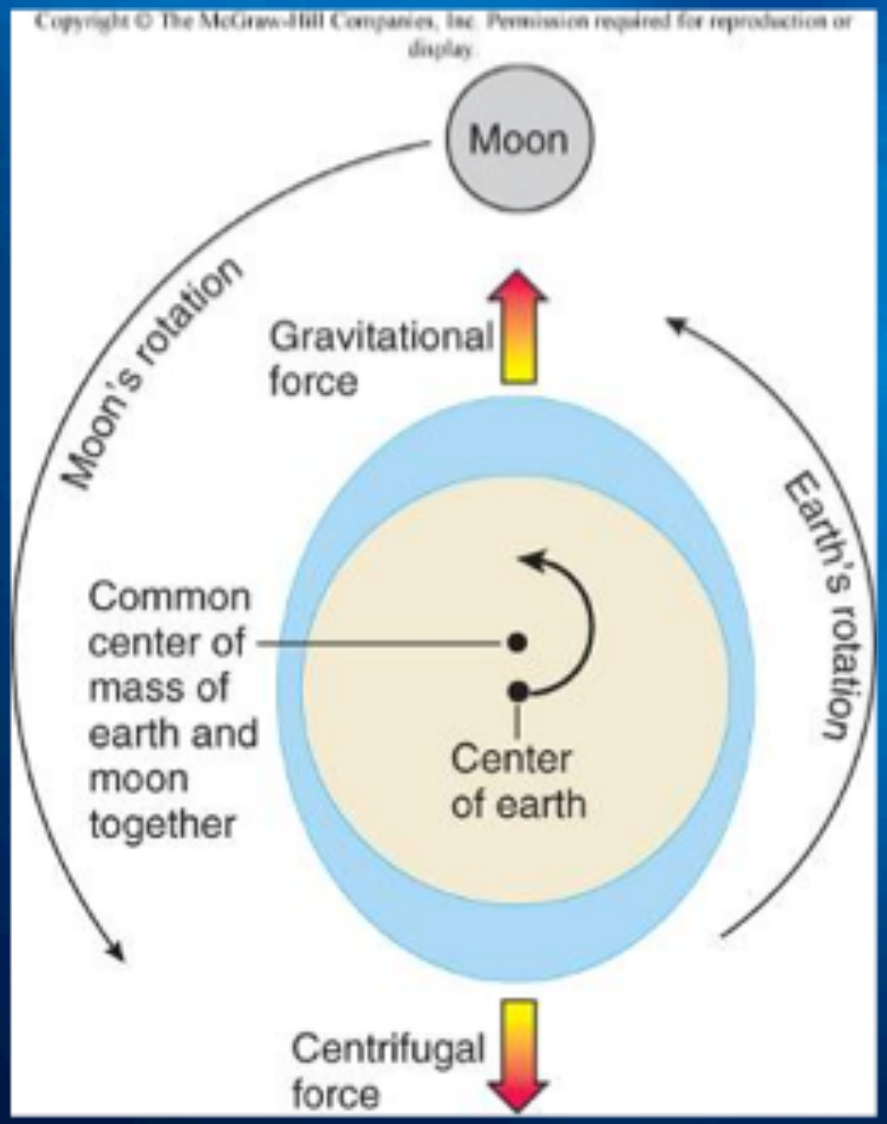
2. The Sun

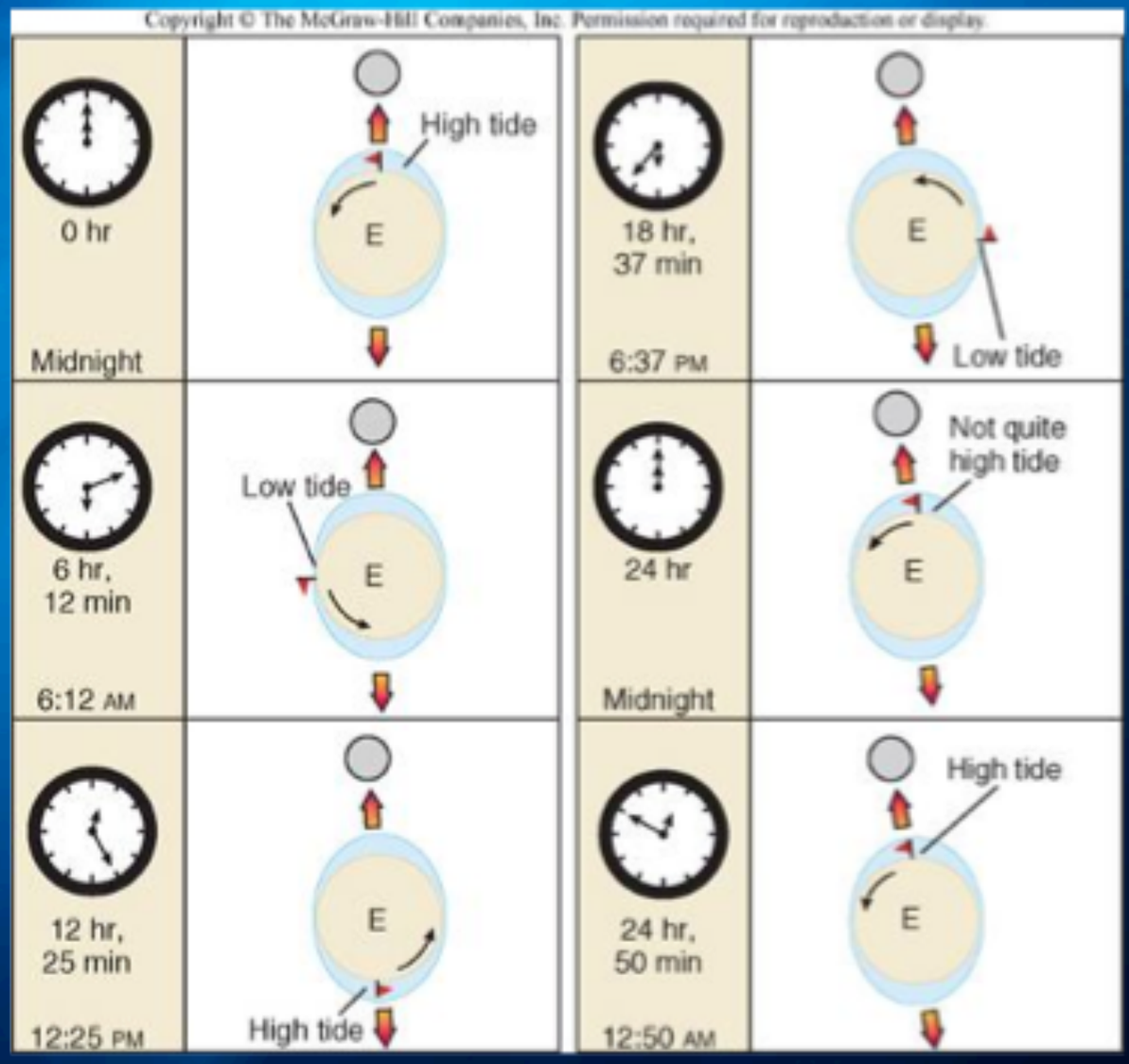


Most locations have two high and two low tides daily.

