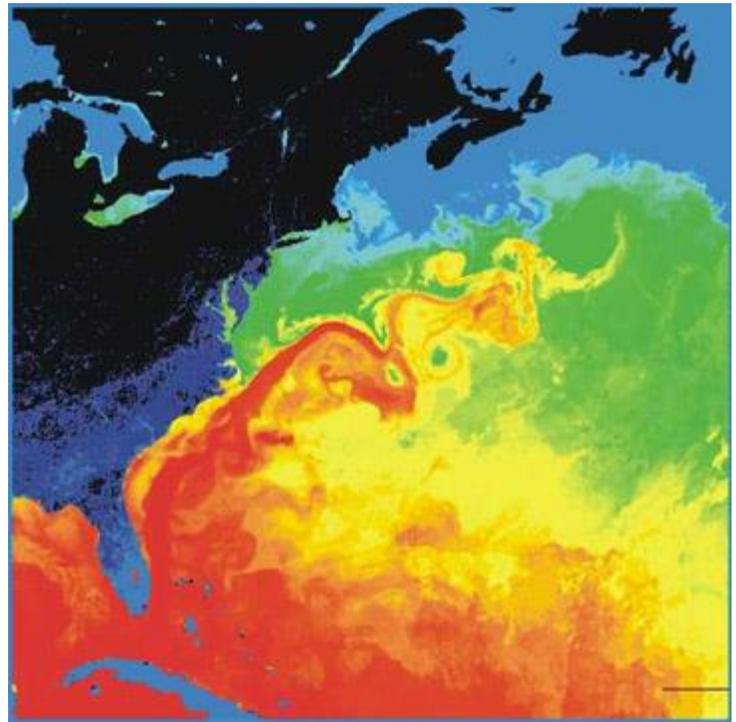


STAAR Science Tutorial 32 **TEK 8.10C: Oceans and Weather**

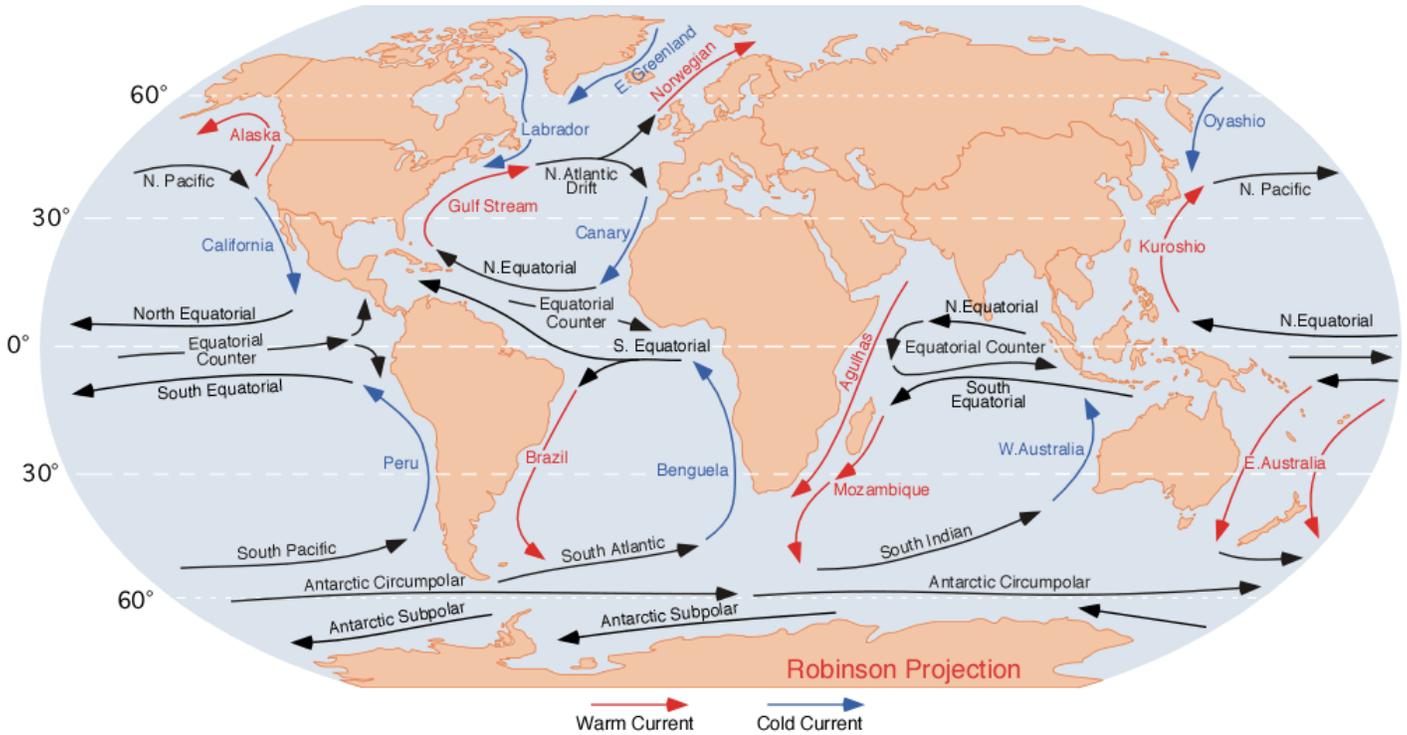
TEK 8.10C: Identify the role of the oceans in the formation of weather systems such as hurricanes.

