Ocean Environmental Management

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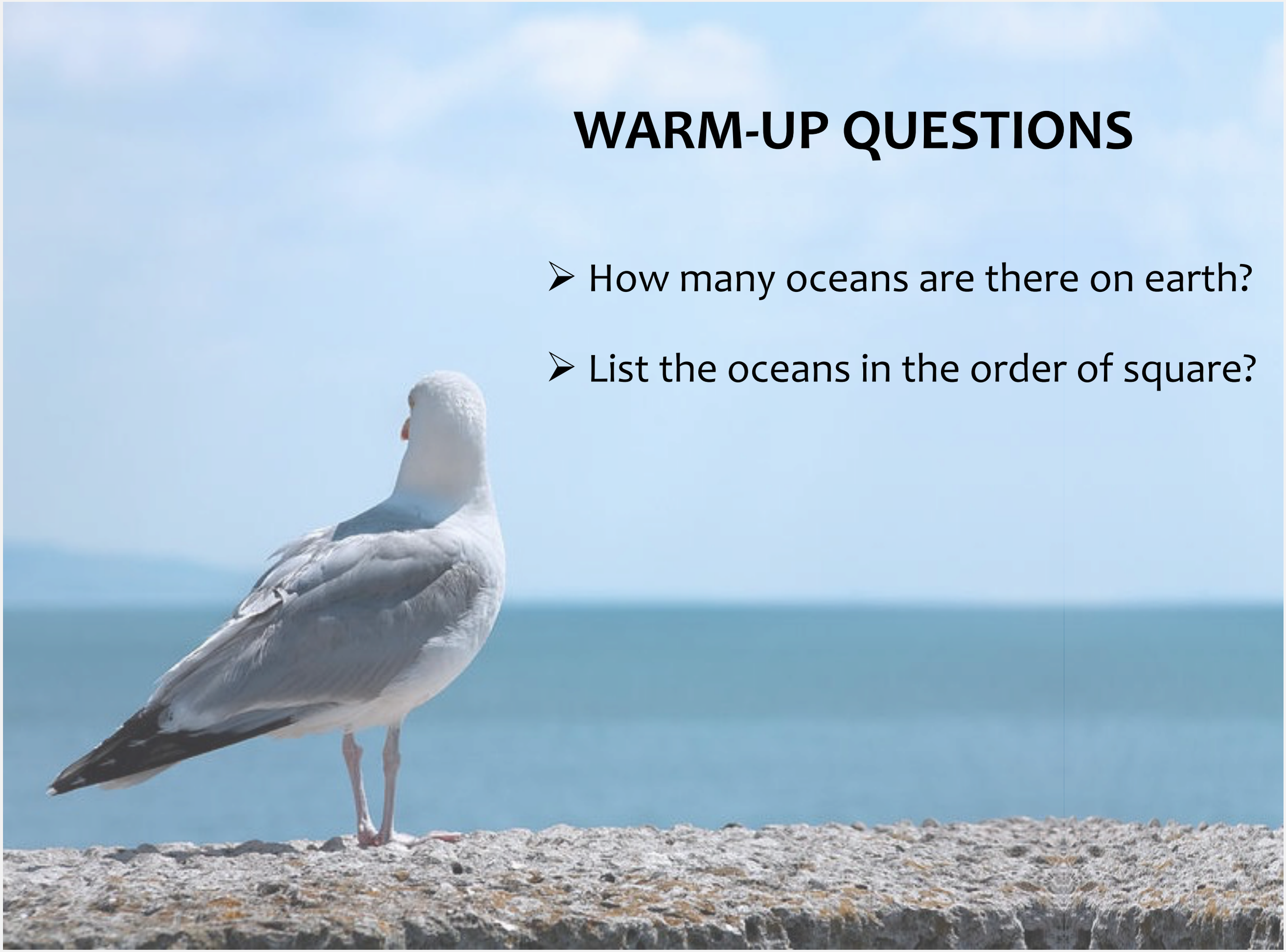
HAI PHONG – 2020

THE WORLD OCEANS

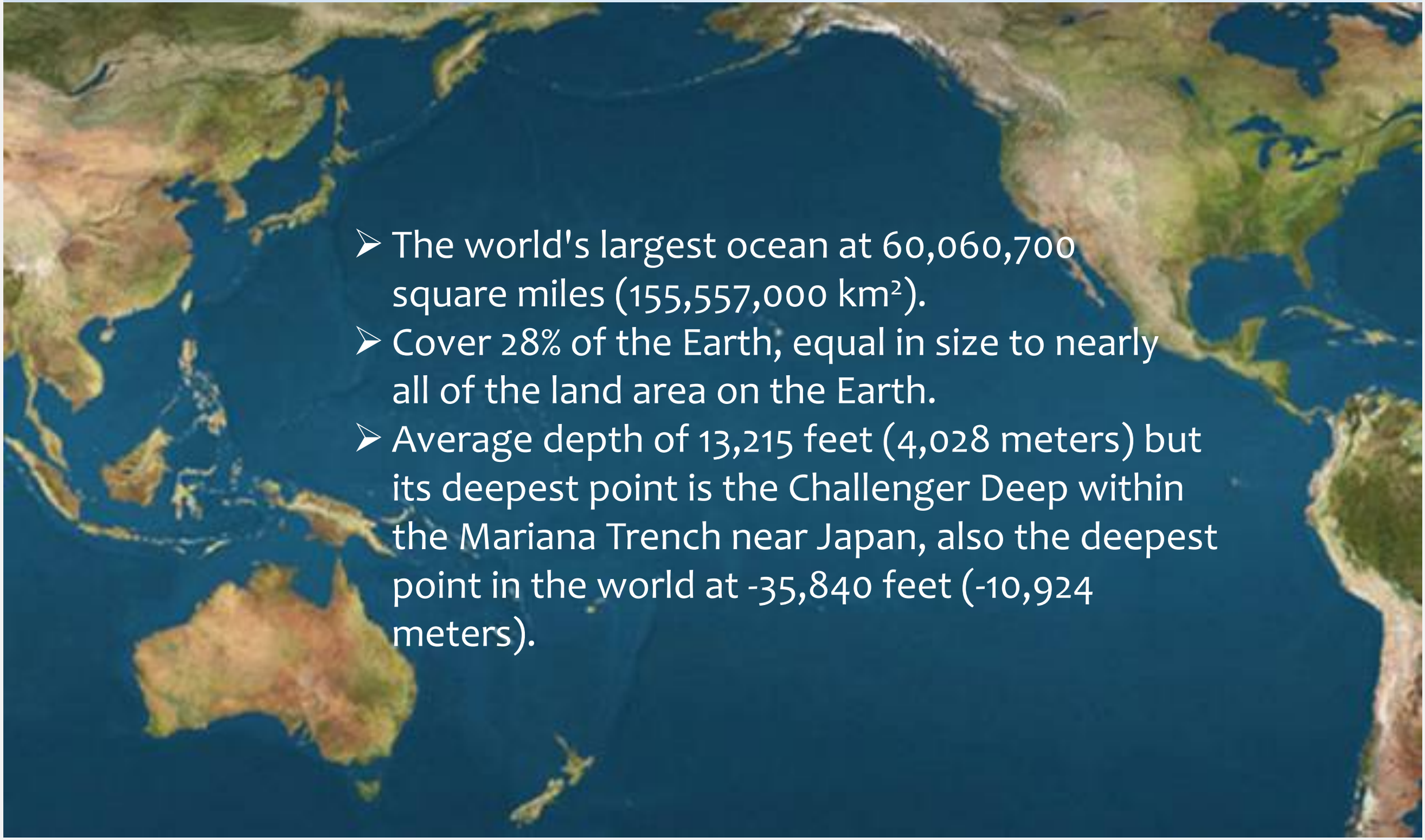
WARM-UP QUESTIONS

- How many oceans are there on earth?
- List the oceans in the order of square?



The world's 5 oceans

01. Parcific Ocean



- The world's largest ocean at 60,060,700 square miles (155,557,000 km²).
- Cover 28% of the Earth, equal in size to nearly all of the land area on the Earth.
- Average depth of 13,215 feet (4,028 meters) but its deepest point is the Challenger Deep within the Mariana Trench near Japan, also the deepest point in the world at -35,840 feet (-10,924 meters).