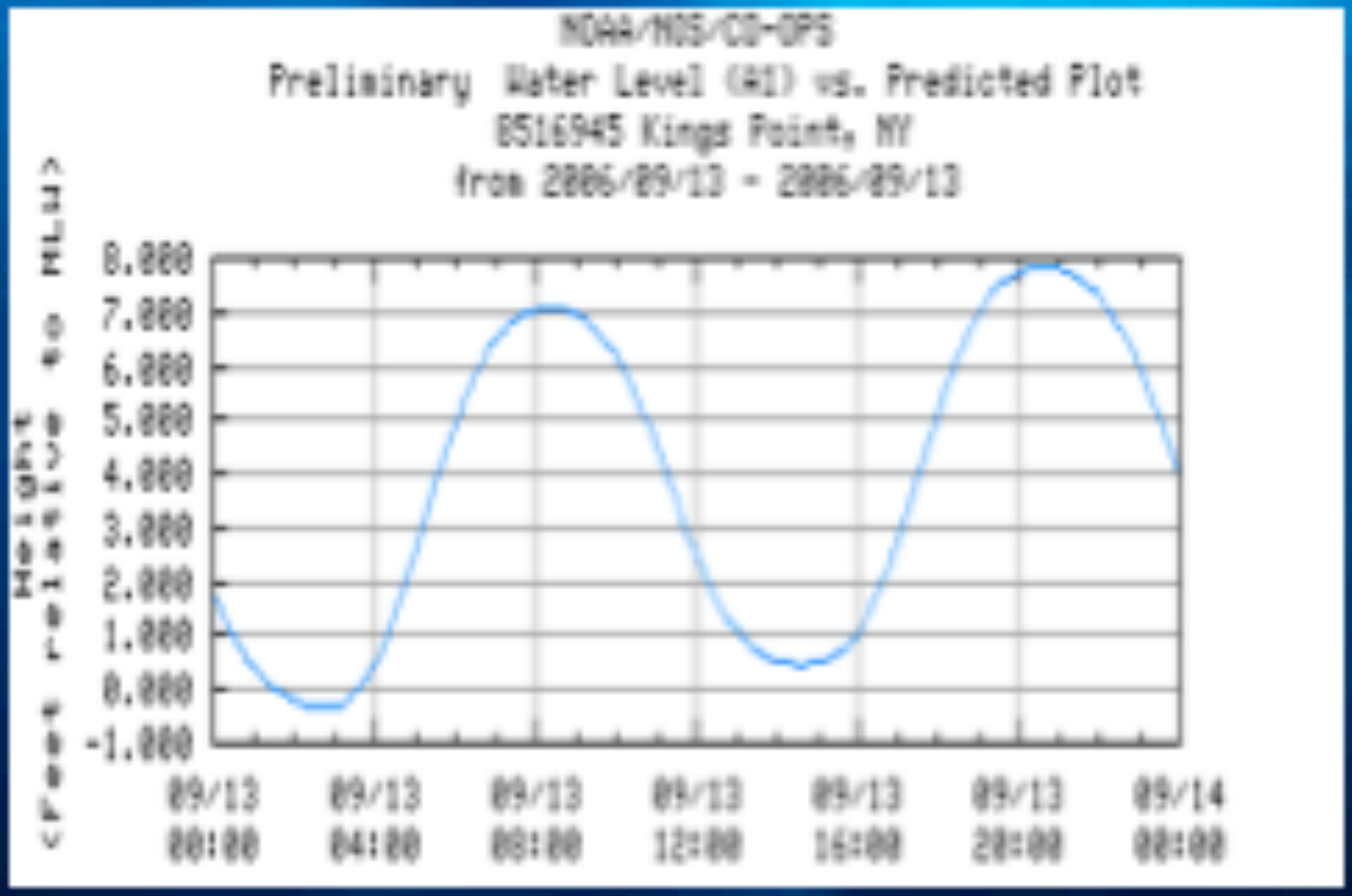






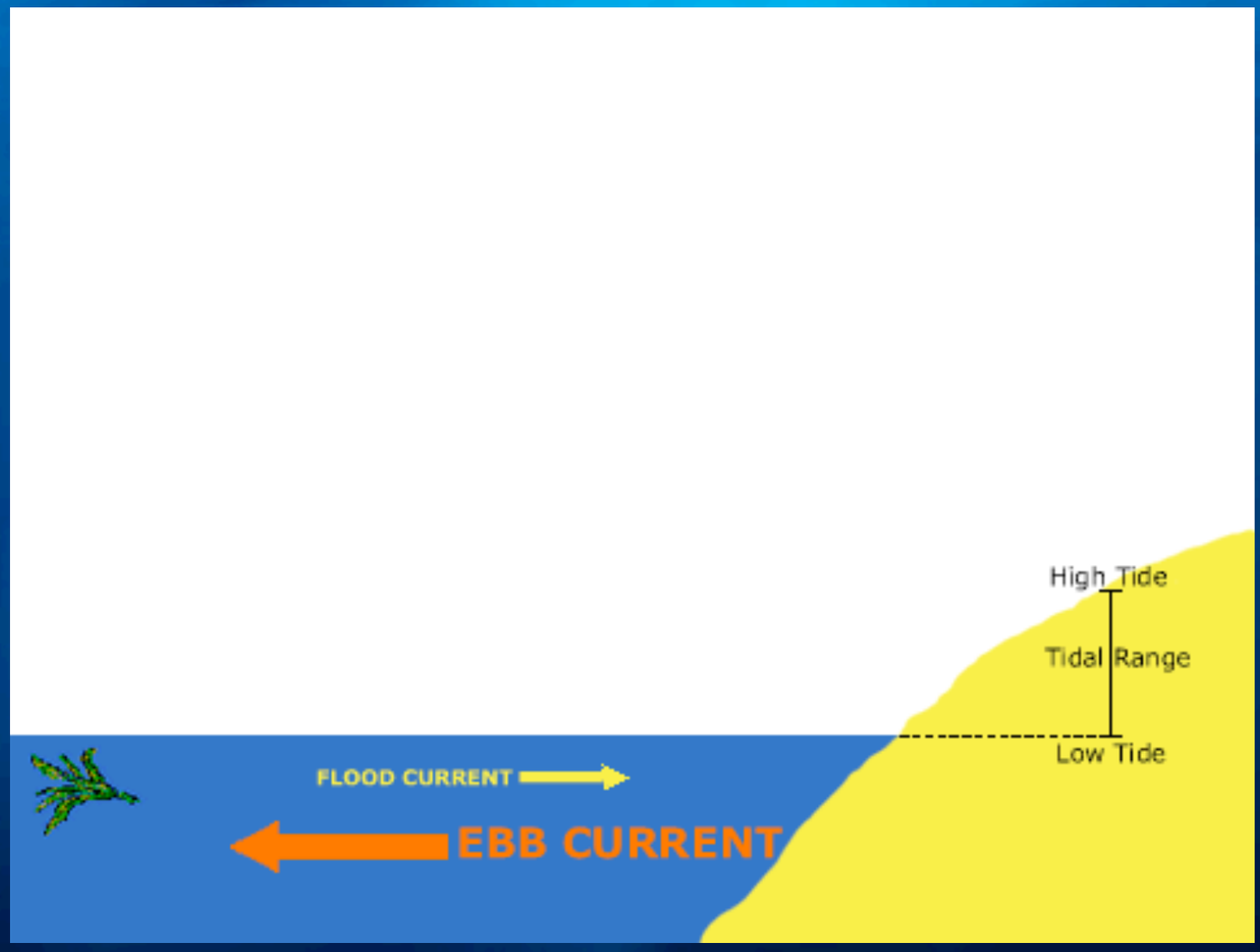


Tides – Long Island, NY



Tidal Range

The difference in levels of ocean water at high tide and low tide



Tidal Range

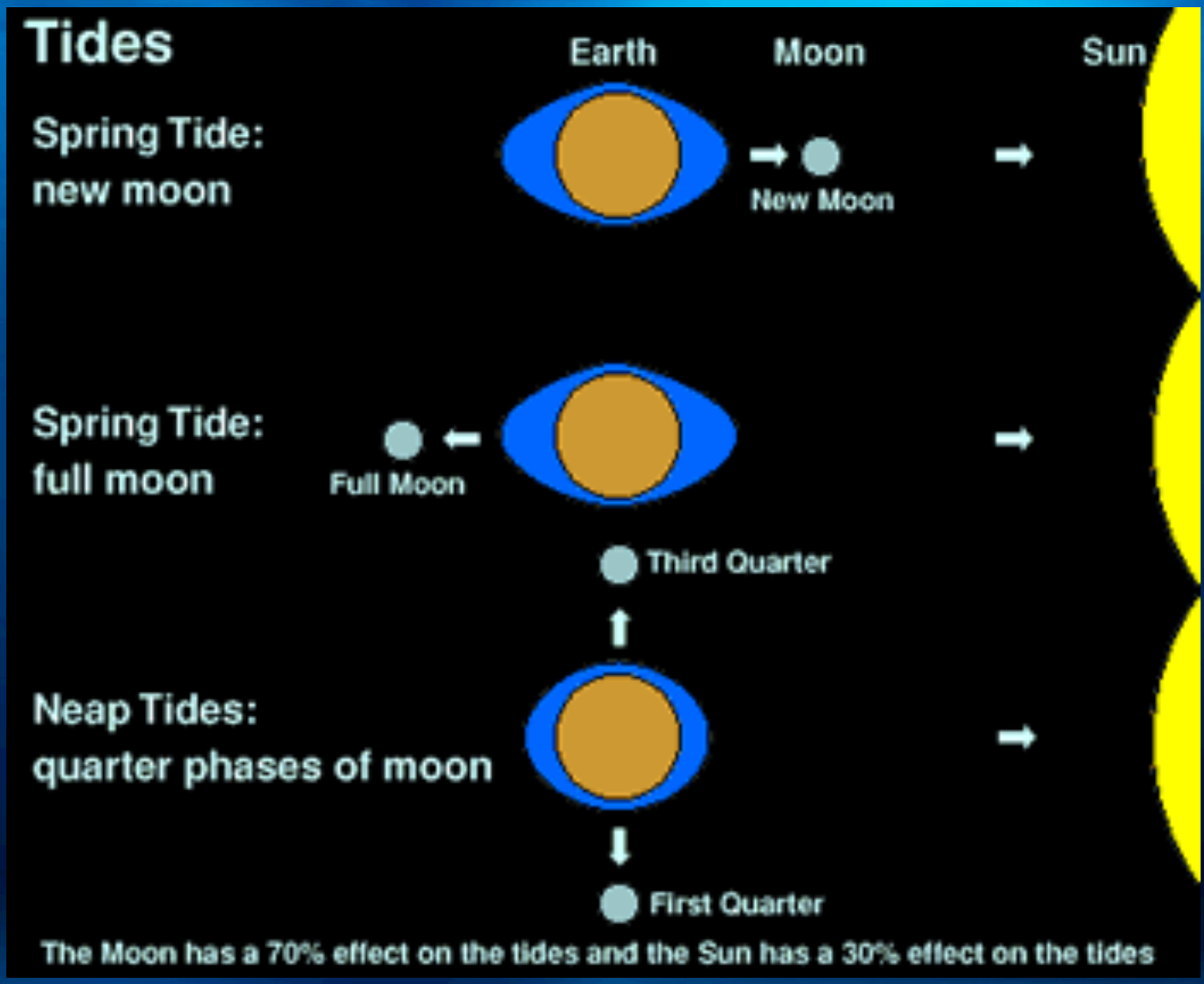
High

Avg. tidal range

Low

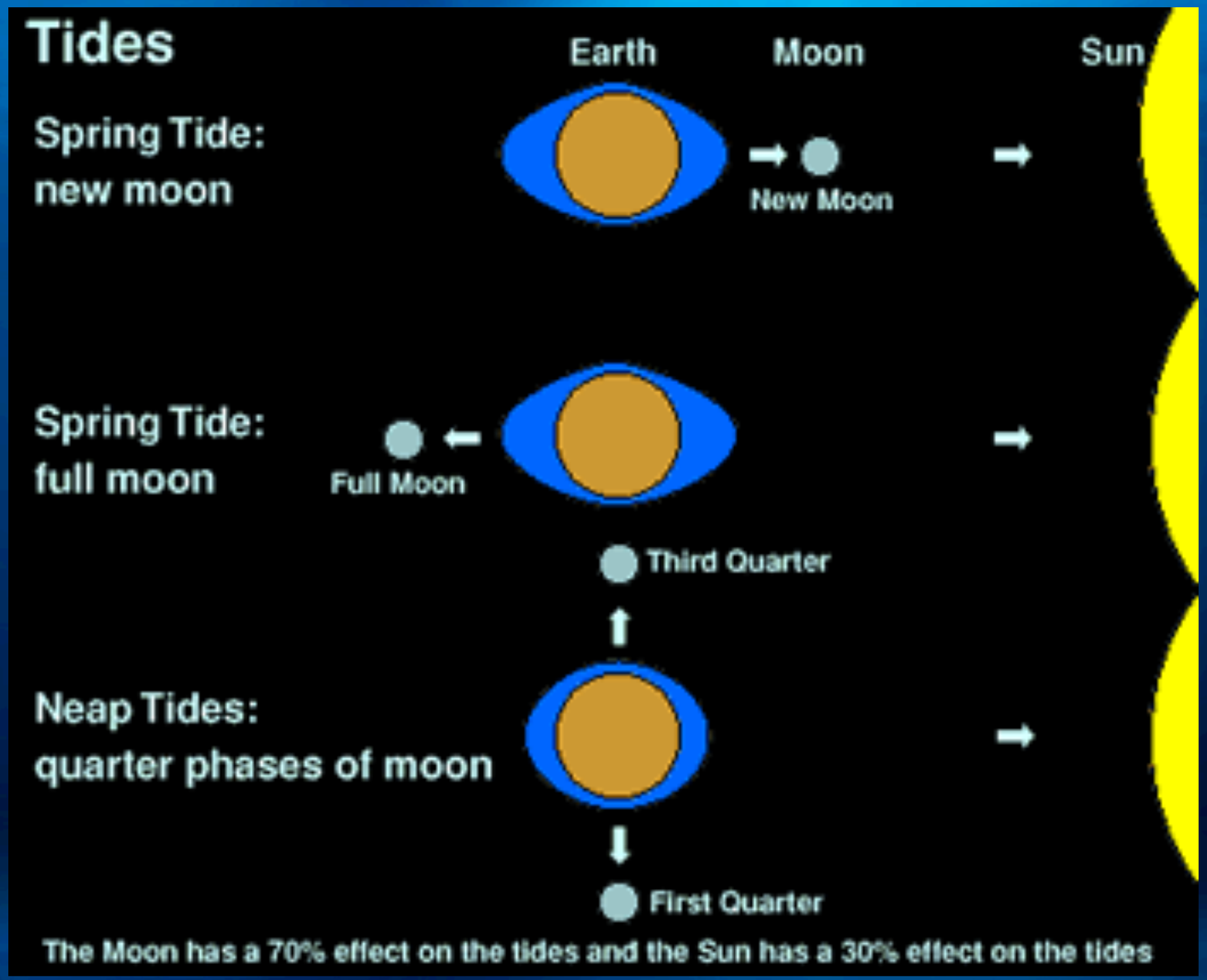
mean = average

Extreme Tides

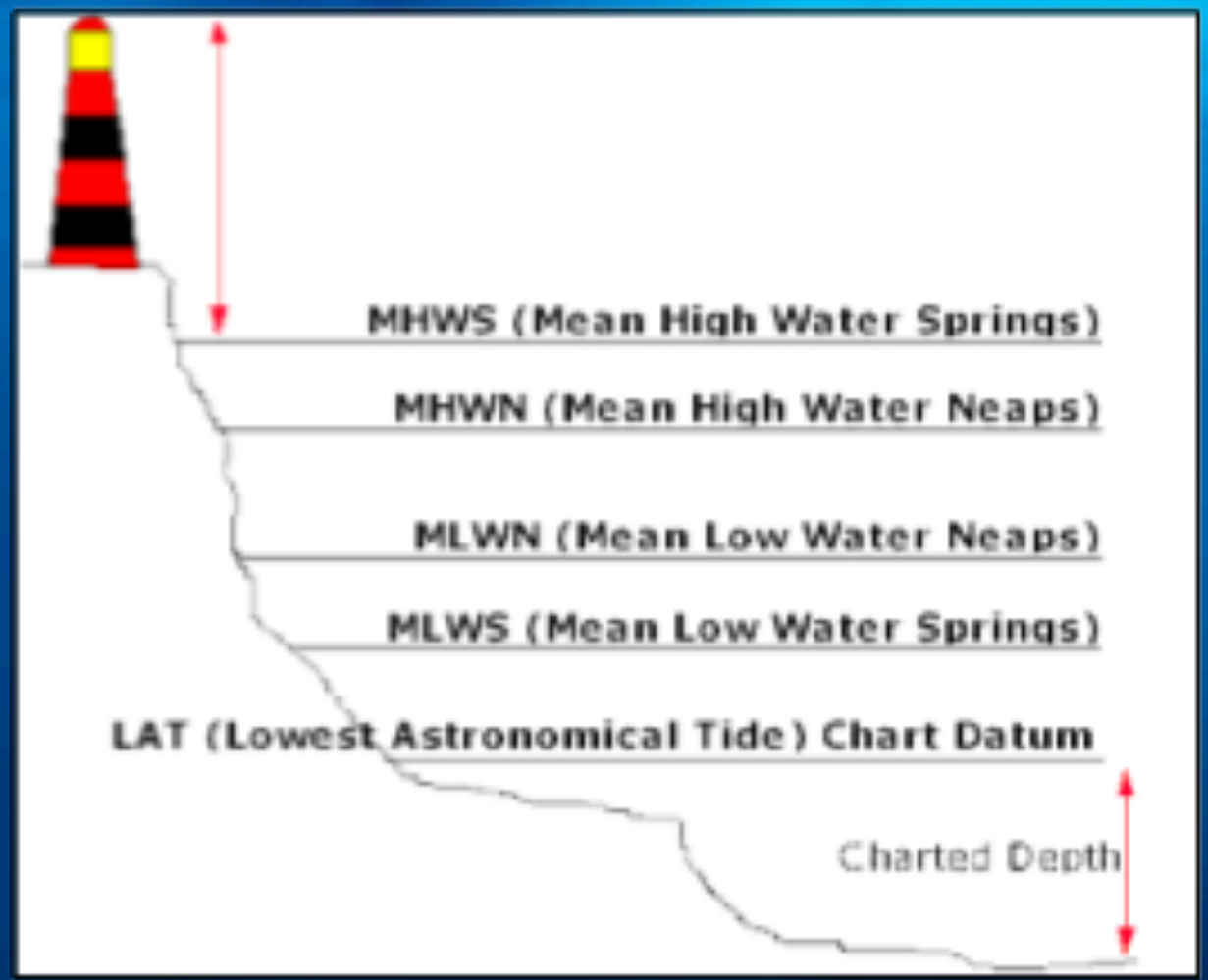


Spring Tides

Occur when Earth, sun, and moon are in a line with one another

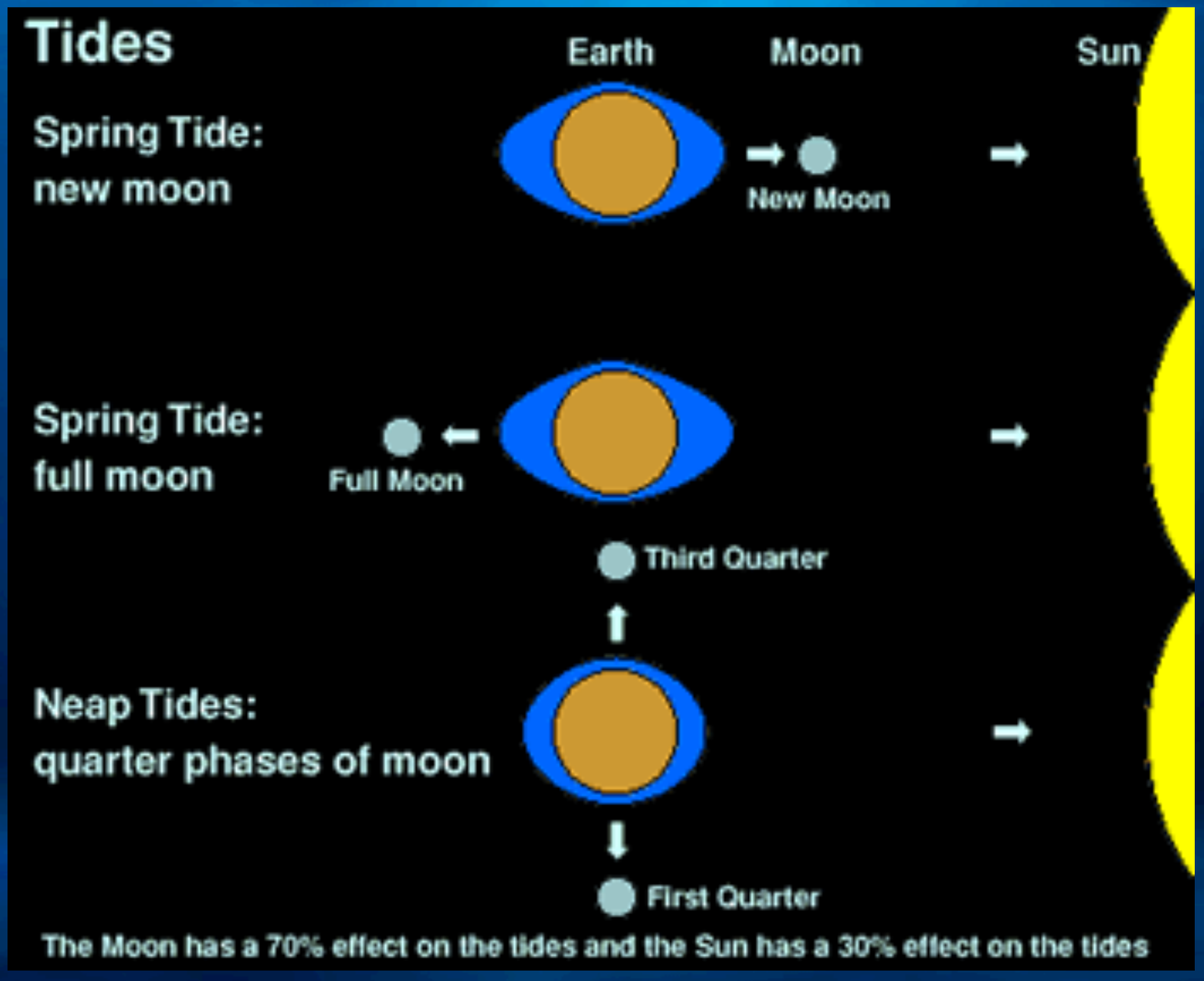


Extreme Tidal Range



Neap Tides

Occur during the first- and third-quarter phases of the moon, the moon and the sun are at right angles to each other.



Tidal Currents

Tidal Currents

Movement of water toward and away from

(1) *flood current* - tidal current flows _____

(2) *ebb current* - the tidal current flows _____

(3) *slack water* - no tidal currents

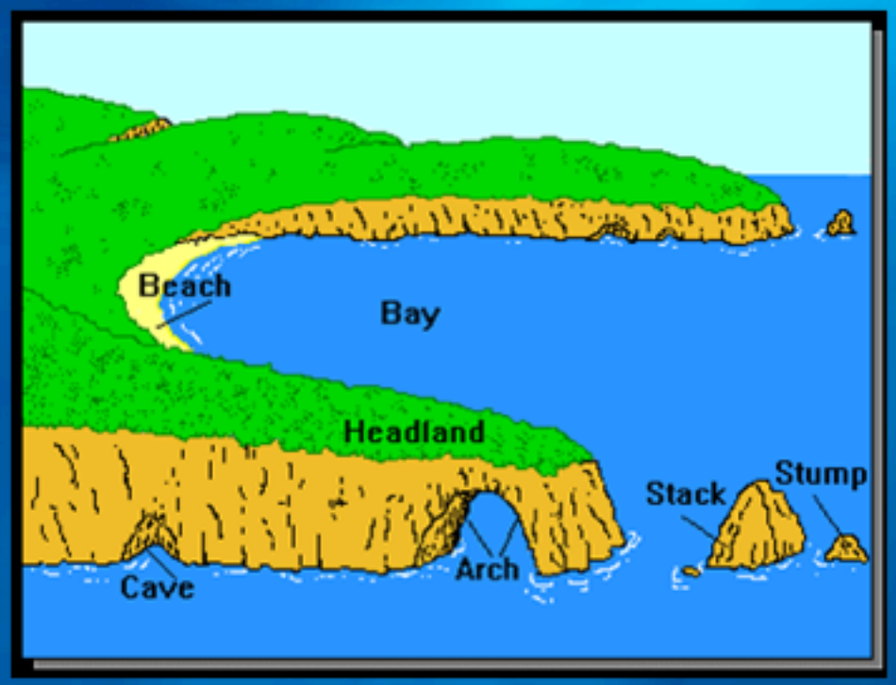
How do Coastlines Change?