- Because water has such a high heat capacity, ocean currents have the ability to carry large amounts of heat energy from the tropics to the temperate and polar regions of Earth.
- Generally, surface currents carry warm water from the tropics to polar regions, and cold water from polar regions back towards the tropics. In the main ocean basins such as the Atlantic and Pacific Oceans, surface currents flow in a clockwise direction in the northern hemisphere and in a counterclockwise direction in the southern hemisphere. See *STAAR Tutorial 24: Solar Energy and Convection* for further discussion of ocean currents.
- Ocean currents have a significant effect on global and local weather patterns. For example, the Gulf Stream / North Atlantic Drift ocean current in the Atlantic Ocean, which flows from the coast of Florida northeast towards northern Europe, makes Europe's winters warmer and wetter than they would be otherwise. London, England, with a latitude of 51°N, has about the same winter average temperature as Atlanta, Georgia, latitude 34°N. The false color satellite photo to the right shows the warm Gulf Stream current in red and yellow.
- Scientists have calculated that the thermal energy carried by the Gulf Stream, if it could all be harnessed, is 100 times more than the entire Earth's human power demand.
- Many north Atlantic storms follow the track of the Gulf Stream, and draw significant energy and moisture from its warm waters. In the winter, severe storms called northeasters form in the Gulf Stream and follow the east coast of the United States northeastward, creating hurricane force winds, blizzard conditions and flooding coastal areas in New England.