02. Atlantic Ocean

- The world's second-largest ocean with an area of 29,637,900 square miles (76,762,000 km^2).
- It includes the includes other water bodies such as the Baltic Sea, Black Sea, Caribbean Sea, Gulf of Mexico, Mediterranean Sea and the North Sea.
- Average depth of 12,880 feet (3,926 meters) and the deepest point is the Puerto Rico Trench at -28,231 feet (-8,605 meters).

03 – Indian Ocean

- The world's third-largest ocean with an area of 26,469,900 square miles (68,566,000 km^2).
- It is located between Africa, the Southern Ocean, Asia, and Australia.
- Average depth of 13,002 feet (3,963 meters) and the Java Trench is its deepest point at -23,812 feet (-7,258 meters).
- The Indian Ocean is known for causing the monsoonal weather patterns that dominate much of southeast Asia and for having waters that have been historical chokepoints (narrow international waterways).

04 – Southern Ocean

- The world's newest and fourth-largest ocean.
- In the spring of 2000, the International Hydrographic Organization decided to delimit a fifth ocean. In doing so, boundaries were taken from the Pacific, Atlantic and Indian Oceans.
- Total area: 7,848,300 square miles (20,327,000 km^2)
- Average depth ranging from 13,100 to 16,400 feet (4,000 to 5,000 meters). The deepest point of -23,737 feet (-7,235 meters) is unnamed.
- The world's largest ocean current, the Antarctic Circumpolar Current moves east and is 13,049 miles (21,000 km) in length.

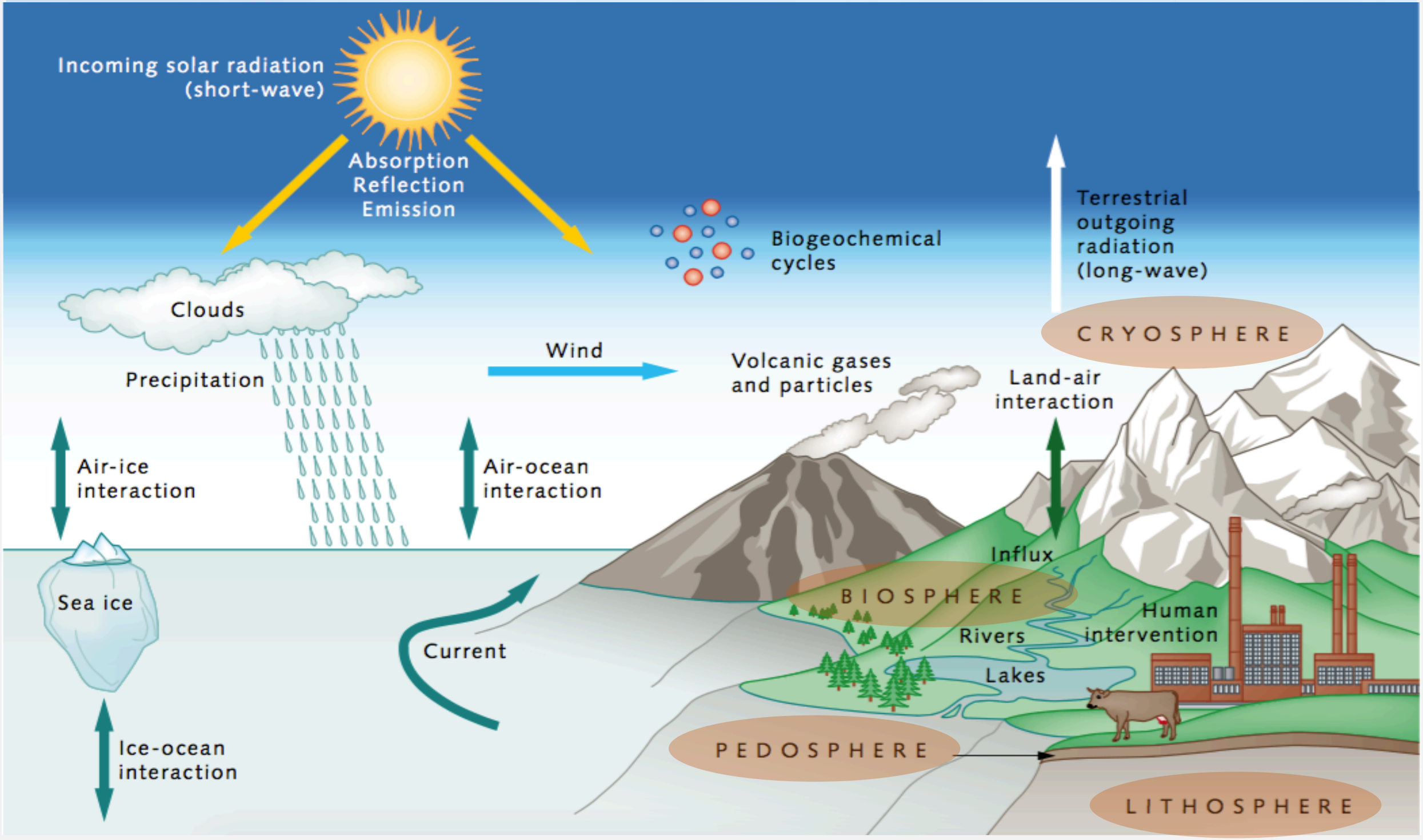
05 – Arctic Ocean

- The world's smallest with an area of 5,427,000 square miles (14,056,000 km^2).
- It extends between Europe, Asia and North America and most of its waters are north of the Arctic Circle.
- Its average depth is 3,953 feet (1,205 meters) and its deepest point is the Fram Basin at -15,305 feet (-4,665 meters).
- Throughout most of the year, much of the Arctic Ocean is covered by a drifting polar icepack that is an average of ten feet (three meters) thick. However, as the Earth's climate changes, the polar regions are warming and much of the icepack melts during the summer months.

Say a word related to OCEAN:

- No repeatation of previous people
- Don’t say something too broad
- A penalty for anyone who violates the rules
- Everyone is observers