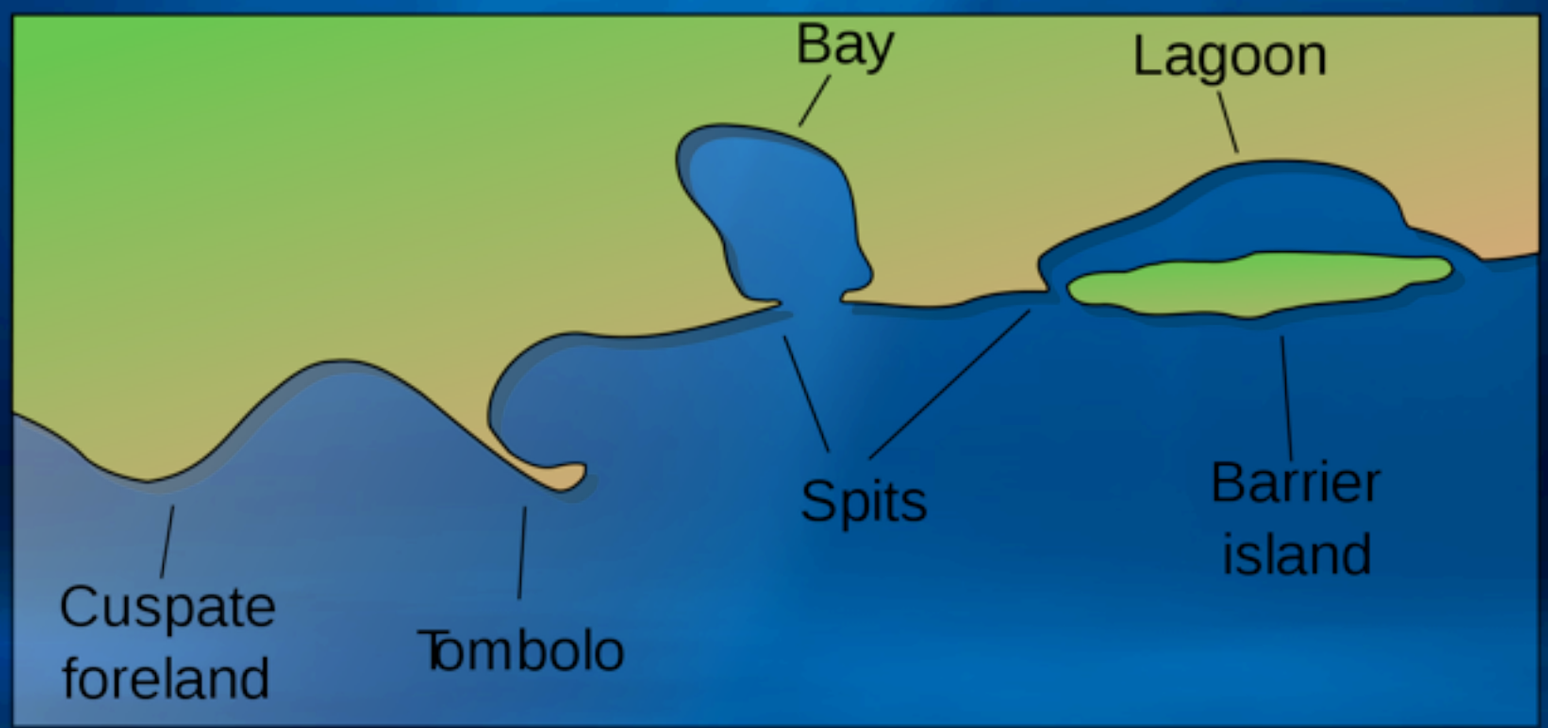
Objectives:

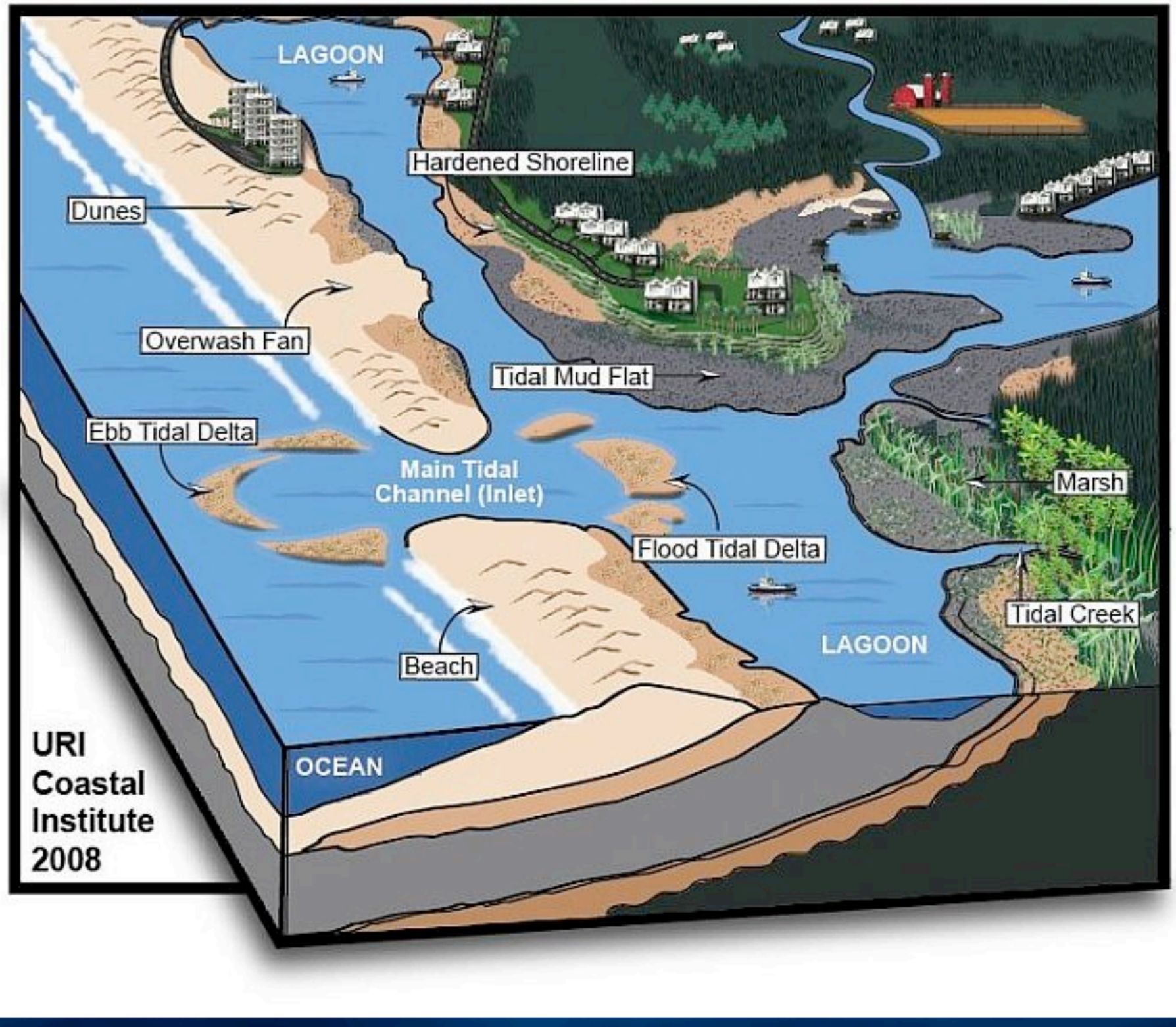
- Explain the role of sediments in the coastal system
- Explain how waves affect coastal areas
- Diagram and explain beach depositional features
- Explain longshore drift
- Explain how human-made structures sculpt beach areas
- Explain why society is interested in coastal dynamics

How do Coastlines Change?

Coastal Landforms







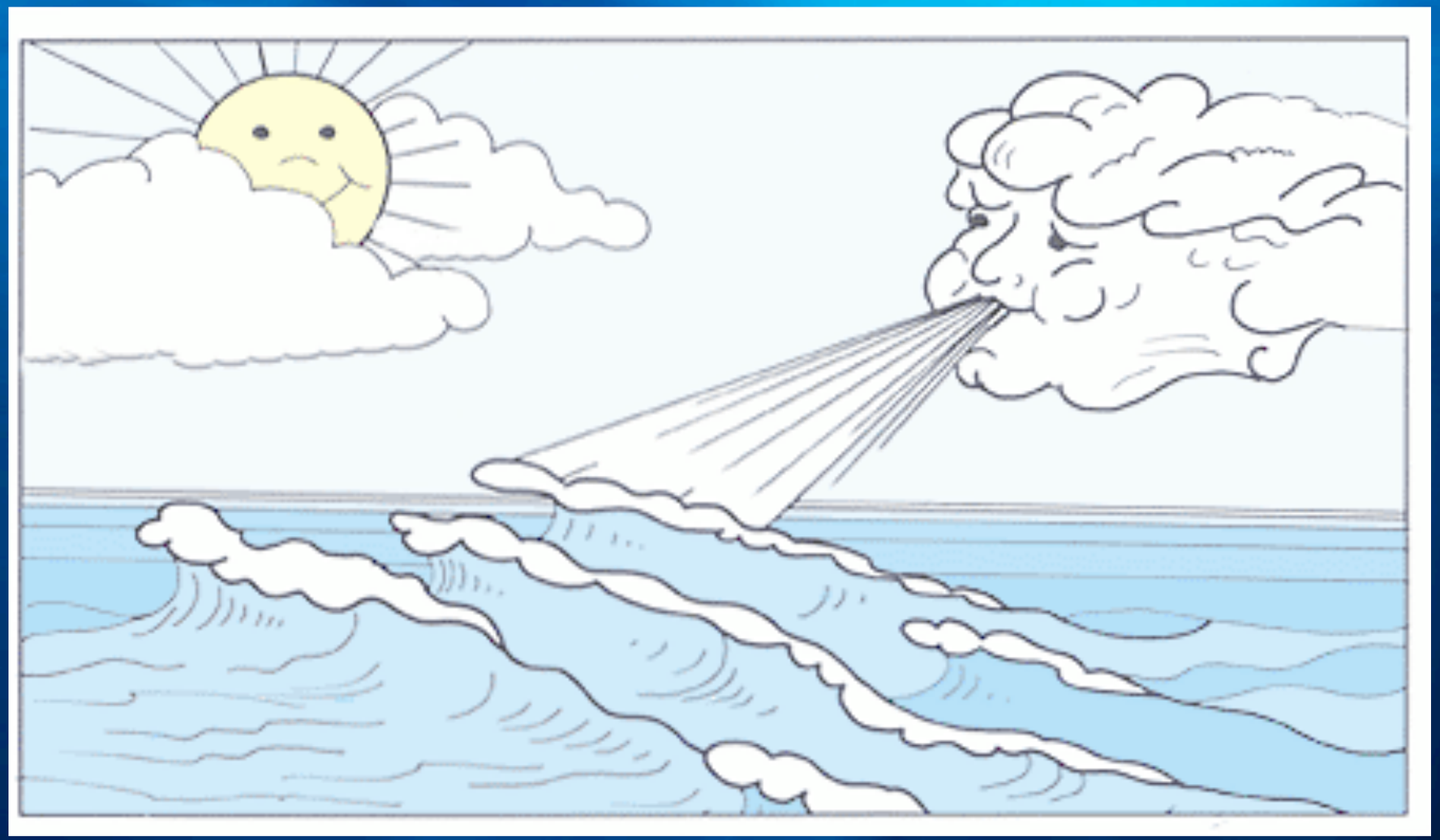
Ocean Waves

Objectives:

Describe the formation of waves and the factors that affect wave size.

Identify the cause of destructive ocean waves.

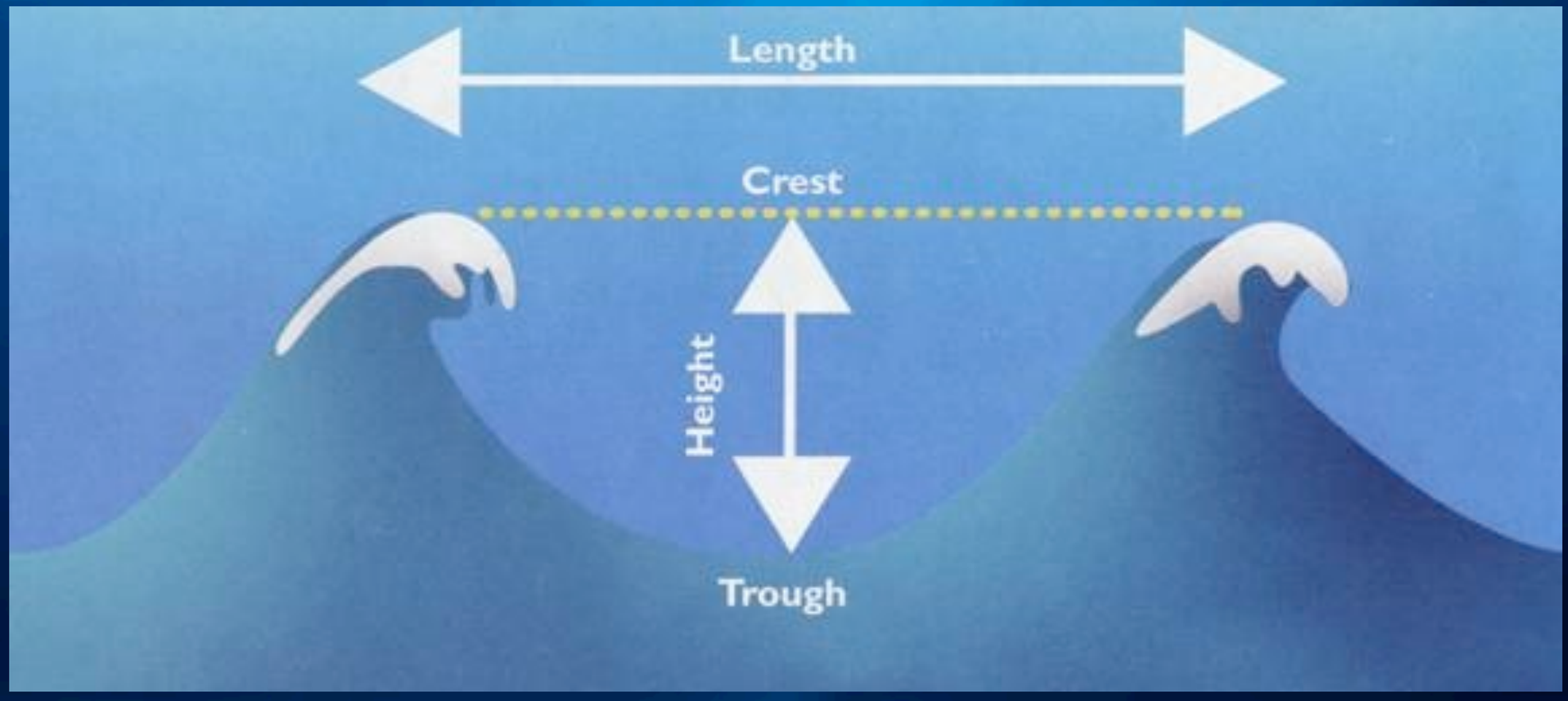
How do waves form?



Ocean waves are generated mainly by wind blowing over the water's surface.