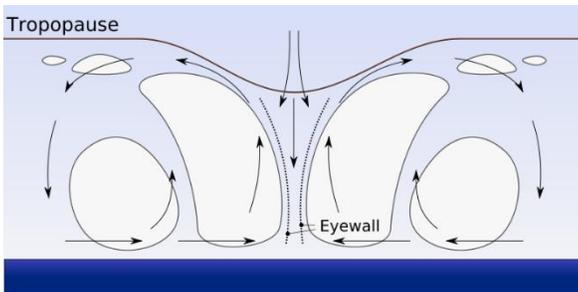


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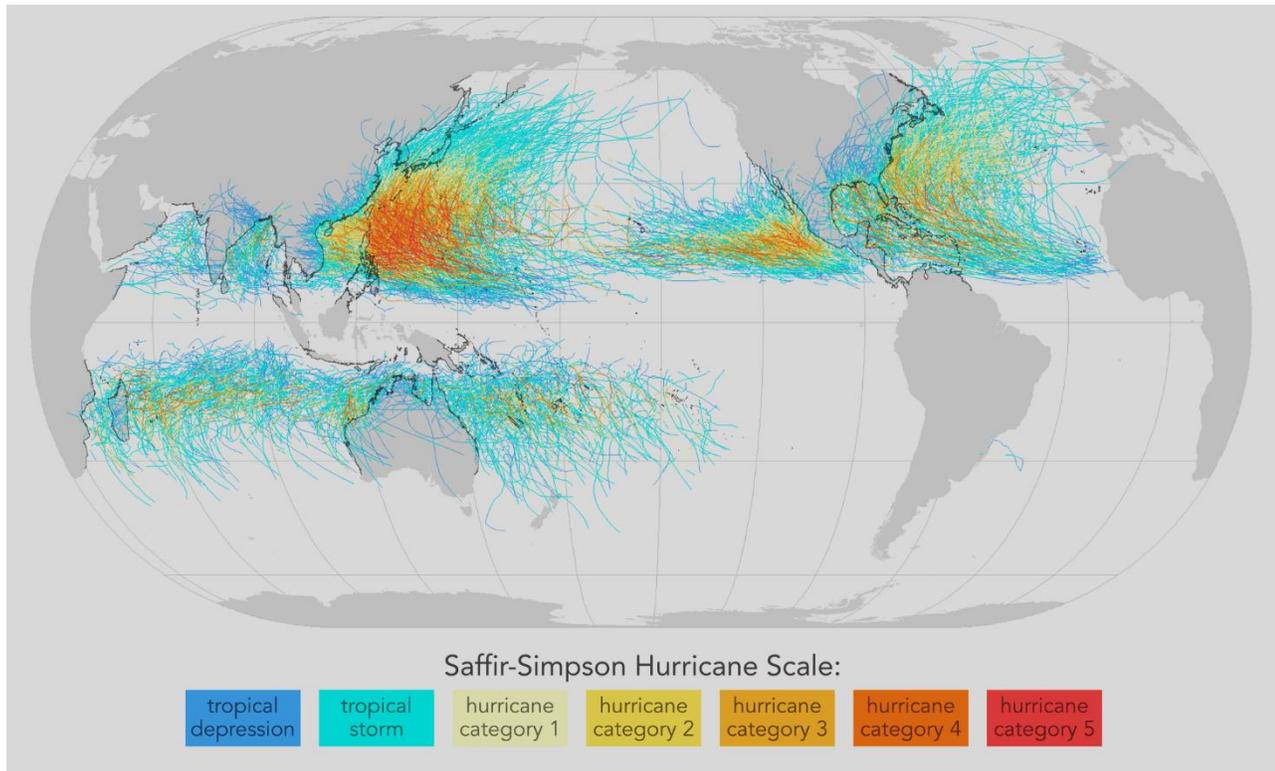
- The California Current, which flows south off the west coast of the United States and Canada, carries cool water from the northern Pacific, making the winter climate of the west coast cooler and wetter, and moderating summer temperatures at the coast.
- The map below shows the Earth's main surface currents.



- Most of the Earth's tropical cyclones, called hurricanes in the Atlantic and eastern Pacific Ocean, typhoons in the northwestern Pacific Ocean and cyclones in the southern Pacific and Indian Oceans, form in very warm equatorial ocean currents and most westward with these currents. They draw their strength from evaporating water. Rising water vapor carries the latent heat of evaporation into the upper atmosphere, where it is released when the water vapor condenses into clouds. The released heat causes even more lift, building thunderstorms that organize into the tropical storm.
- The diagrams below are cross-sections of a hurricane, showing the bands of thunderstorms and eye.



- The diagram below shows the tracks of all tropical cyclones from 1945 to 2006. The colors represent storm intensity, with yellow, orange and red being the strongest.



Practice Questions

- In the northern hemisphere's major ocean basins, ocean currents generally circulate in a _____ direction. In the southern hemisphere, they circulate in a _____ direction.
- The _____ current flows from the coast of Florida northeastward across the Atlantic Ocean, giving _____ and _____ weather to northern Europe.
- The _____ current flows from the northern Pacific Ocean southward along the west coast of the United States, bringing _____ and _____ weather to the west coast in winter.
- Hurricanes, cyclones and typhoons form in the _____ waters of the _____ currents, and generally move _____ with the currents.
- Hurricanes get their energy from the _____ of very warm water.