The climate system, its sub systems and relevant processes and interactions



Climate changes can be triggered in 2 different ways

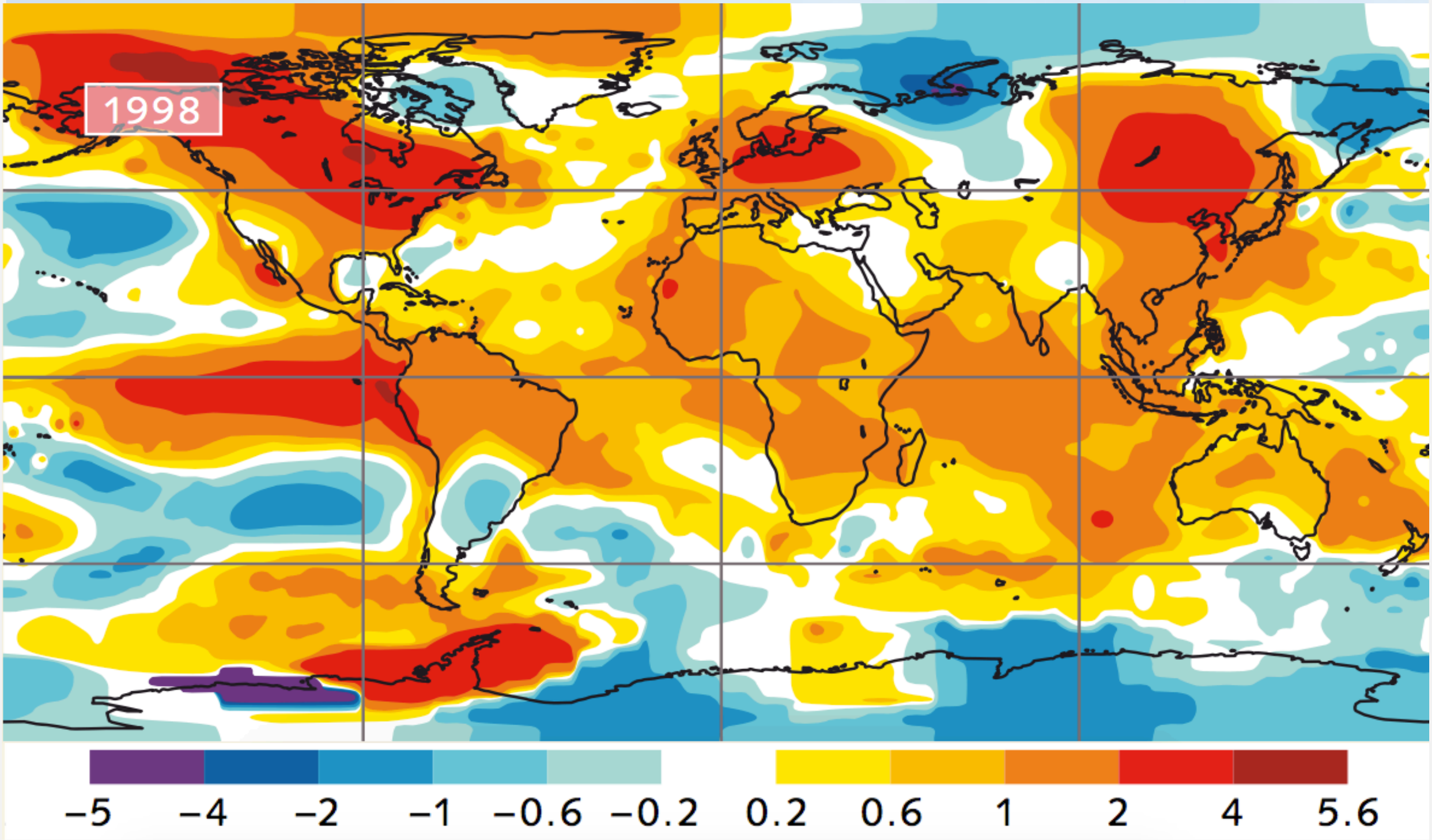
The internal forces

- Changes in a single climate component, for example, an anomalous ocean current;
- Changes in the interactions between different climate components, for example, between the ocean and atmosphere.

The external mechanisms

- The very slow drift of continents, which moves land masses into different climate zones over millions of years;
- The changing intensity of radiation emitted by the sun.
- Volcanic eruptions, which inject ash and sulphur compounds into the atmosphere.

The difficulty of detecting anthropogenic climate change



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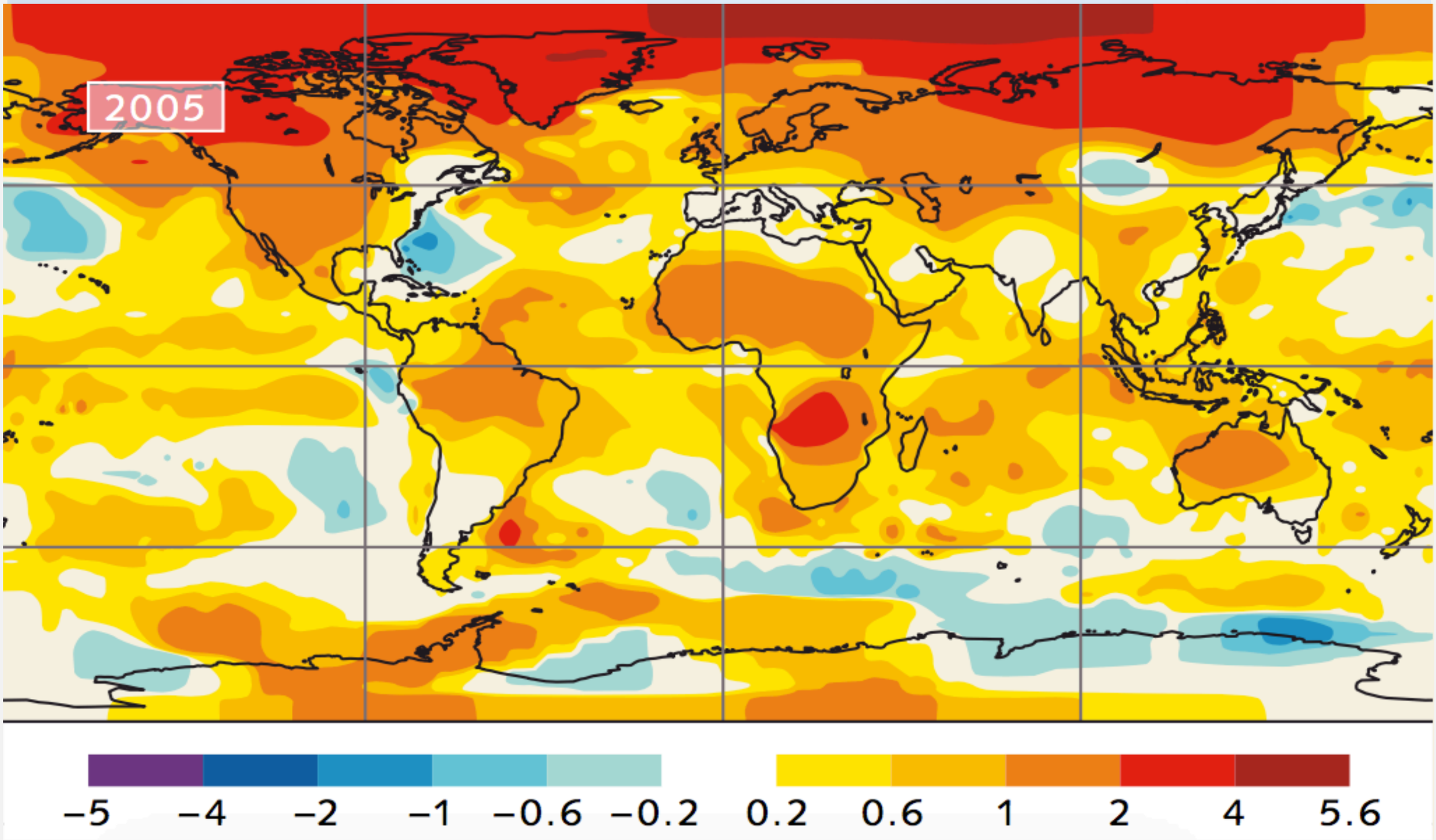