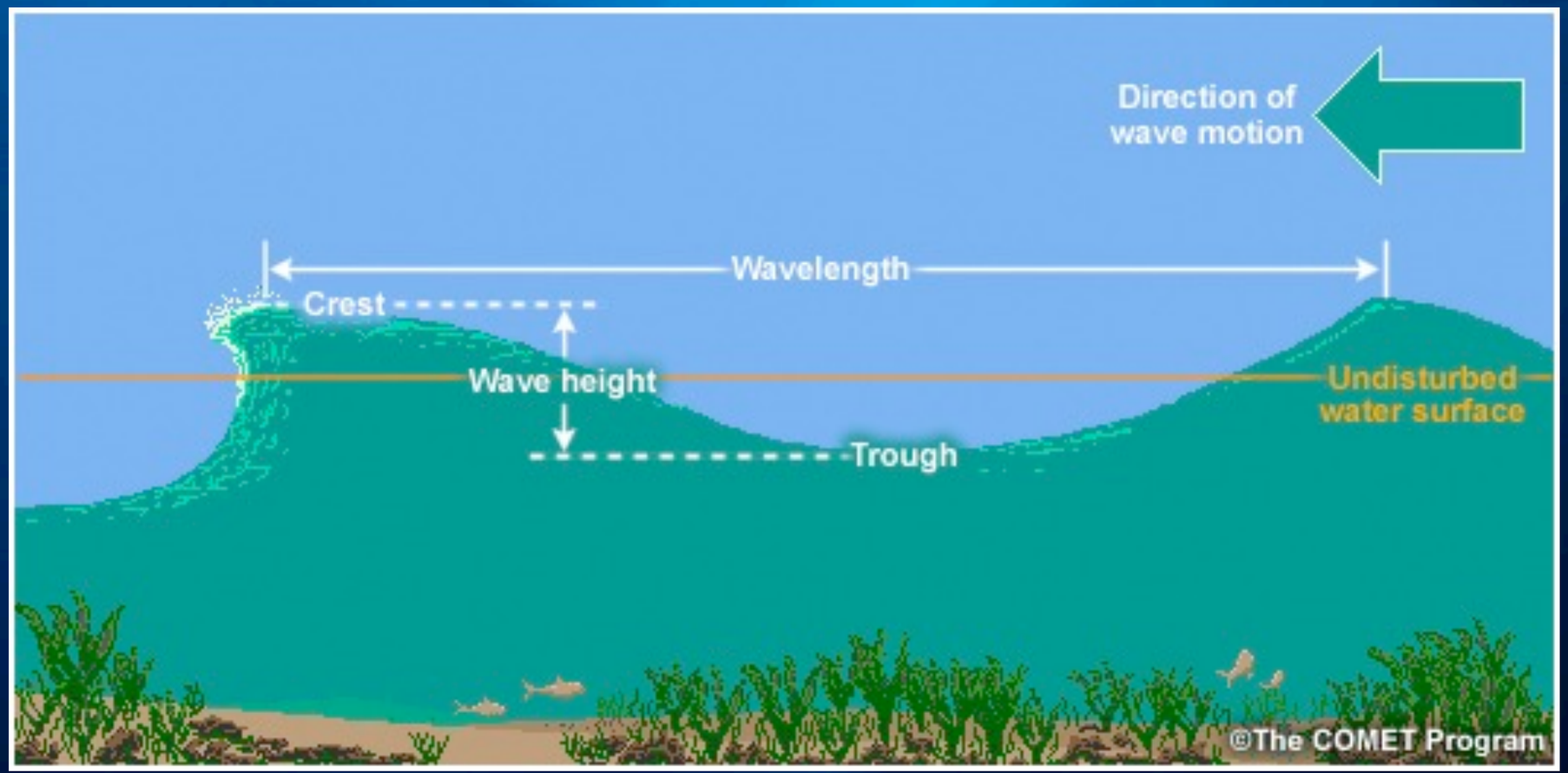
Waves

Periodic disturbance in a solid, liquid, or gas as energy is transmitted through a medium.



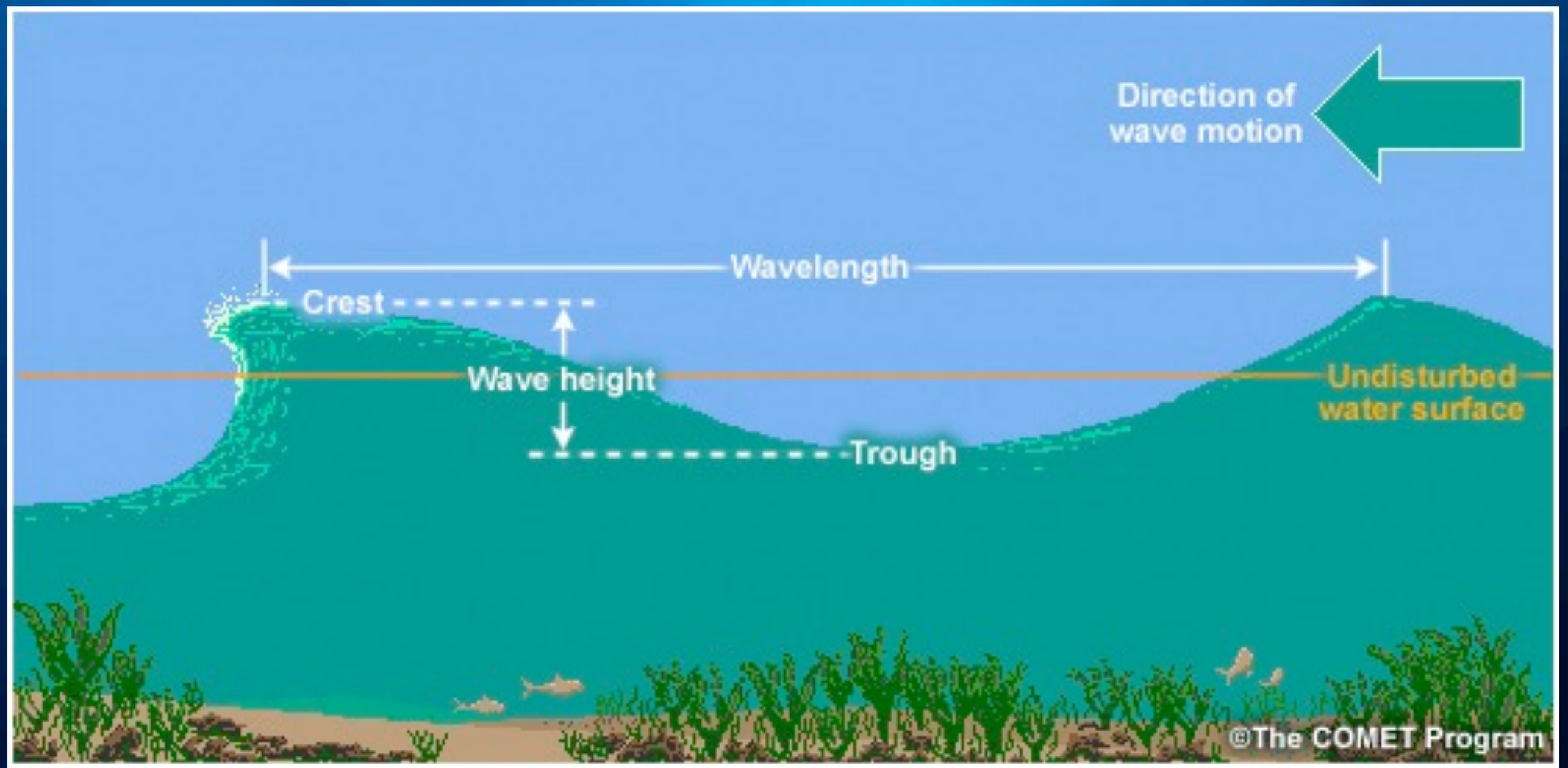
Wave Height

Vertical distance between the crest and the trough of a wave.

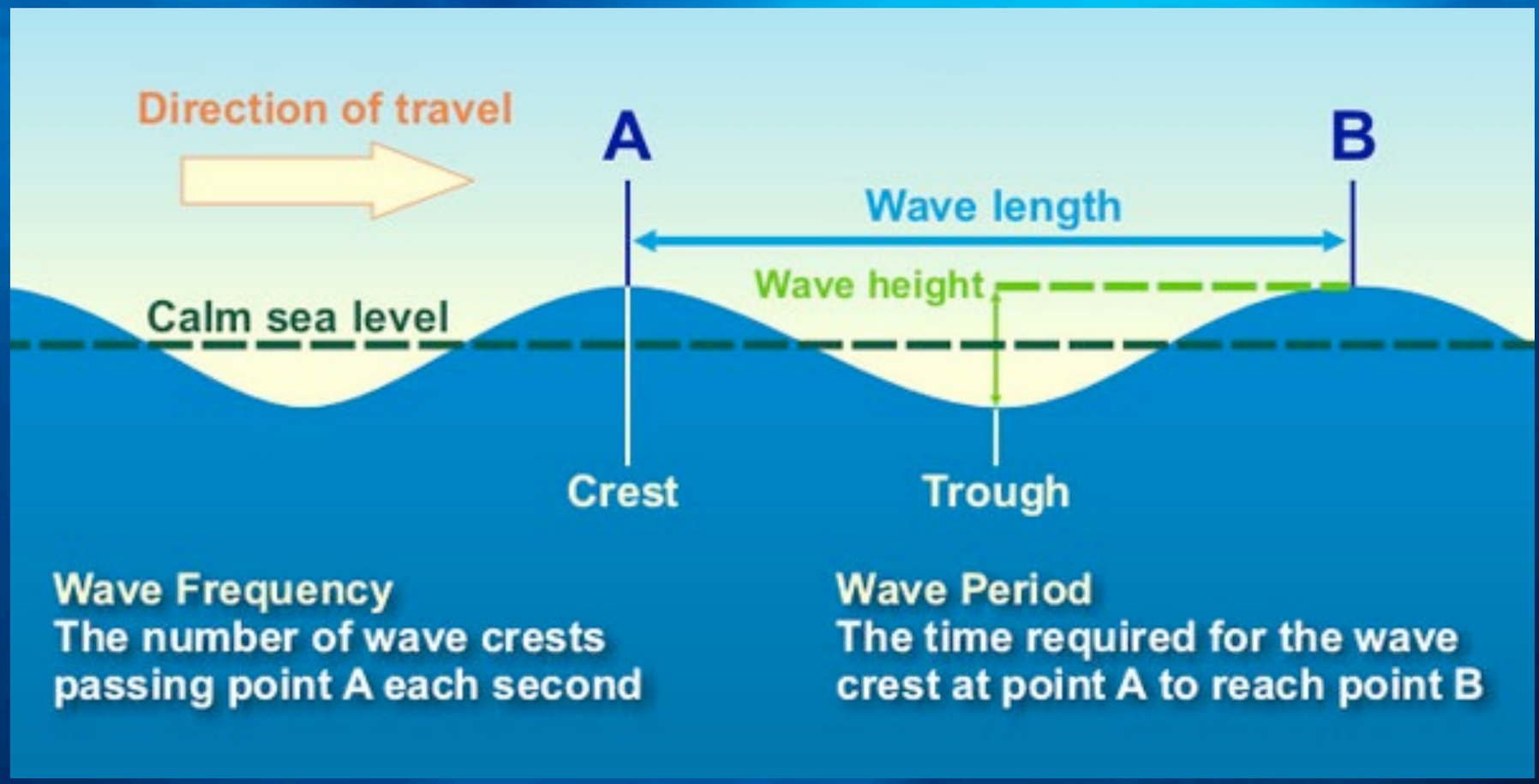


Wavelength

the horizontal distance between two consecutive crests or between two consecutive troughs.

