Air Movement and the Coriolis Effect
AZ State Standards

• Concept 2: Energy in the Earth System (Both Internal and External)
• Understand the relationships between the Earth’s land masses, oceans, and atmosphere.
• PO 10. Demonstrate the effect of the Earth’s rotation (i.e., Coriolis effect) on the movement of water and air.
Content Objectives

• SWBAT describe how the Coriolis Effect alters prevailing wind and ocean currents on Earth.

• SWBAT draw convection patterns and explain how it is mechanism for heat transfer.
First Thought

• **Convection** - The transfer of heat by the circulation or movement of heated liquids or gases.

• In otherwords:
  
  • Hot air rises
  
  • Cold air sinks
Air Movements on Earth

- Radiation brings energy to Earth and heats the ground.
- Conduction moves heat from rock to air.
- But, **Convection** drives the movement of heat on Earth.
- This principle can be used to explain most weather phenomena.
Coriolis Effect

- The Earth is spinning. The drag of the spinning of Earth on the air does not allow it to travel all the way from the poles to the equator without being deflected.
Coriolis Effect
Because of the deflection of the winds and the fact that the equator spins faster than the poles, a series of deflected winds called Hadley Cells develop.
The Vacuum Effect

- Air always moves from **high pressure** to **low pressure**.
- **Warm air rising** at the Equator creates a **low pressure** vacuum.
- **Sinking air** at the poles collects to form **high pressure**.

Thus, high pressure cold air moves down towards the Equator to fill in the warm low pressure vacuum.
Coriolis Effect – Mid-latitudes

- As air rises at the Equator, it cools high in the Troposphere.
- When it moves about 30° N and S, it cools and sinks.
- This creates high pressure on the surface and the air spreads out N and S of 30°.
- This causes the air to move from the NE and SW.

This cycle is called a Hadley Cell.
Low Pressure at the Equator

- As warm air rises on the Equator, sinking air from 30°N flows in to fill the vacuum.
- But, you can see the deflection caused by the Earth spinning.
Coriolis Effect – High Latitudes

• As air moving from SW reaches 60° it runs into cold high pressure air coming from the poles.
• These two air masses hit and rise up. This creates a low pressure vacuum.
• This affects the development of storms.
The prevailing wind is the direction the wind generally blows due to the Coriolis Effect.

In most of North America, the prevailing wind is from the SW or W, these are known as Westerlies.

In Hawaii and the Caribbean, being below 30°, the prevailing wind is from the NE. These are known as Trade Winds.
A View of the Westerlies

Our prevailing winds come from the Southwest
Ocean Currents

Coriolis effect also affects ocean currents, causing a clockwise rotation in the N. hemisphere and counter-clockwise in the S. hemisphere.
How Might Ocean Currents Affect Climate on Land?
What effect do you think this has on climate and on the sea life?
Map of World Ocean Temperatures
Discussion Question

• What would the world be like if the continents looked different?
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