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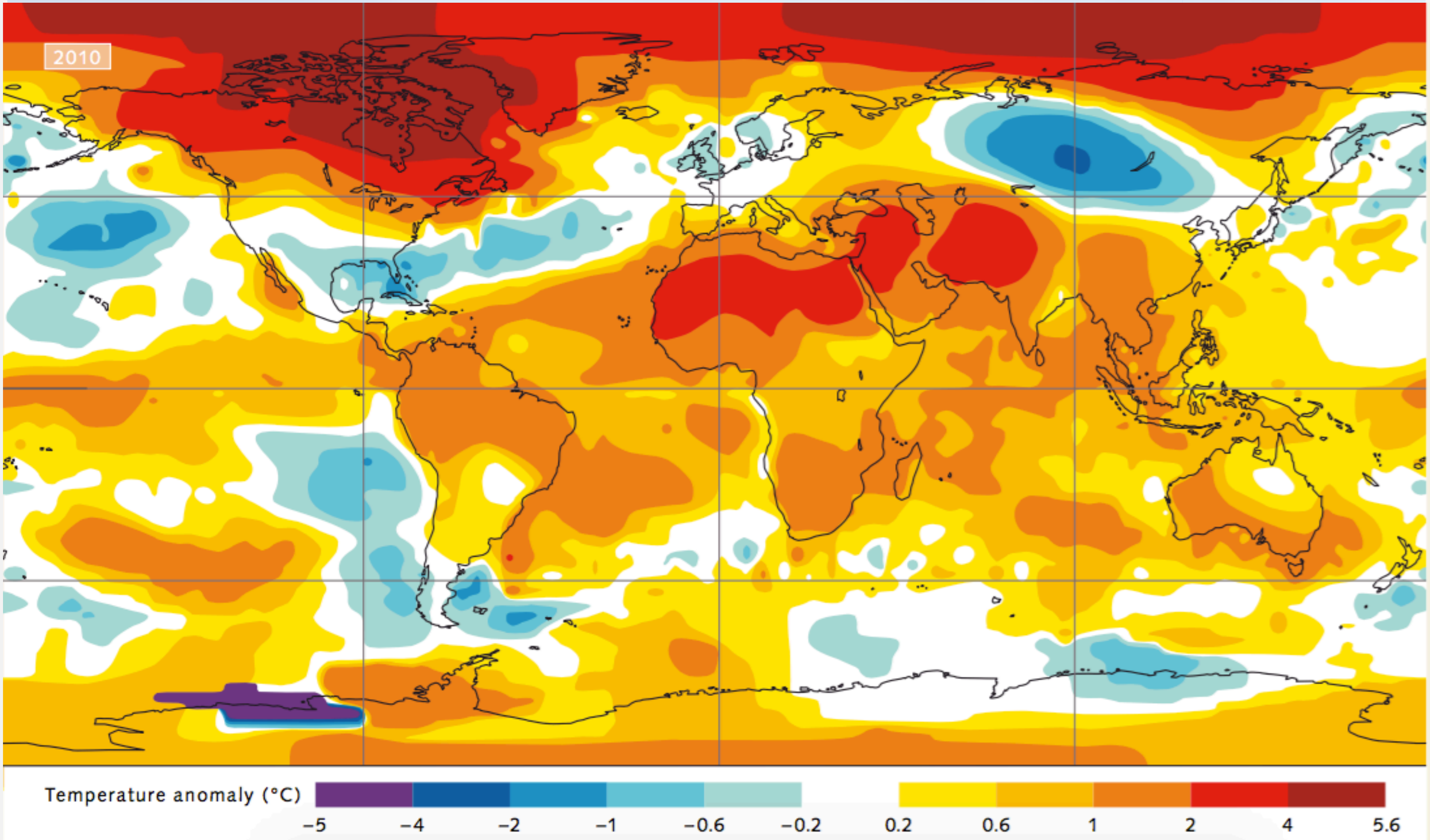
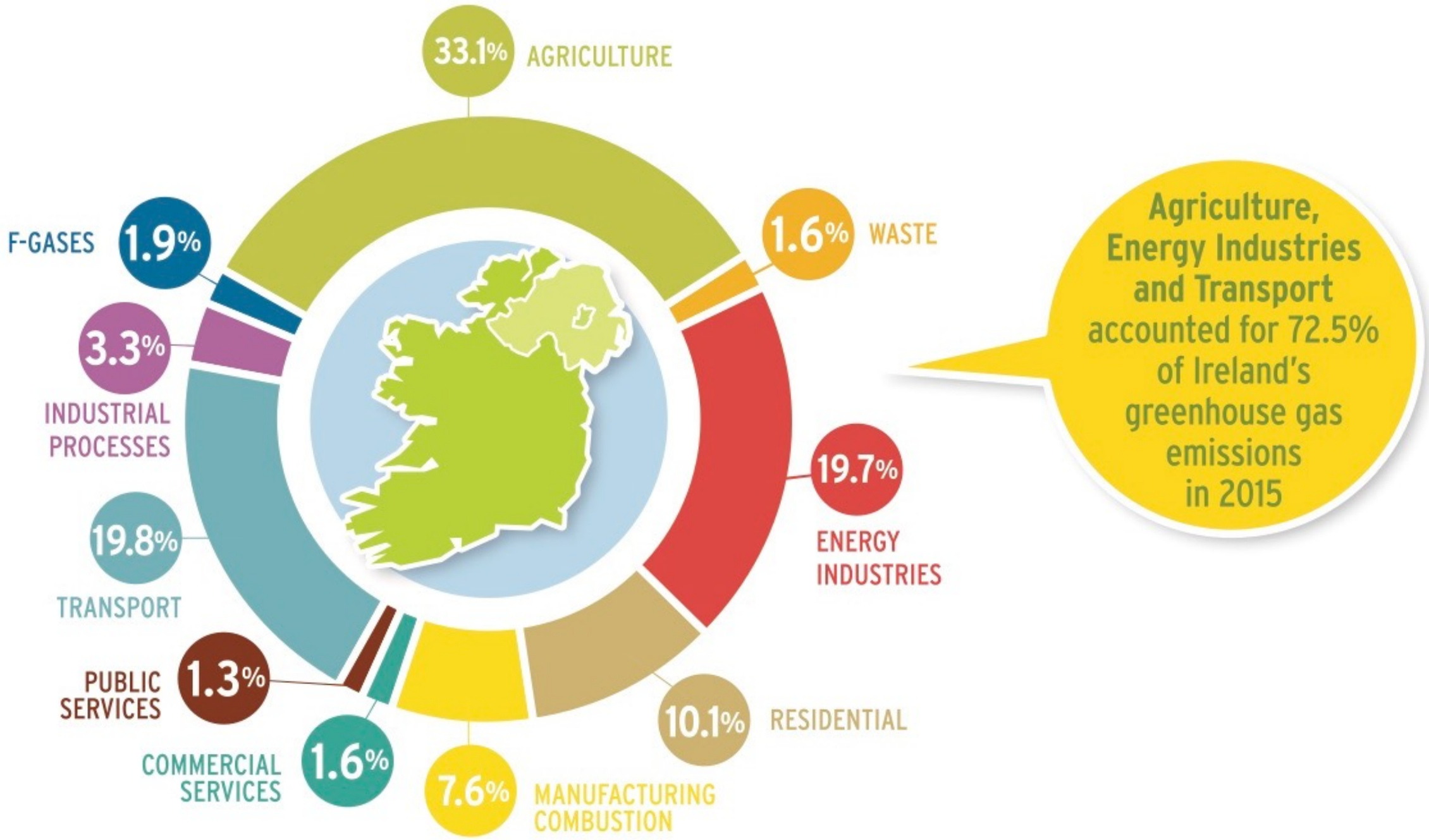


How humans are changing the climate ?



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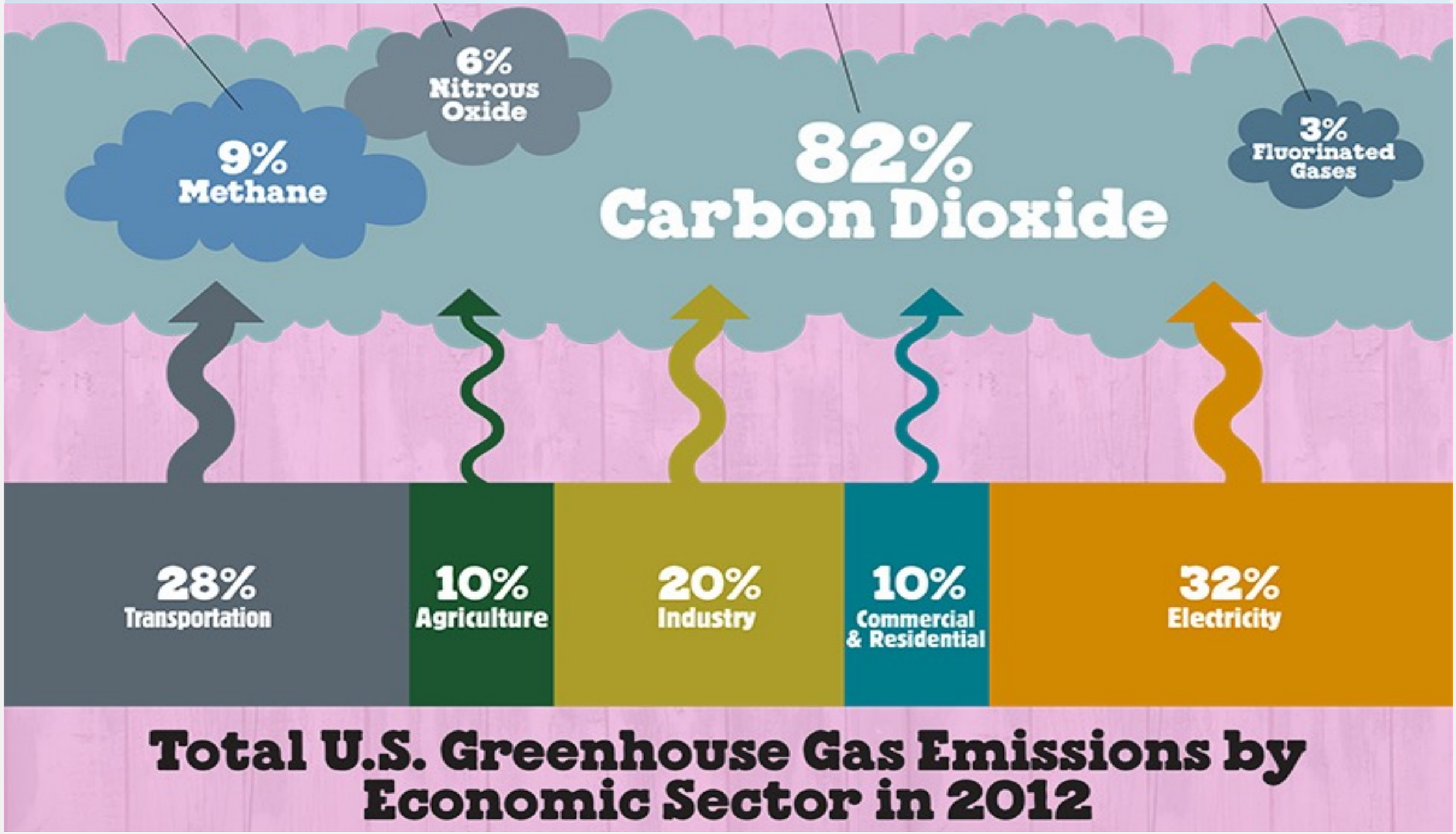