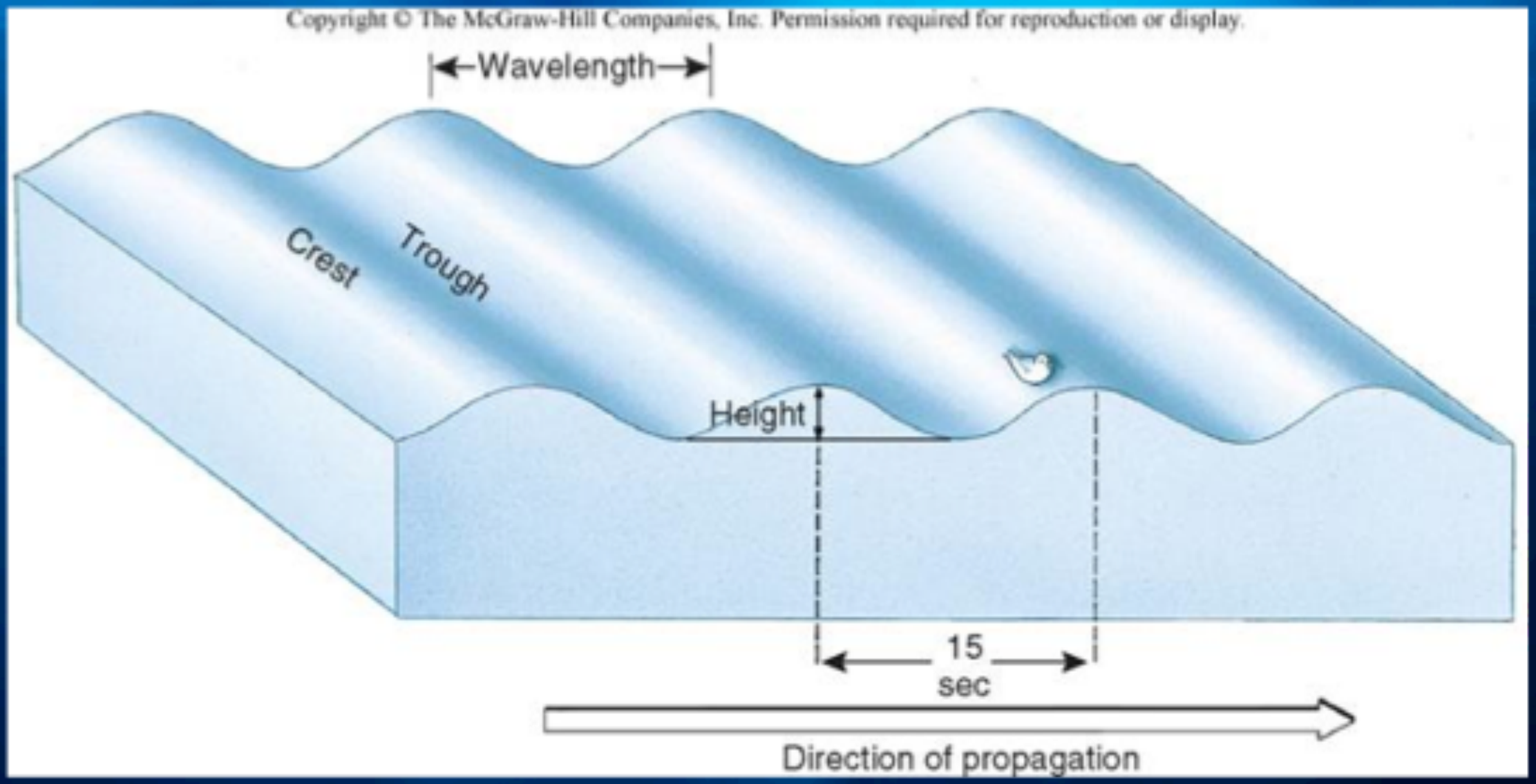


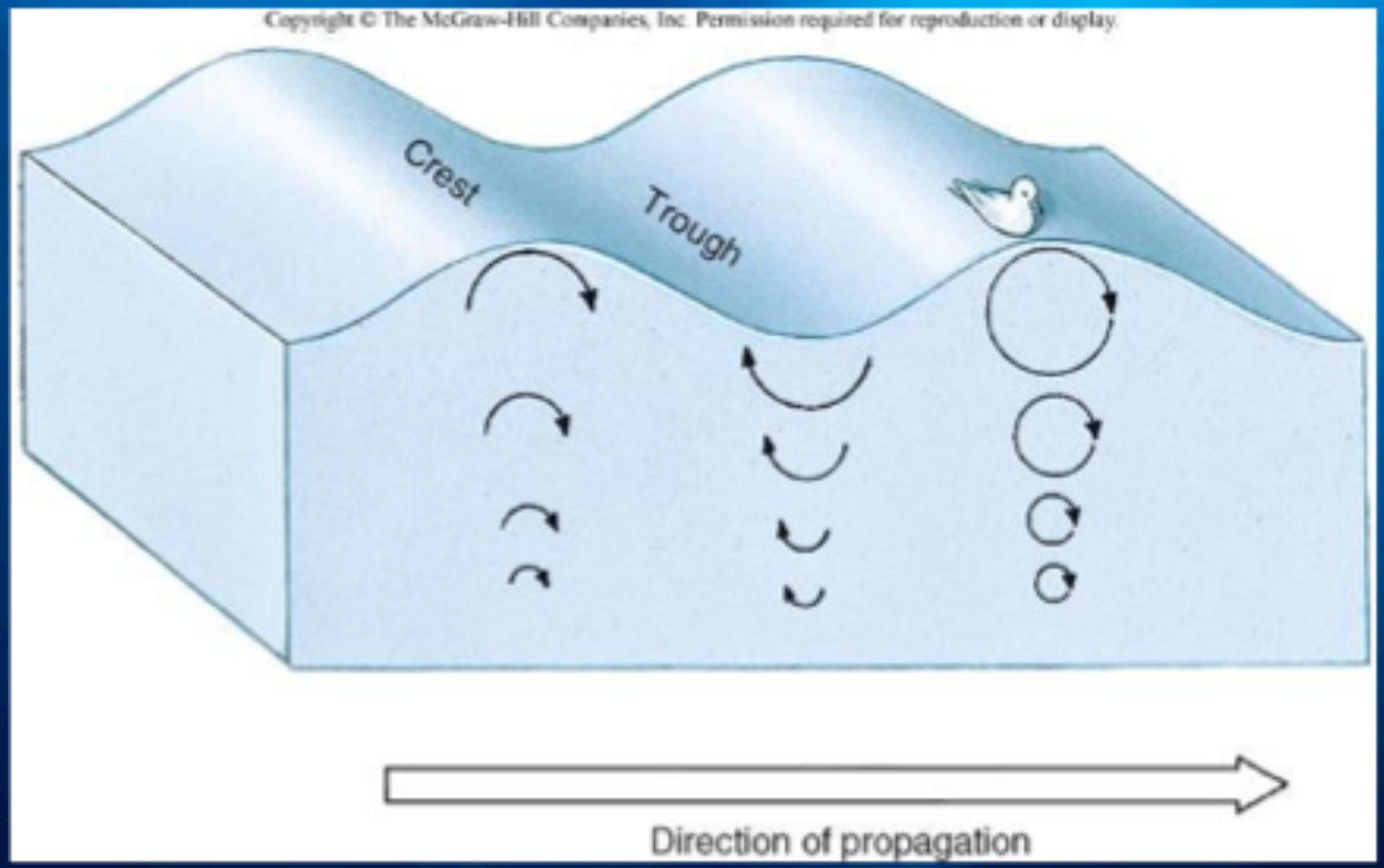
Wave period

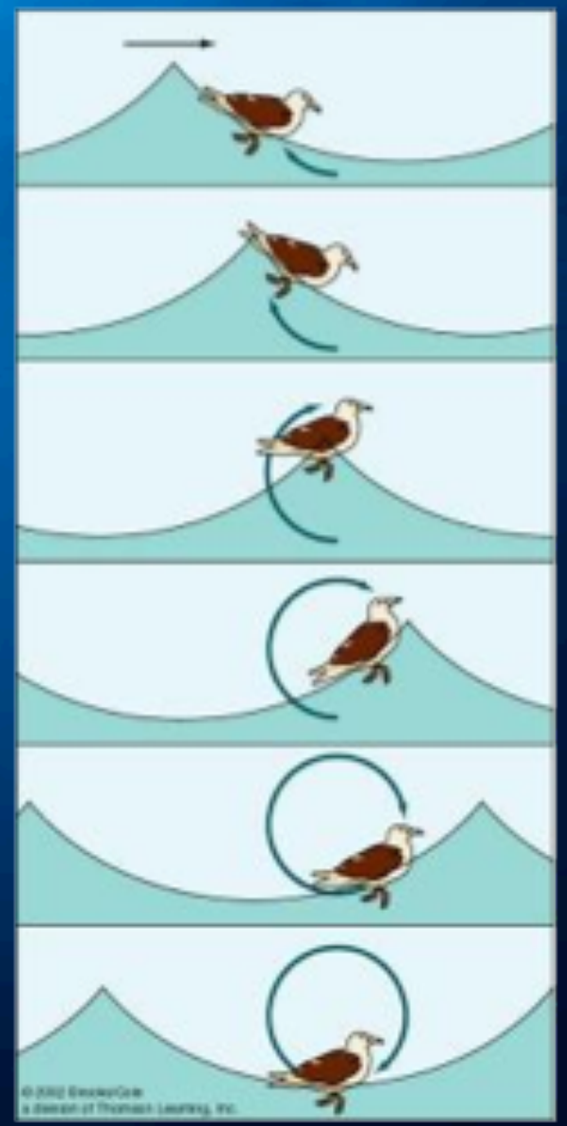


The time required for two consecutive wave crests to pass a given point

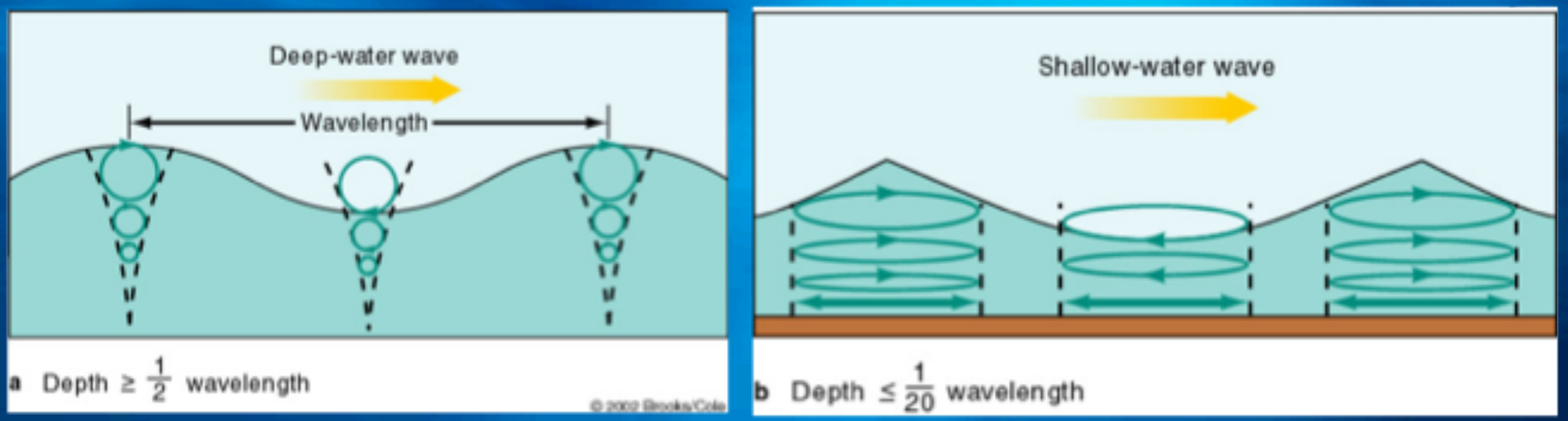
Waves are created by the wind



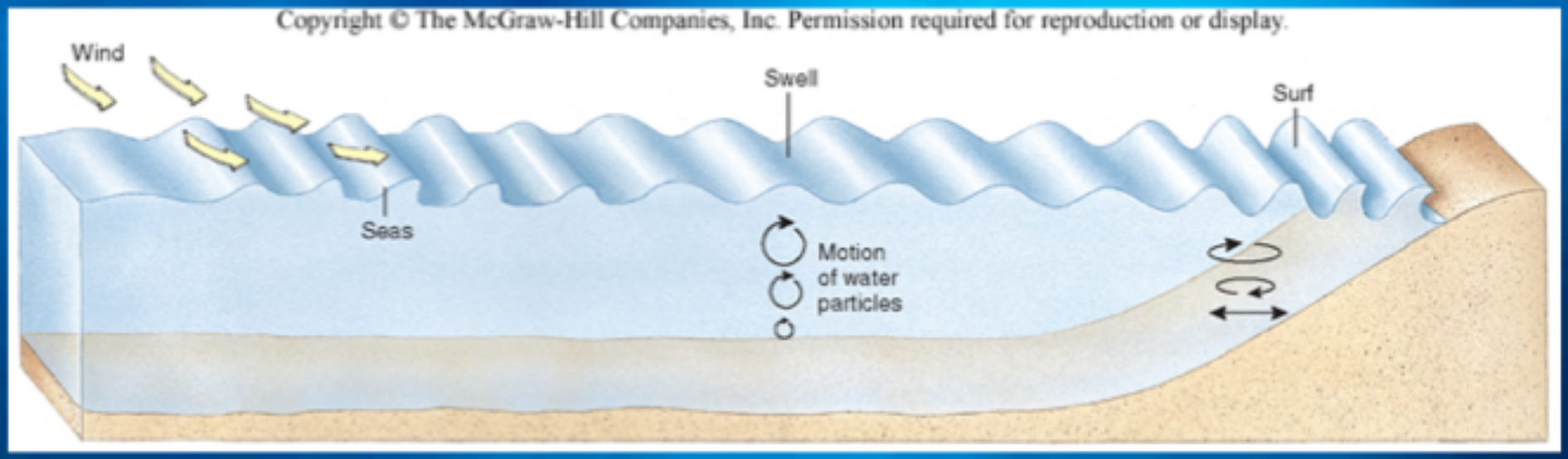




Waves



In deep water have round orbits
In shallow water have elliptical orbits



Wave Size

3 factors determine the size of a wave.

(1) the speed of the wind

(2) the length of time the wind blows

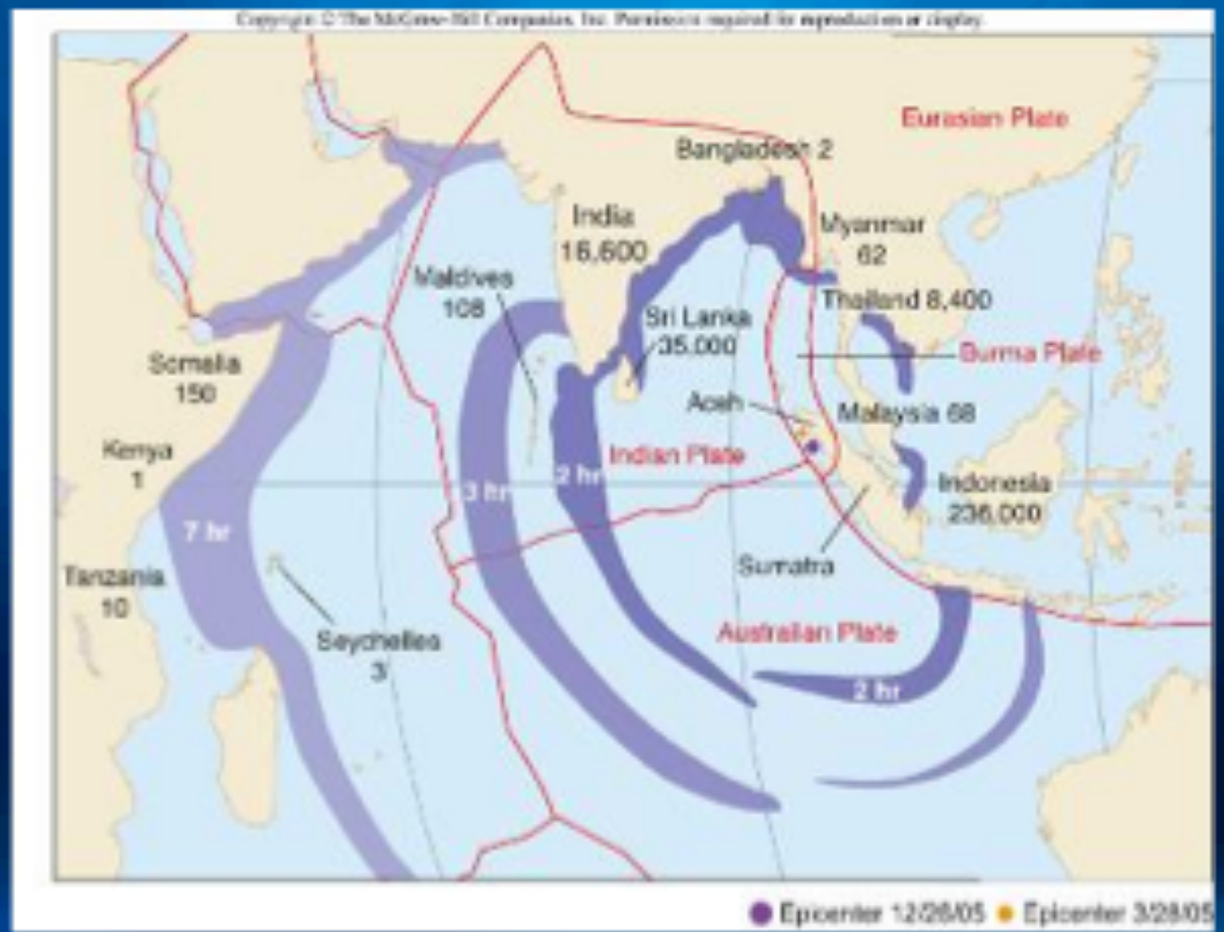
(3) fetch

Wave Energy

The longer that wind blows, the more energy is transferred from wind to water and the larger the wave becomes.