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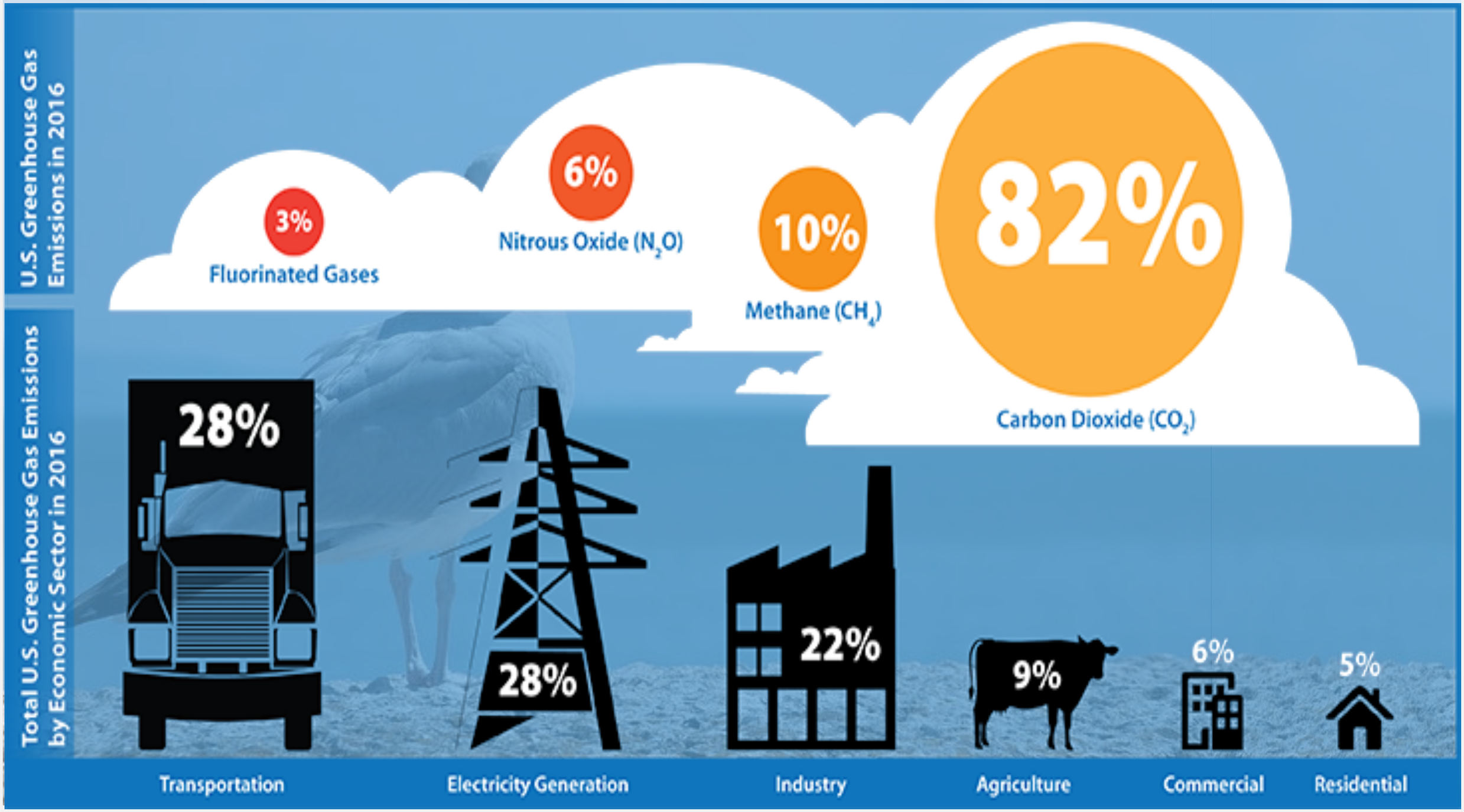
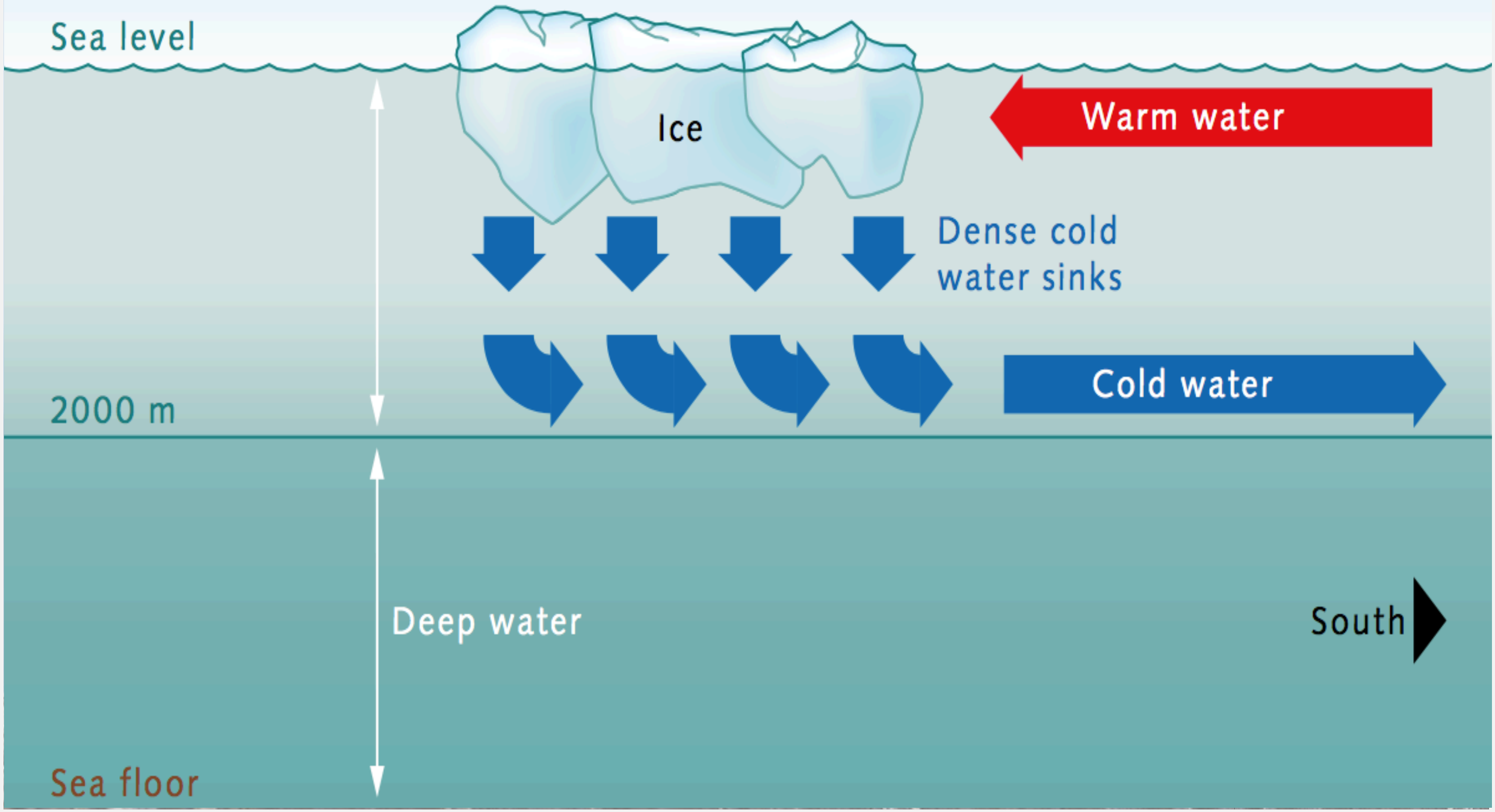


How humans are changing the climate ?

Great ocean currents

- Ocean currents transport enormous amounts of heat around the world, making them one of the most important driving forces of climate.
- Climate changes associated with wind and sea ice could become recognizable more quickly.

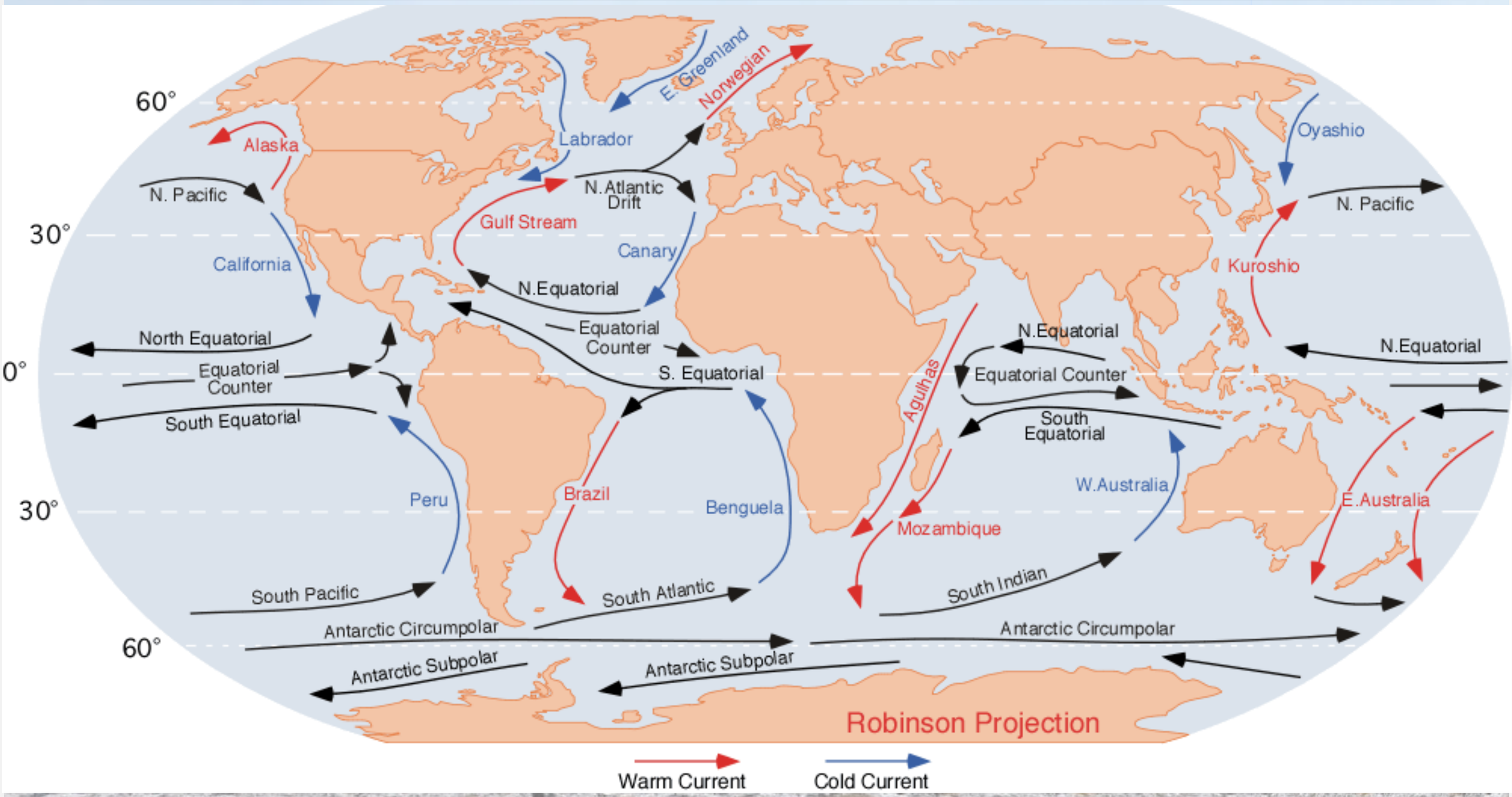
What drives the water masses?

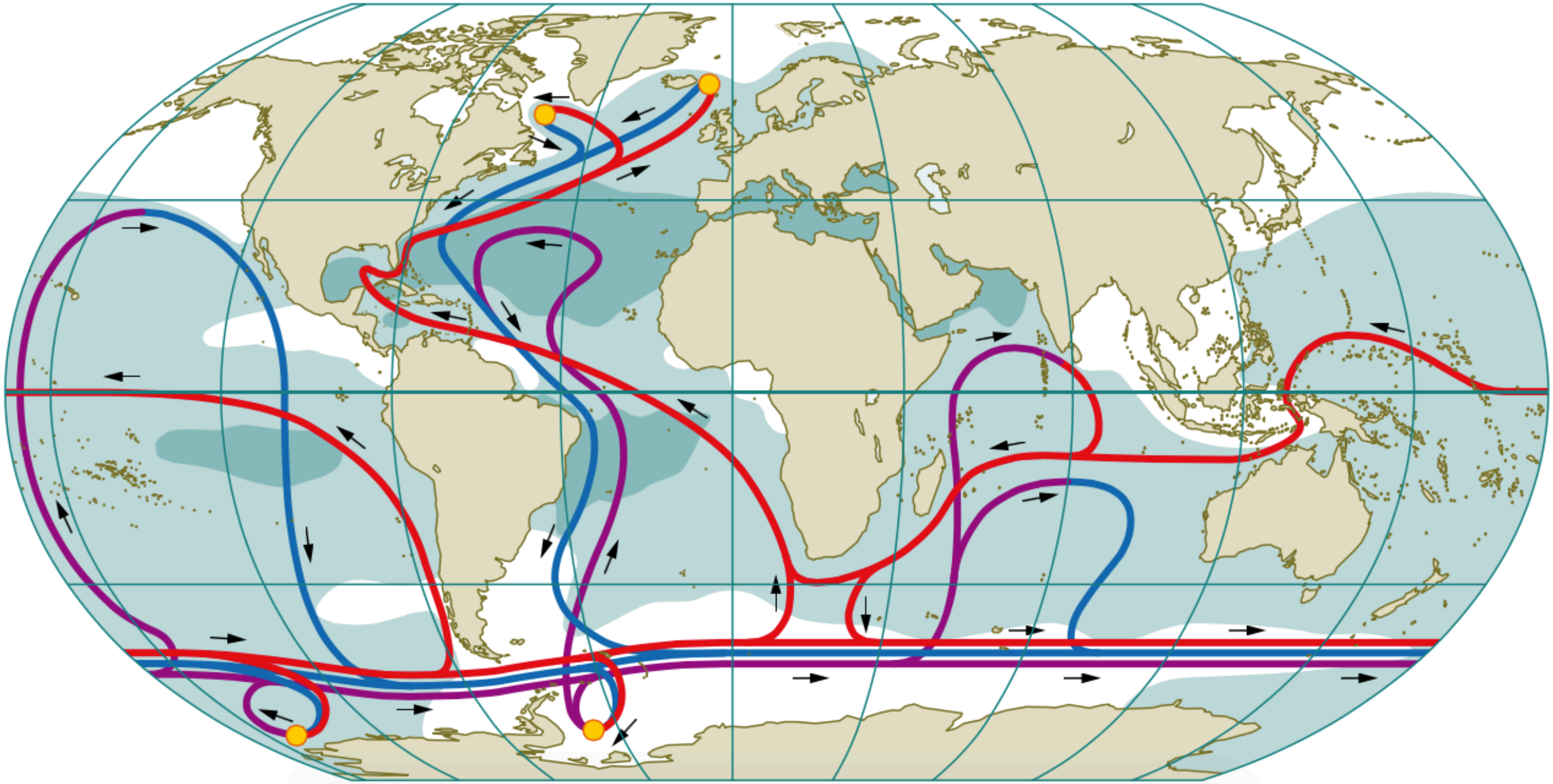


What drives the water masses?