Tsunami

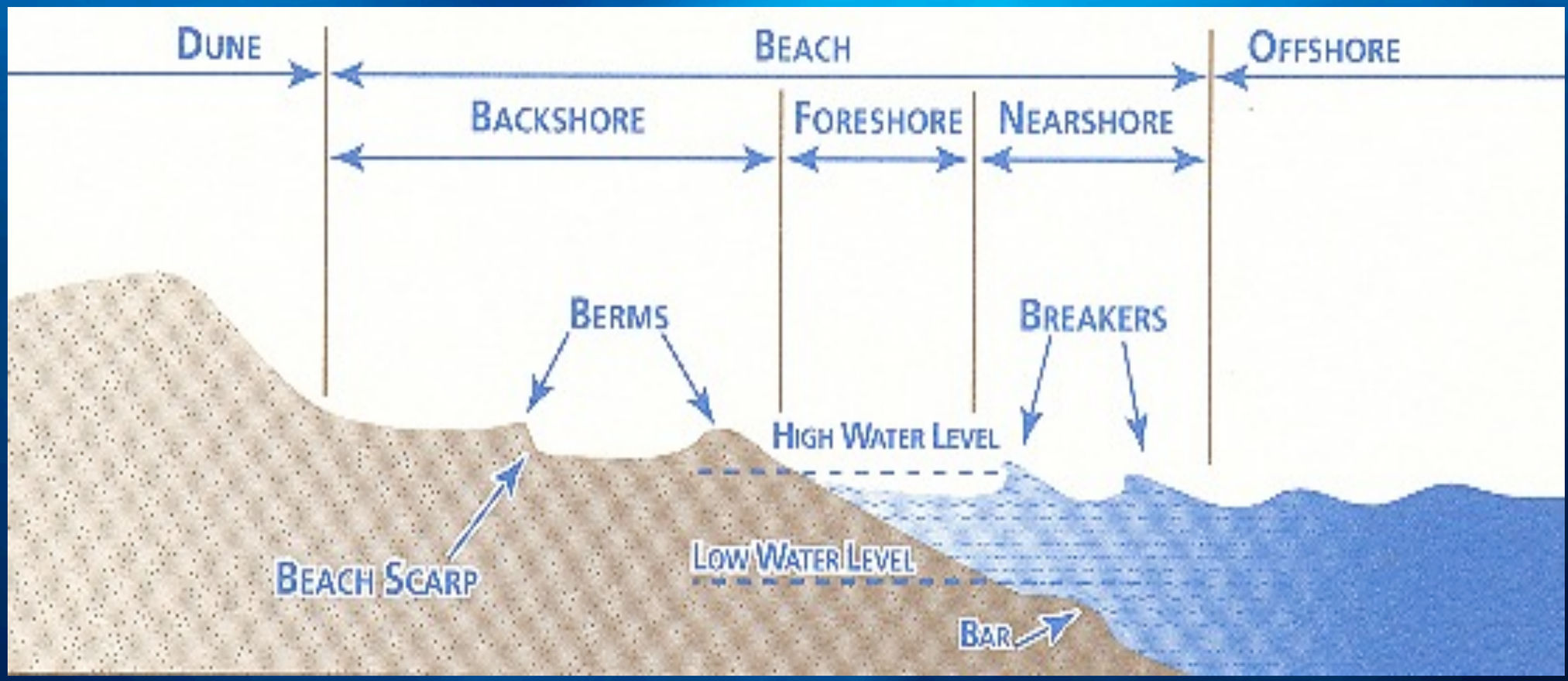
Waves created by displacement of water during earthquakes, volcanos, or landslides



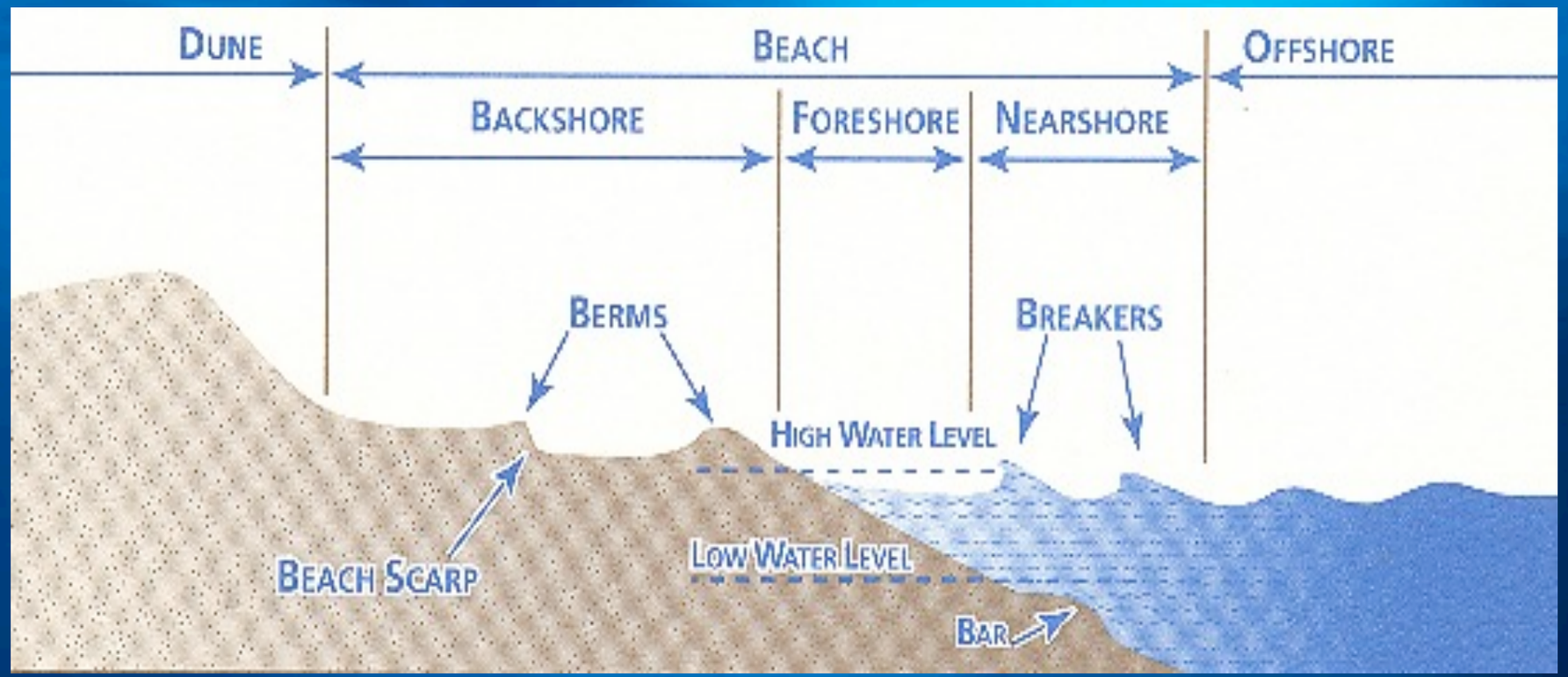
Whitecaps

When winds blow the crest of a wave off

How will the height of a wave will changes as the wave approaches the coastline?



Breakers

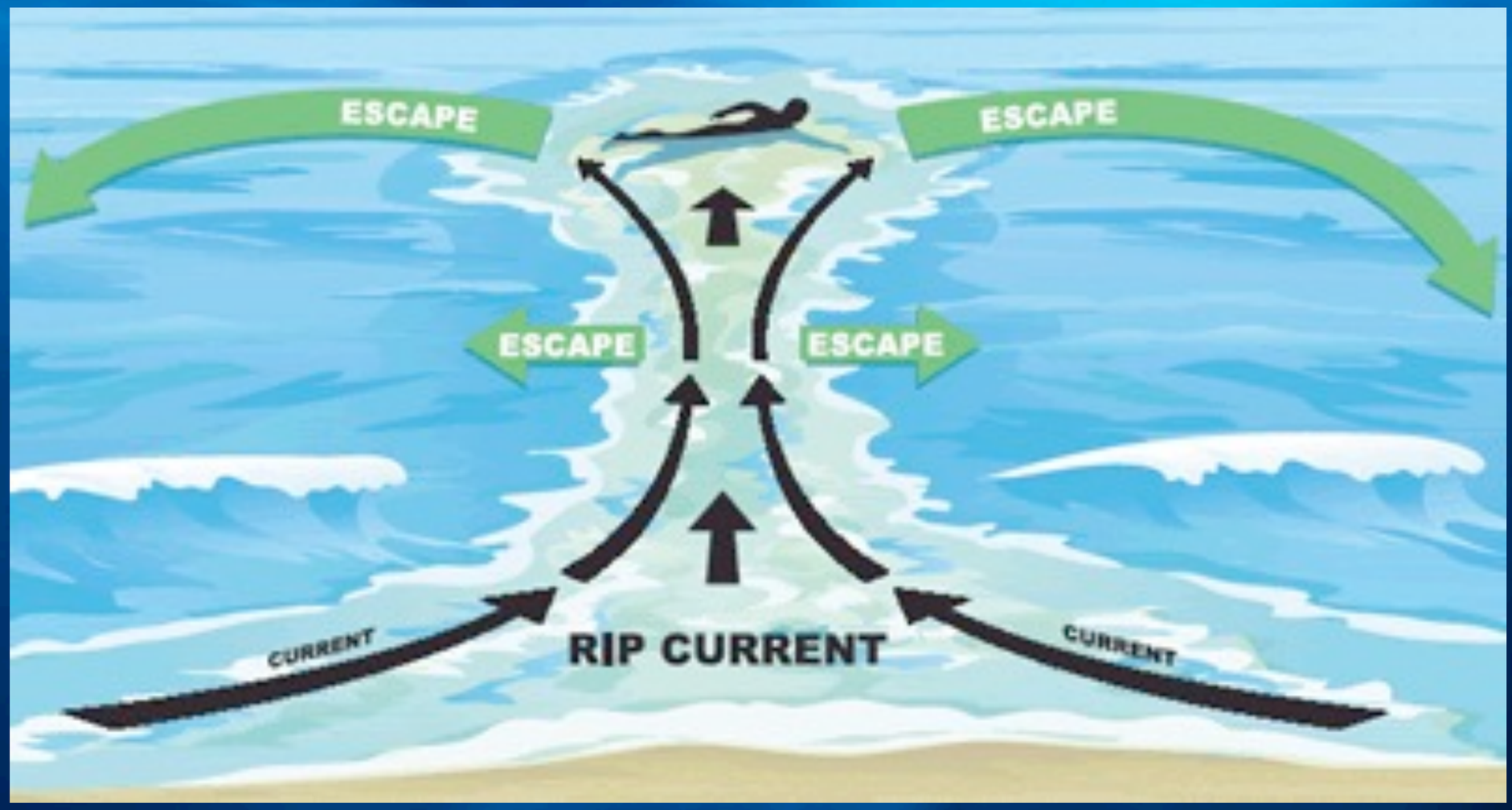


As the wave moves into shallow water, the bottom of the wave slows down. The top of the wave, continues to move at its original speed.

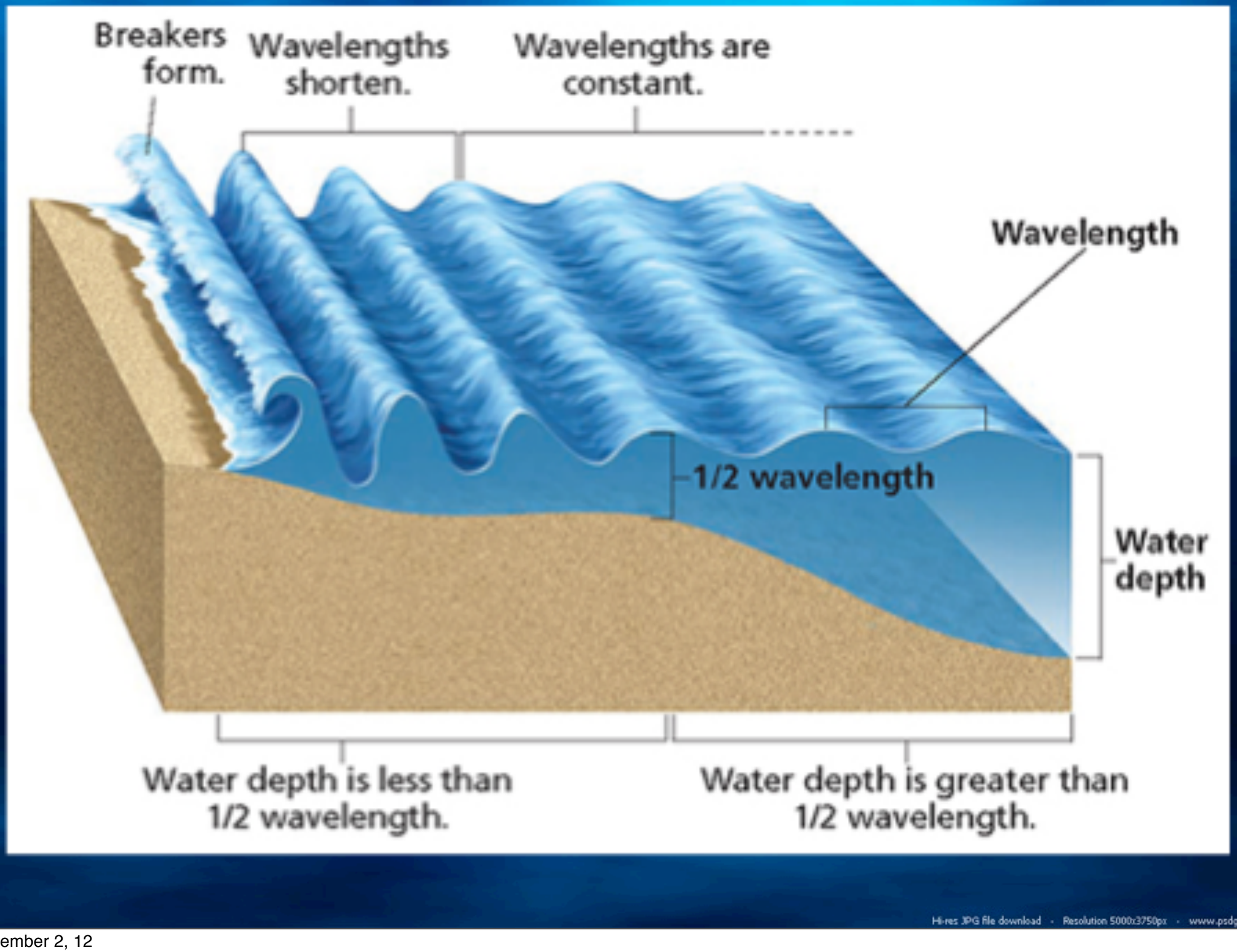
Undertows

Water carried onto a beach by breaking waves is pulled back into deeper water by gravity.

Rip Currents

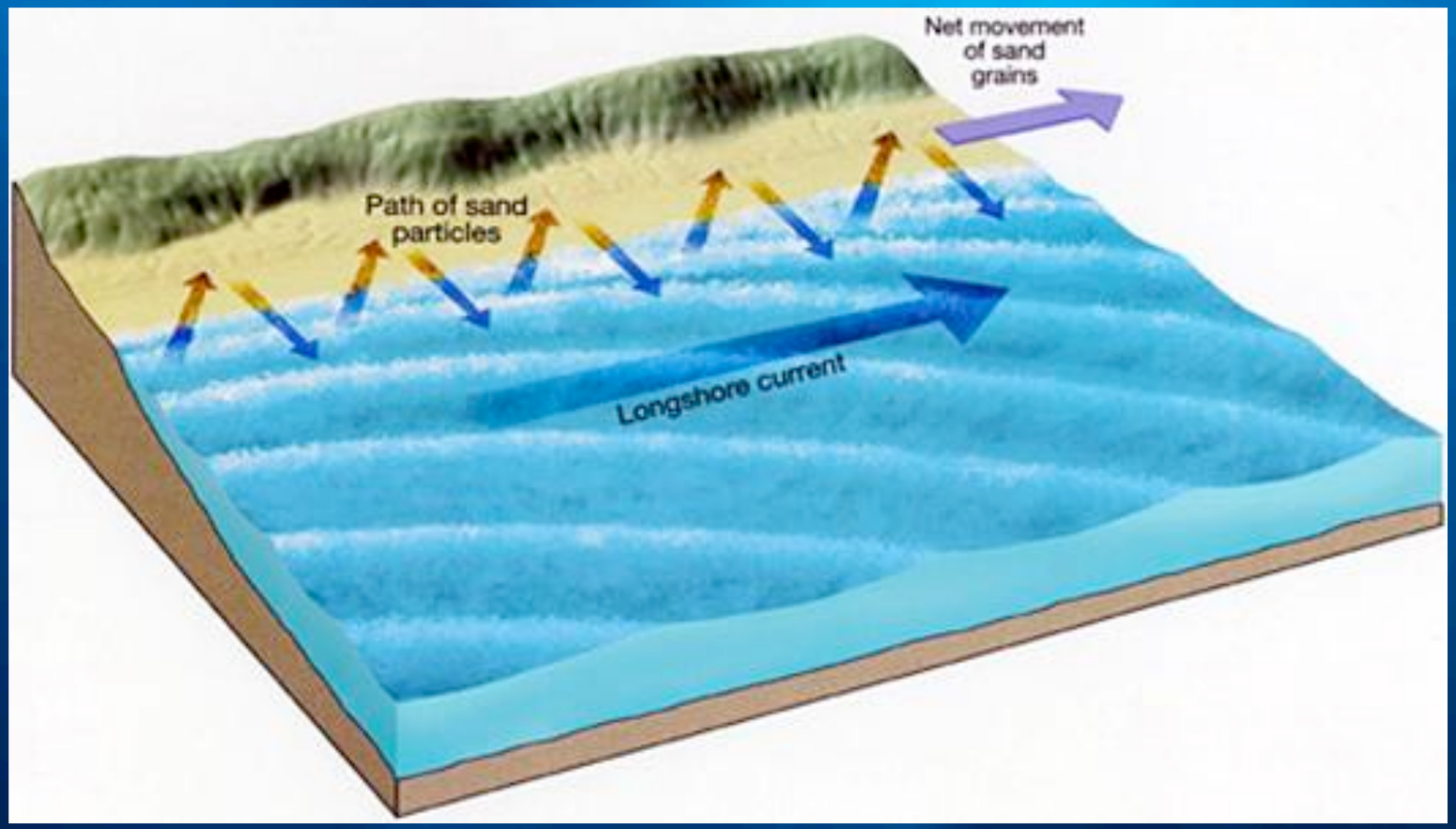


Water from larger breakers returns to the ocean through channels that cut through underwater sandbars that are parallel to the beach.

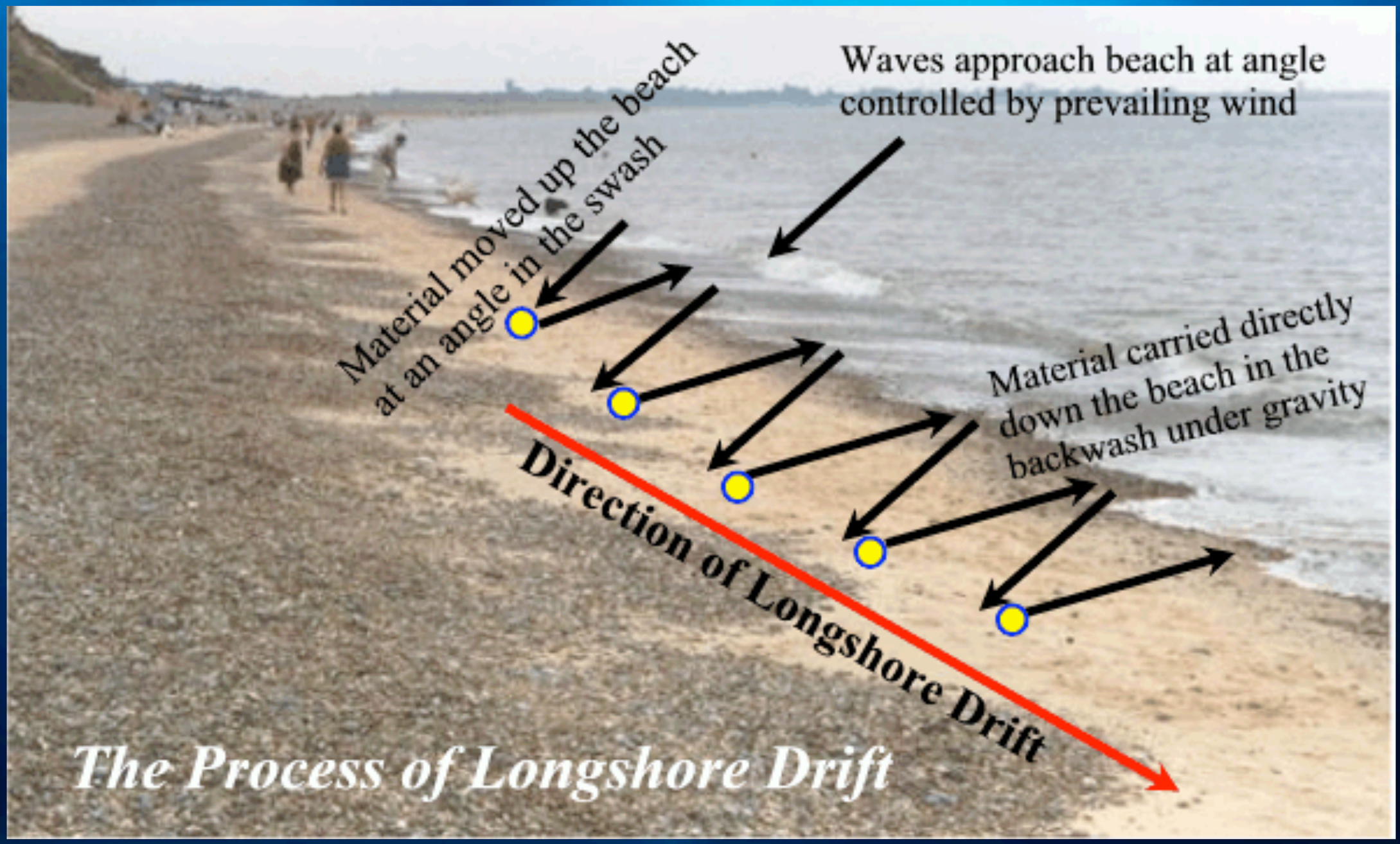


Longshore Transport

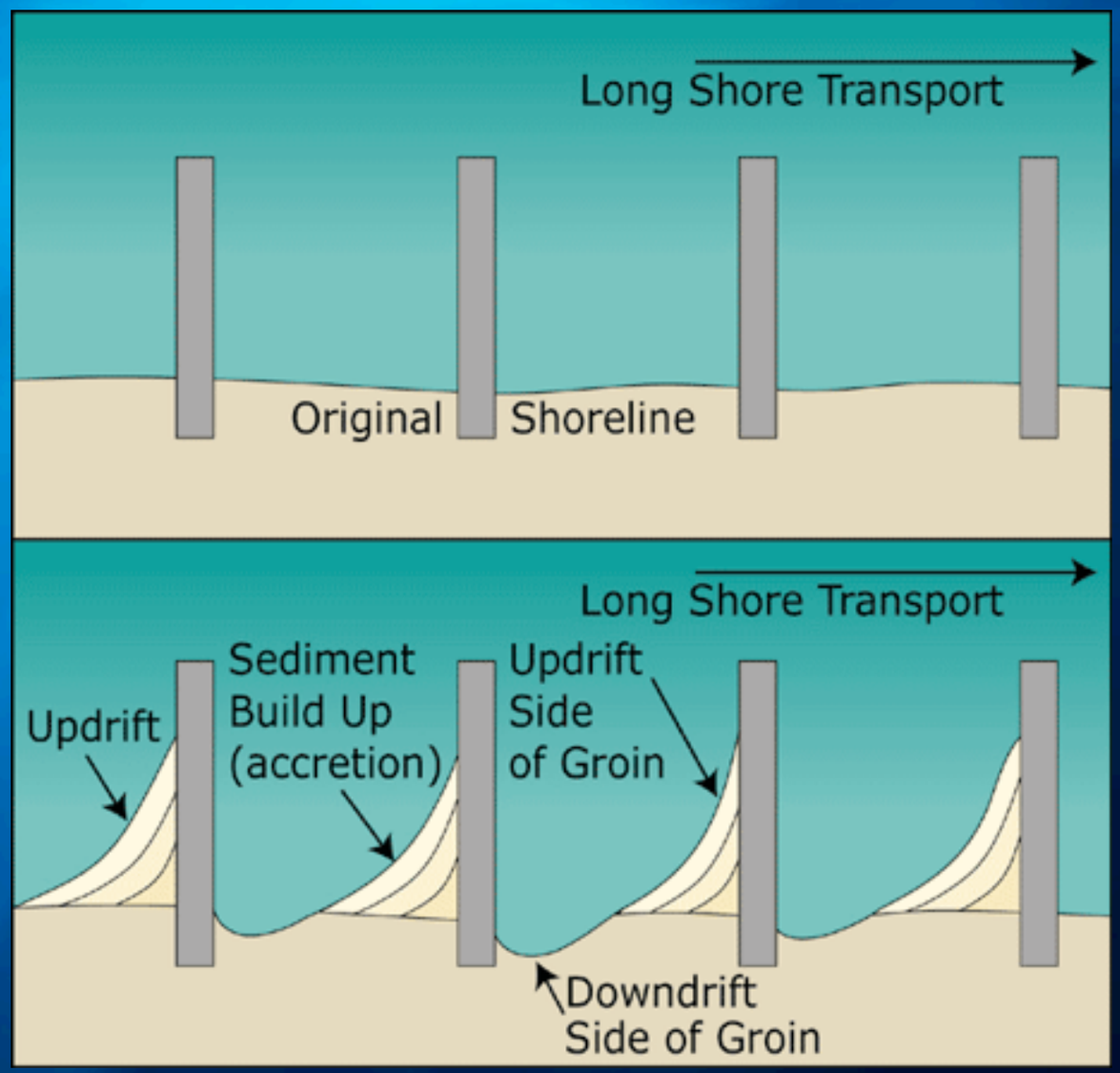
motion of the water along the shore is called moving sediment

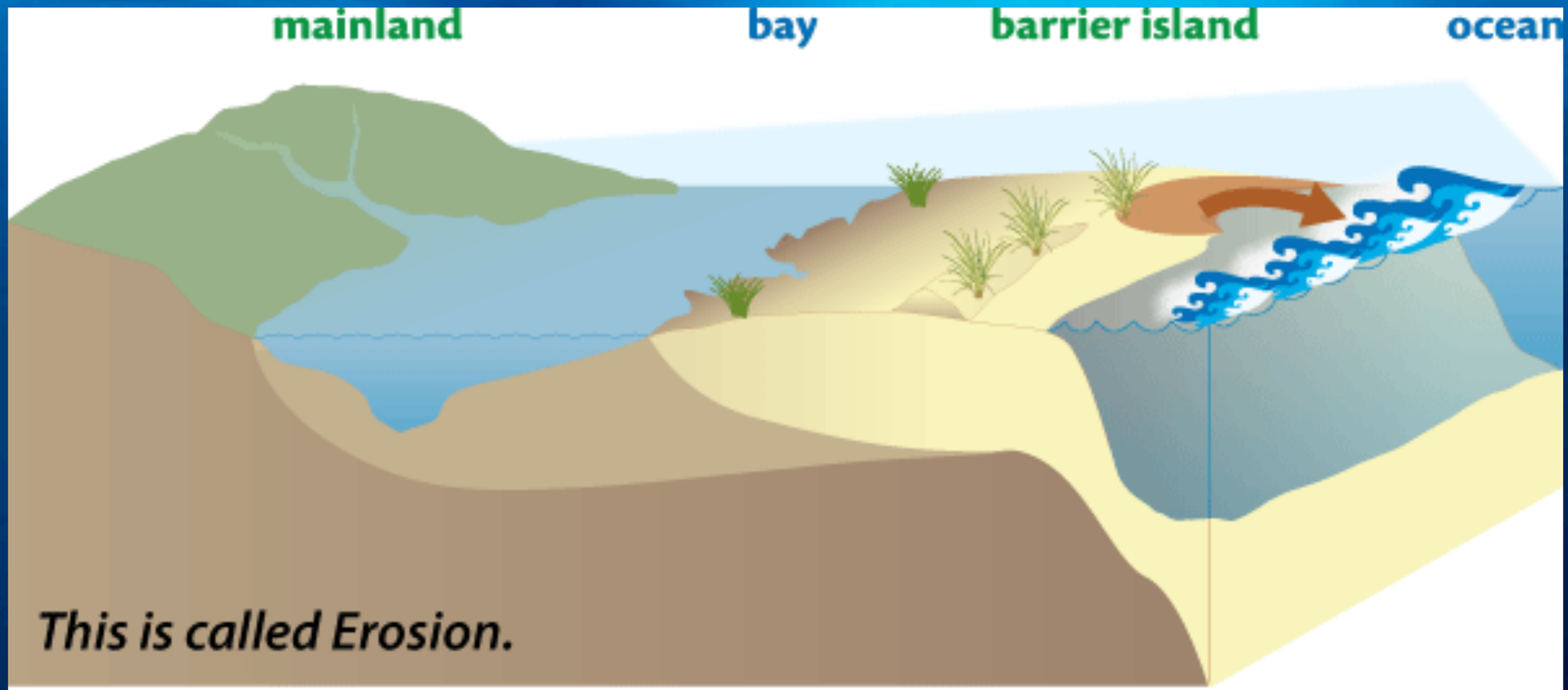


Longshore Transport



Longshore Transport





Waves carve out and wash away beach sand from the northern end of the island. This is called **erosion**.

Depositional Features

Sandbars

A ridge of sand built up by currents

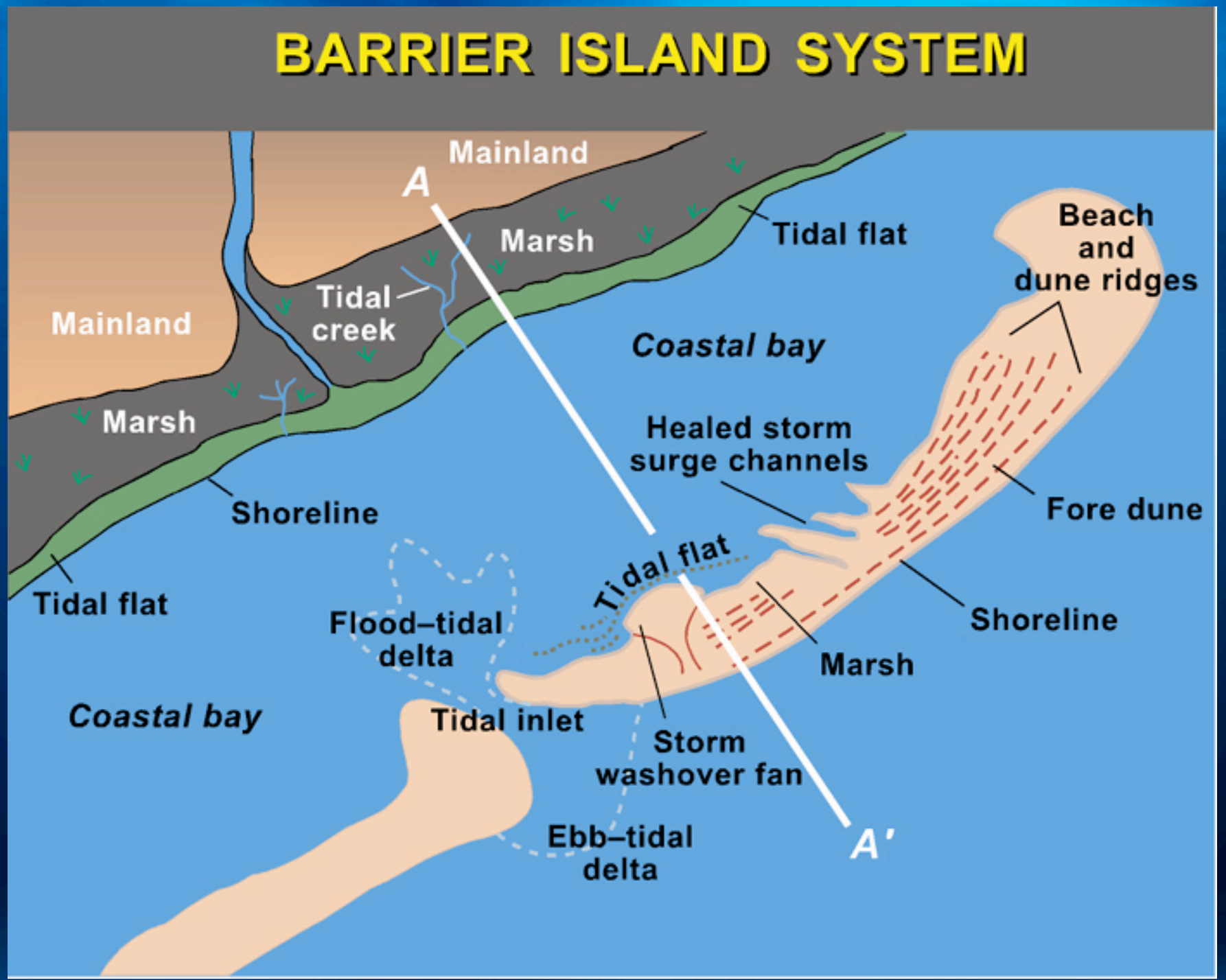
A ridge of sand built up by currents especially in a river or in coastal waters