- Cold, salty water is heavy and sinks to great depths → the circulation of millions of cubic metres of water in the ocean → convection.
- Low temperature and high salinity are the primary driving forces of convection. They pull the dense water of the polar regions downward, which drives a worldwide convection engine called thermohaline circulation (driven by temperature and salinity differences).

➔ But how do the water masses of different densities that drive ocean convection actually originate?





Blue line: the flow of cold, saline surface water

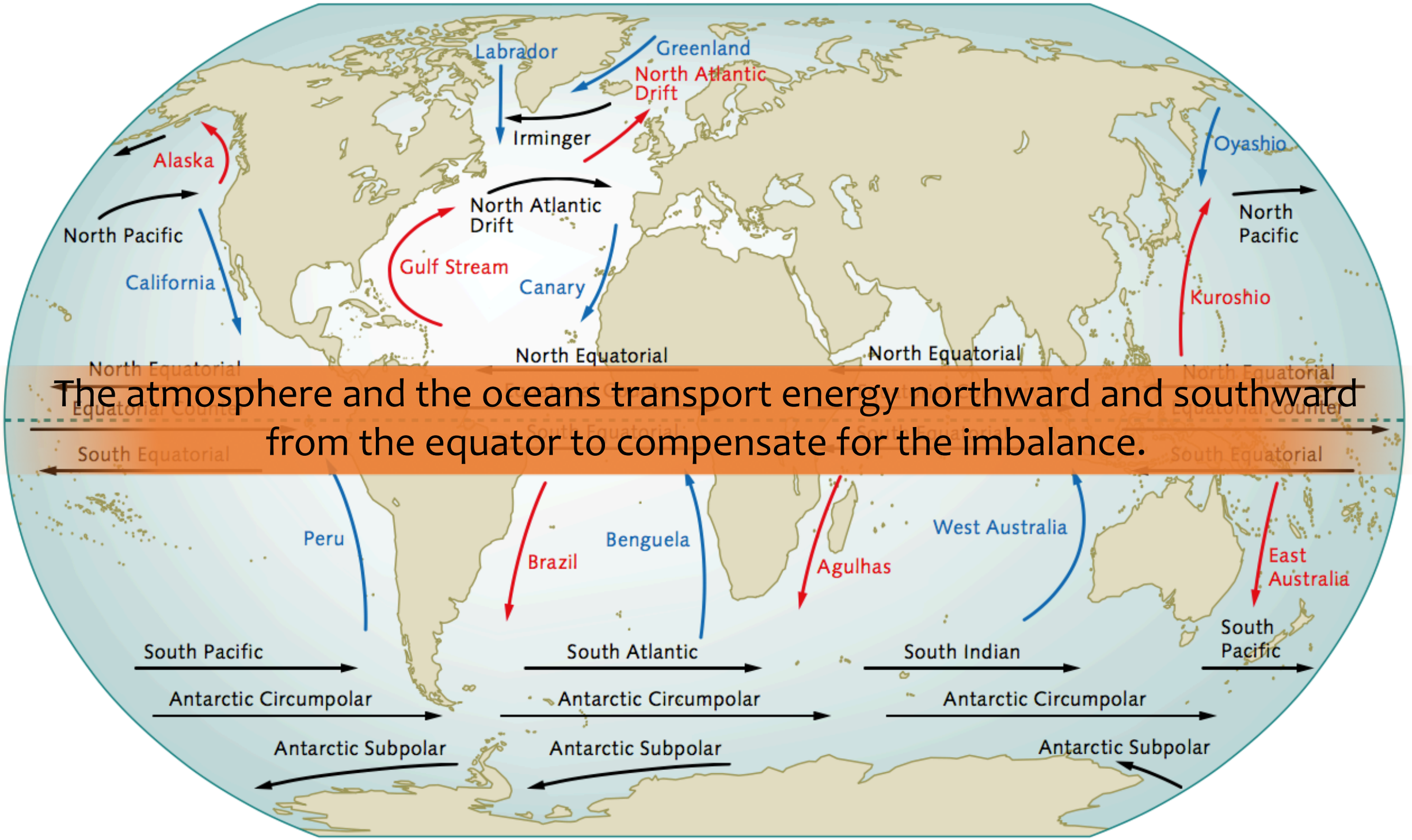
Red line: warm surface water

Small yellow circles in the polar regions: convection areas.

The dark areas: high salinity

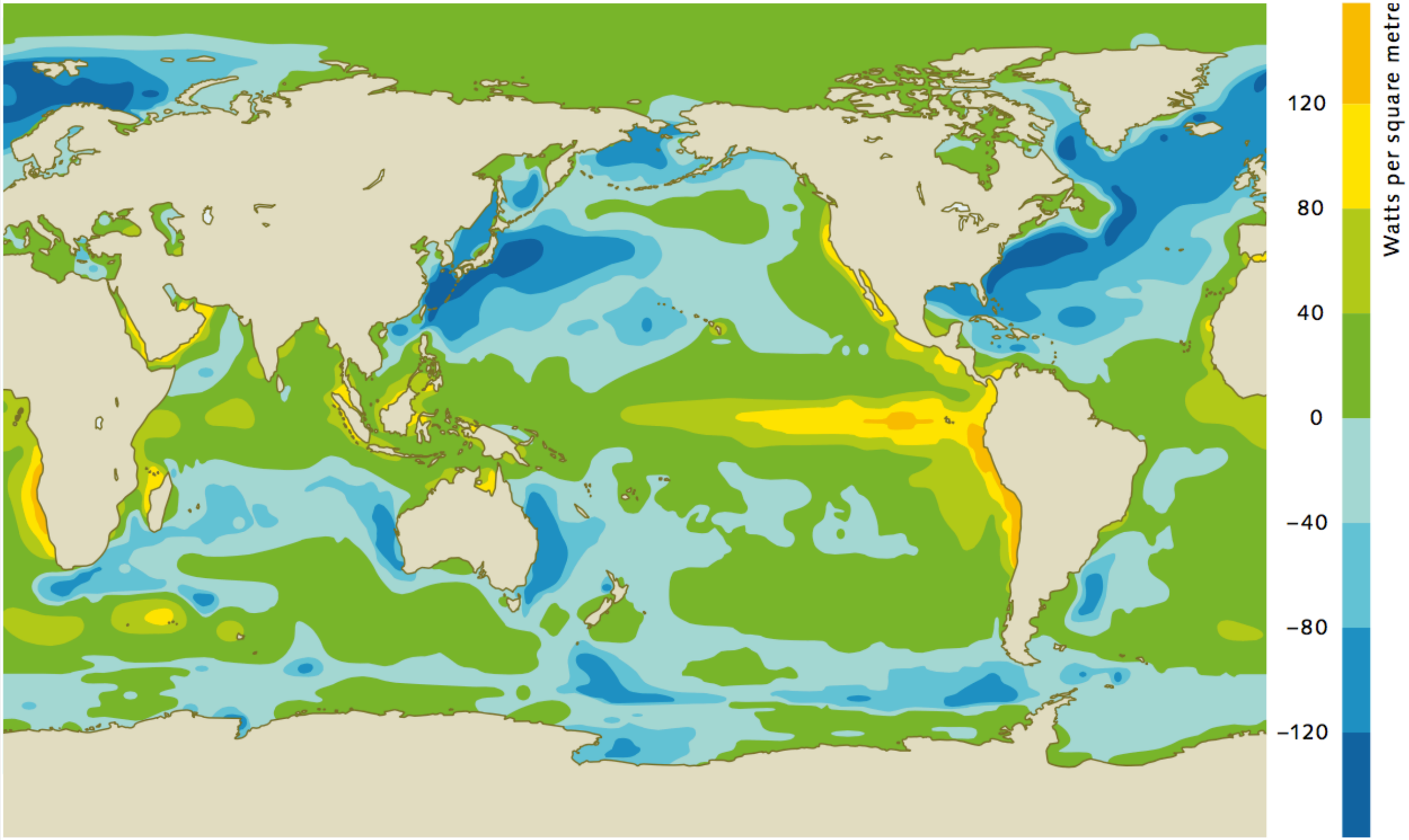
The white areas: low salinity

The ocean – a global storehouse for heat



The atmosphere and the oceans transport energy northward and southward from the equator to compensate for the imbalance.

The ocean – a global storehouse for heat



GROUP PRESENTATION

Topic 1. Ice melting in the Arctic Ocean

Major elements in the ocean

- Ocean water is 96% pure water.
- Chlorine (1.9%) and sodium (1.1%) make up the next largest concentration of elements.
- Sodium chloride is table salt.

Salinity

- Salinity describes the amount of dissolved water in the ocean.
- Salinity is expressed in parts per thousand.
- The salinity level of the ocean is expressed in parts per thousand.
- The average salinity of ocean is 35 parts per thousand.

Gases in Ocean Water

- The most abundant gases in ocean water are nitrogen, carbon dioxide and oxygen.
- The amounts of these elements vary with depth. They are more abundant at the ocean's surface where sunlight causes more plant life.

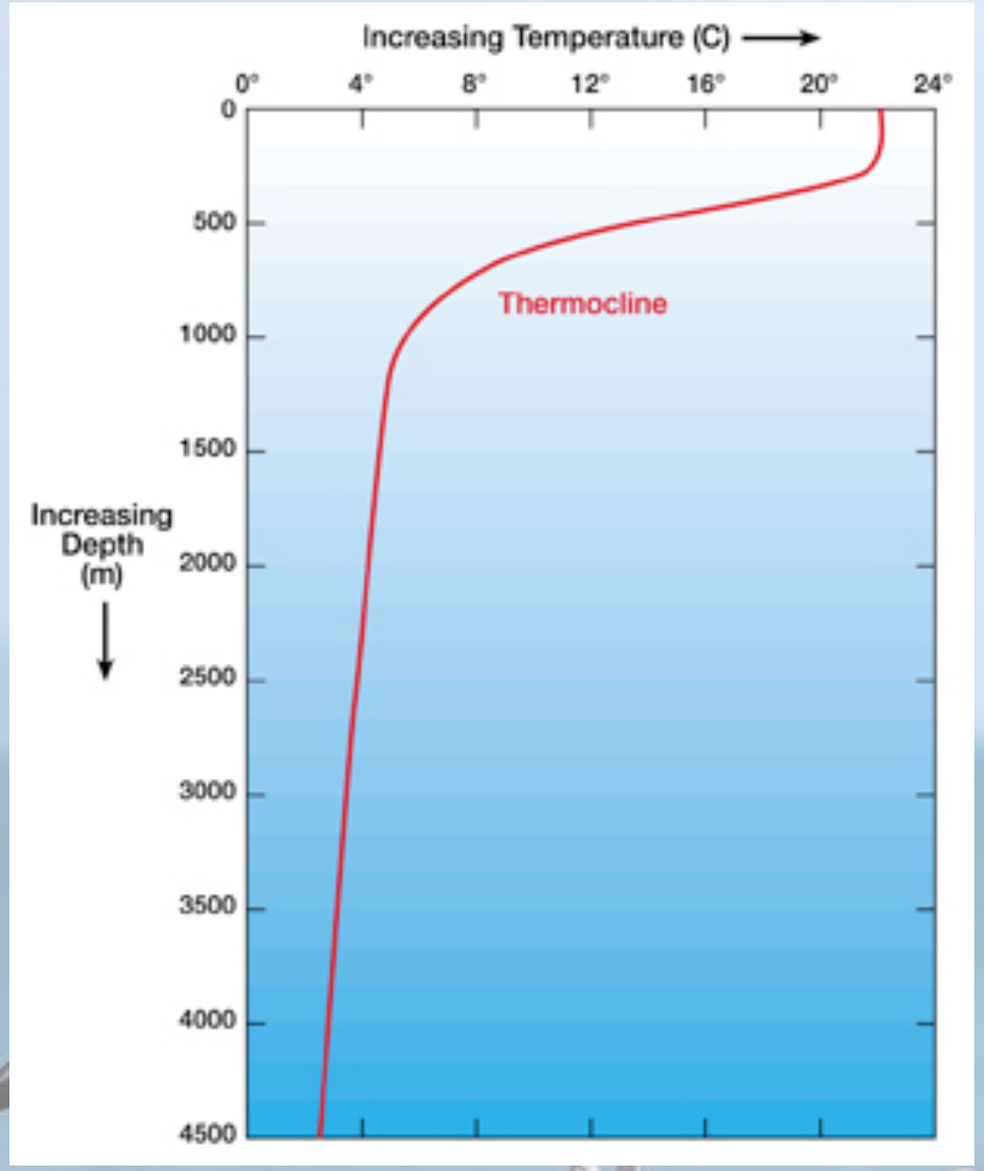
Temperature of Ocean Water

- Warm water holds less dissolved gas than cold water.
- When ocean water is cold, like in polar regions, it sinks and carries oxygen rich water to the ocean depths.
- As a result, fish and other animals can live in deep parts of the ocean.

Surface Zone

- The zone where the water is mixed by waves and currents is called the surface zone.
- The surface zone extends 100-400 meters downward.
- The temperature remains constant with depth.
- Temperature in a surface zone changes due to seasons and locations.

Thermocline



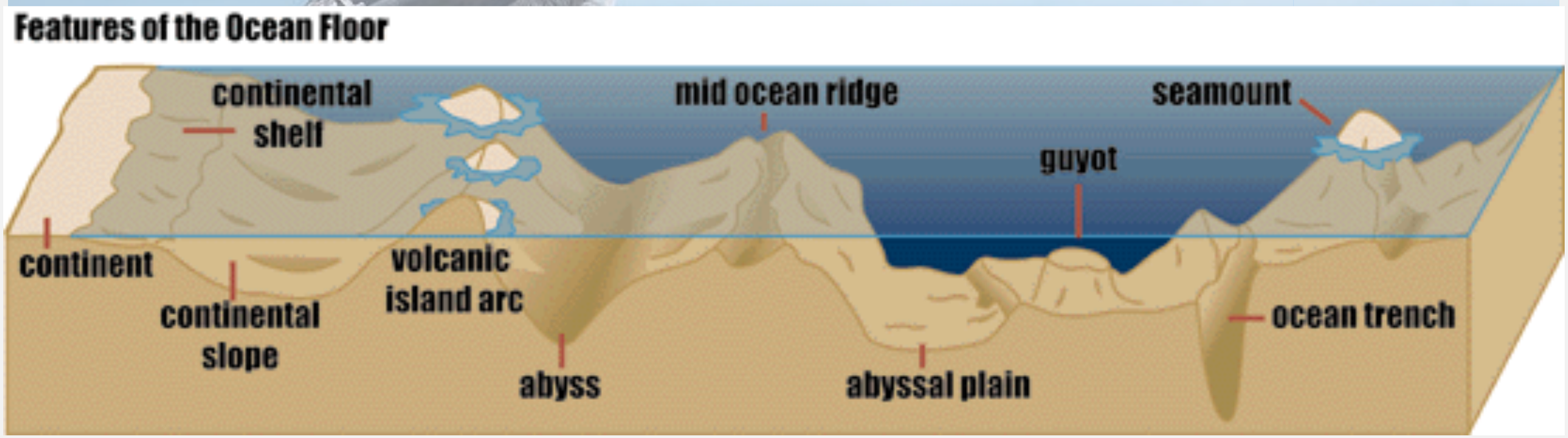
- The zone of rapid temperature change is called the thermocline.
- The thermocline does not occur at a certain depth.
- The season and flow of ocean currents alter the depth of the thermocline.
- The thermocline exists because warm, surface water does not mix easily with colder, denser water.

Deep Zone

- The thermocline forms a transition between the surface zone and the deep zone.
- The deep zone is an area of extremely cold water that extends from the bottom of the thermocline to depths of 4000 meters or more.
- Within the deep zone, temperatures decrease only slightly.
- At depths greater than 1500 meters, the temperature is about 4 degrees C.
- The the deep zones are not found in the polar (Arctic and Antarctica) regions since the surface waters are always cold.

The ocean floor

- The topography of the ocean floor is different from the topography of the continents
- The ocean floor has higher mountains, deeper canyons, and larger flatter plains. Earthquakes occur more often.
- The rocks are very different.
- The crust is thinner.



Now is your turn to speak

- Prepare within 15 minutes on a certain topic
  - ➢Source of salt in the ocean
  - ➢Tide
  - ➢Wave
- Present within 3 minutes
- Relate to reality in your living areas