Barrier Islands

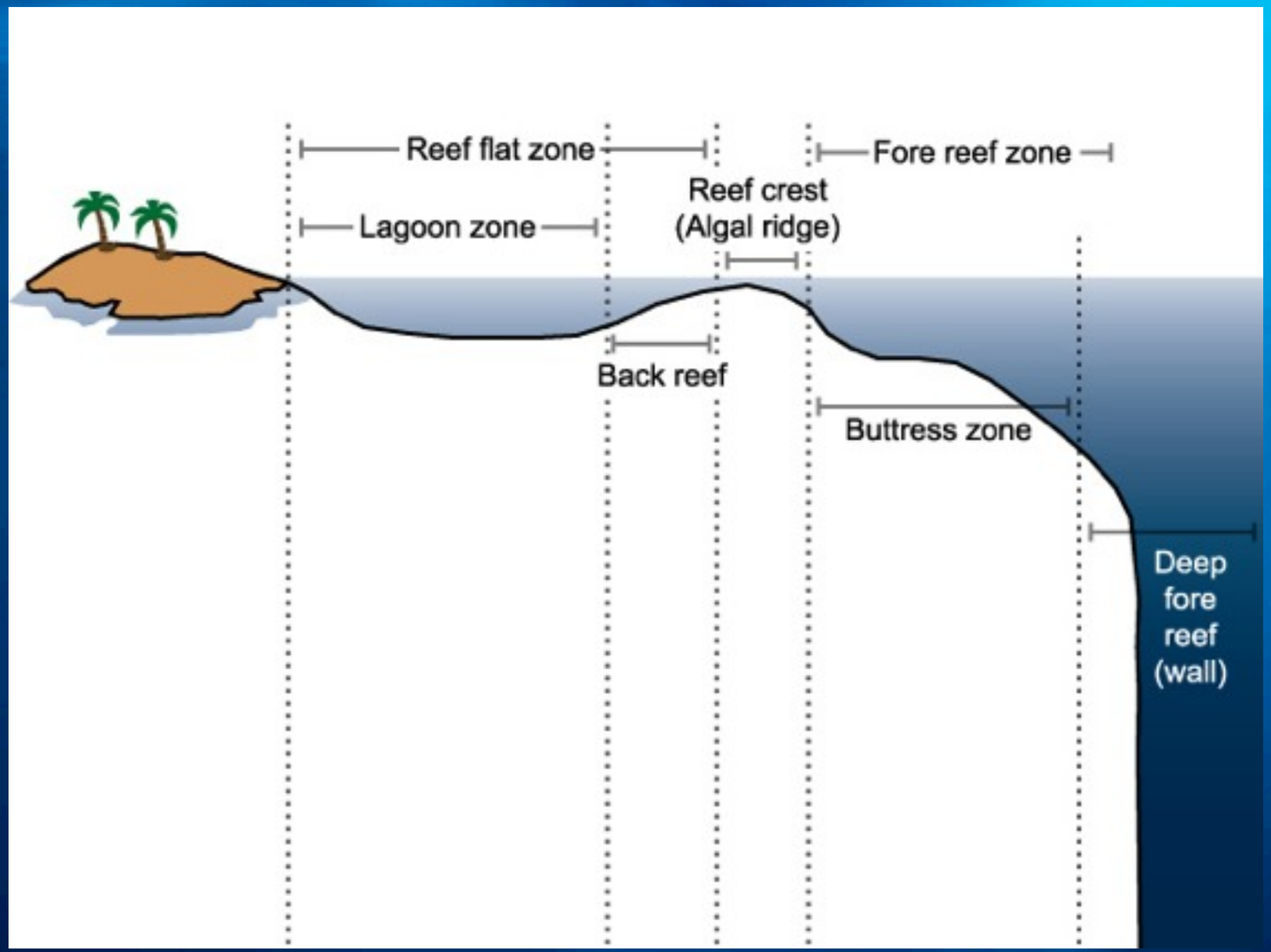
Beaches

Barrier Islands

Barrier Islands



Coral Reefs



Life on a coral reef

Features of the Ocean Floor

November 29

Objectives

Describe the main features of the continental margins & deep ocean basins.

Remember to GEAR-UP

Ocean-Floor Sediments

Composition depends on which part of the ocean floor the sediments form.

(1) Coarse gravel and sand are usually found close to shore, these heavier sediments do not move easily offshore.

(2) Lighter particles are suspended in ocean water and are usually deposited at a great distance from shore.

Sources of Deep Ocean-Basin Sediments

Inorganic Sediments

(1) Rock particles carried from land by rivers.

(2) Fine particles of rock, including volcanic dust, that have been blown great distances out to sea by the wind.

(3) Icebergs also provide sediments & even meteorites form sediments

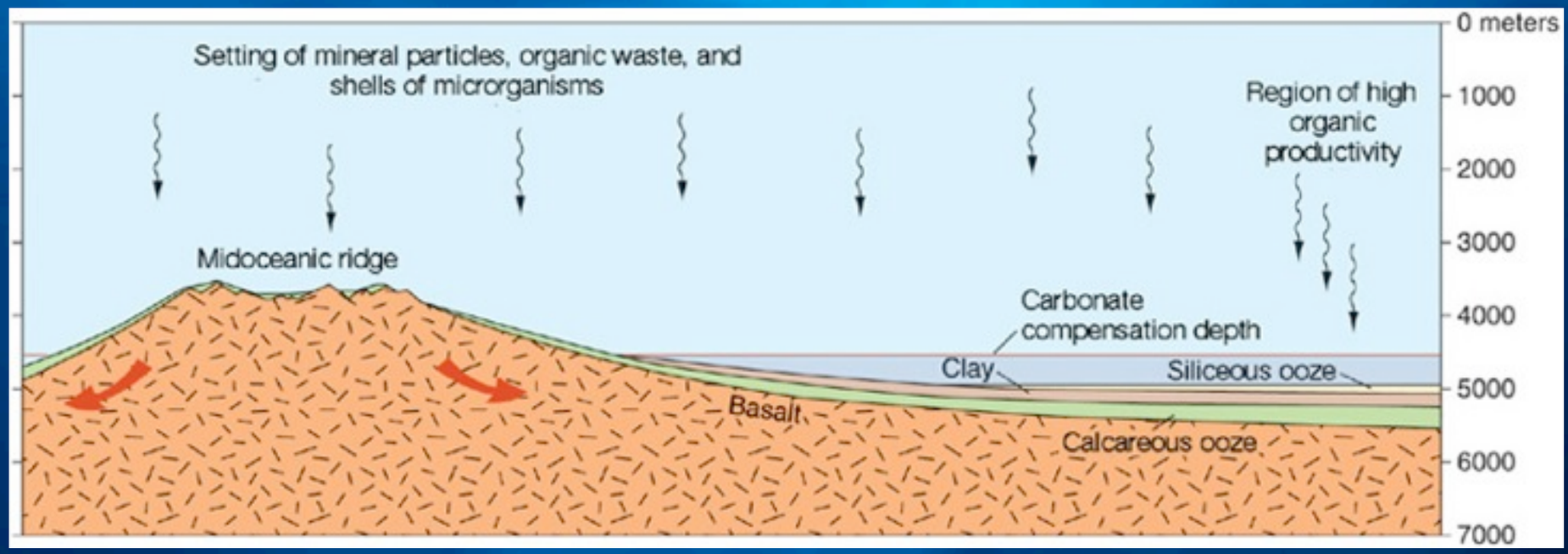
Biogenic Sediments

(1) Remains of marine plants and animals.

Physical Classification of Sediments

Muds - very fine silt and clay-sized particles of rock.

Calcareous ooze - made of calcium carbonate.



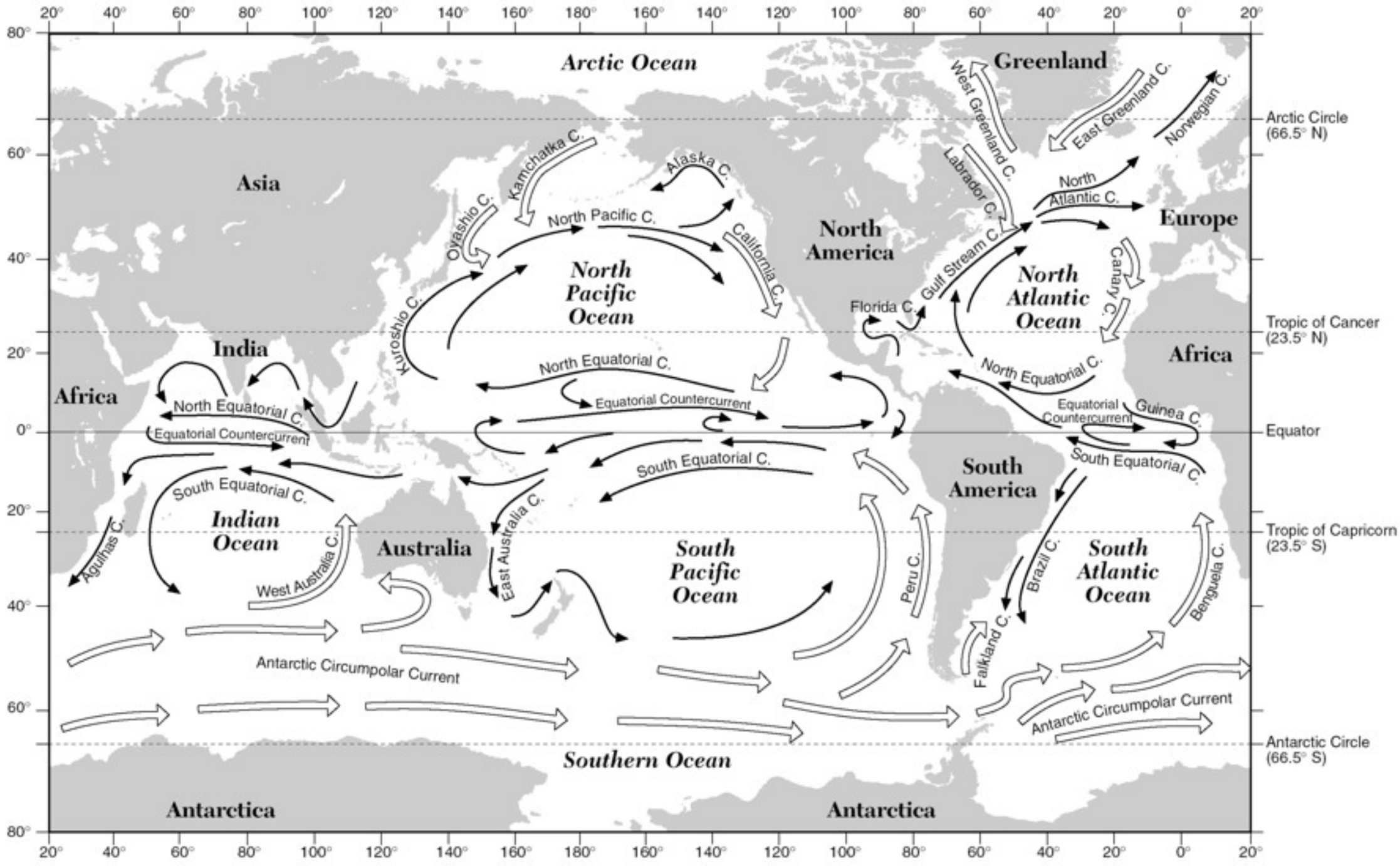
Siliceous ooze - can be found at any depth, is made of mostly silicon dioxide, which comes from sea shells.

Pick the pollutants

Drag and separate the pollutants that effect our oceans.

Pollutant

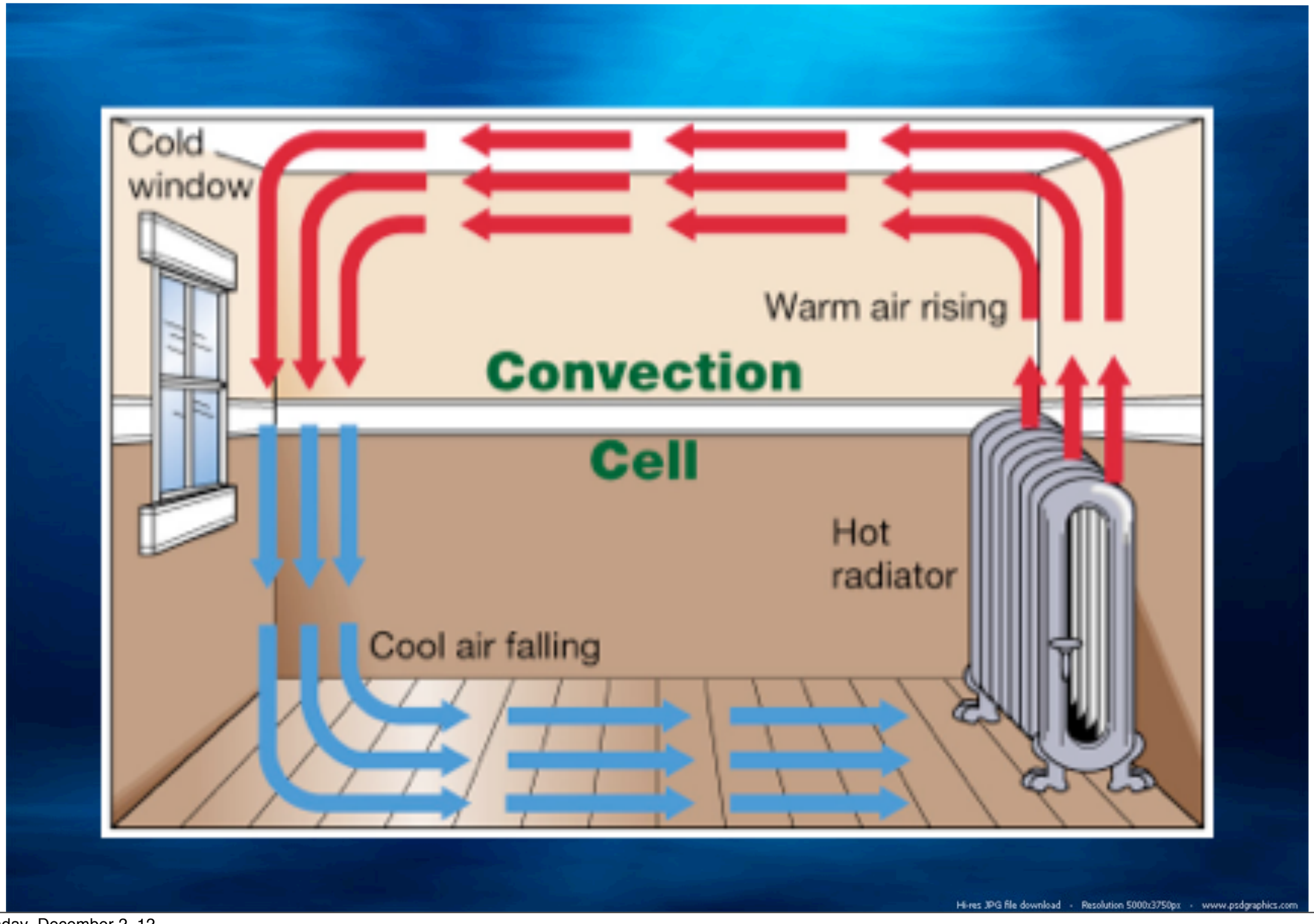
Surface Ocean Currents



NOTE: Not all surface ocean currents are shown.

Key

- Warm currents
- Cool currents


Cold
window
Warm air rising
Convection
Cell
Hot
radiator
Cool air falling
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