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Atmospheric Circulation: How Sunlight, Earth's Spin, and Wind Work Together

Have you ever stood outside and felt the wind blow across your face? Did you ever wonder what causes that wind? Wind doesn't just happen randomly. It follows patterns. These patterns stretch across the whole planet. The way air moves in these patterns is called **atmospheric circulation**. Let's start by looking at where it all begins—the **Sun**.

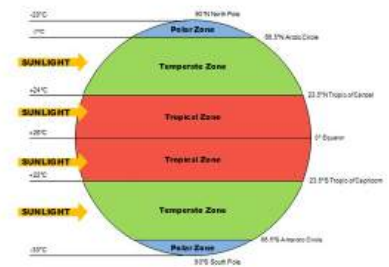
Sunlight Drives the Movement of Air

The Sun is the main source of energy on Earth. It warms the air, the land, and the oceans. But the Earth is a sphere (a ball), so sunlight does not shine equally on all parts of the Earth.

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Because of this, the Earth can be divided into **latitudinal bands**—zones that run across the planet from west to east:

- **Tropical zones** near the Equator are hot.
- **Temperate zones** between the tropics and poles are warm or cool.
- **Polar zones** near the poles are cold.



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This cycle repeats in **three major cells** in each half (hemisphere) of the Earth:

1. **Hadley Cells** (near the Equator)
2. **Ferrel Cells** (in the middle)
3. **Polar Cells** (near the poles)

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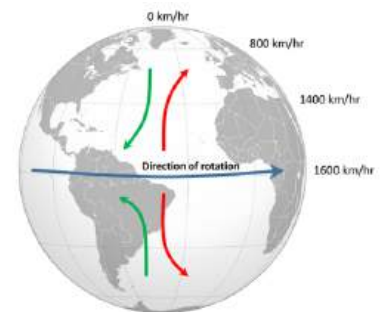
Earth's Spin and the Coriolis Effect

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As the Earth turns, it makes the moving air **curve** instead of going straight. This curving is called the **Coriolis effect**.

- In the **Northern Hemisphere**, moving air curves to the **right**.
- In the **Southern Hemisphere**, moving air curves to the **left**.

Let's break this down with an example.



Imagine you are on a spinning carousel, and you throw a ball straight across to your friend. While the

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This curving effect creates the wind patterns we see around the world.

Prevailing Winds: Global Wind Belts

Thanks to the sunlight and the Coriolis effect, winds around the Earth blow in certain directions most of the time. These are called **prevailing winds**.

There are **three main types** of prevailing winds in each hemisphere:

1. Trade Winds (from 0° to 30° latitude)

- These winds blow from **east to west**.

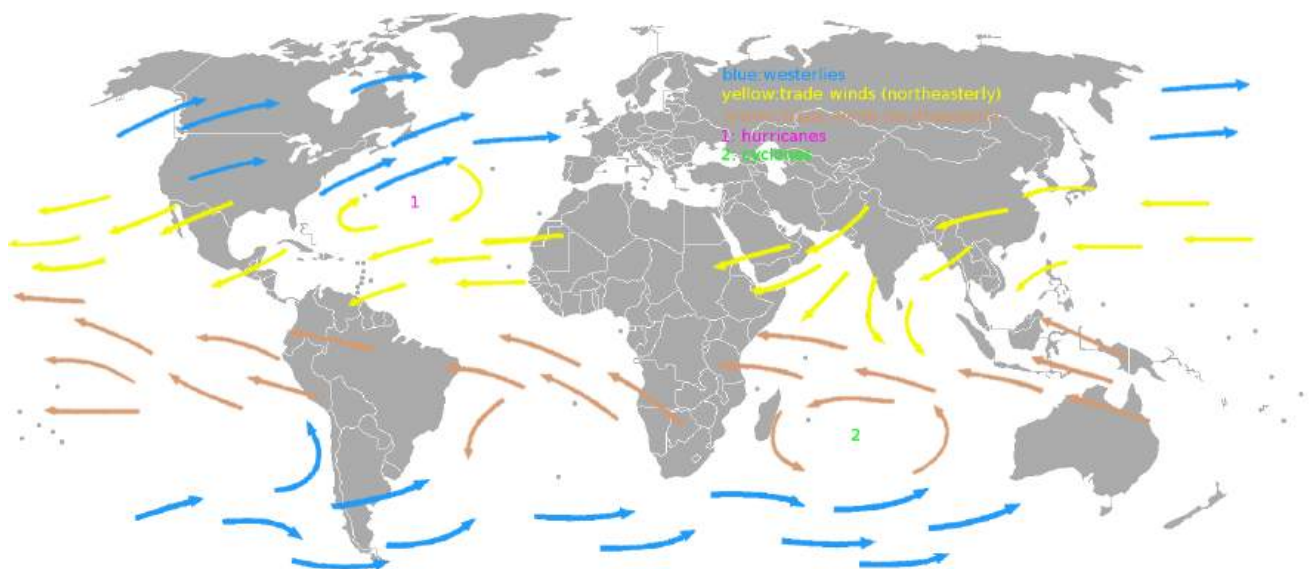
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2. Westerlies (from 30° to 60° latitude)

- These winds blow from **west to east**.
- They are found in the **temperate zones**, where most of us live.
- In both hemispheres, they help move weather systems across continents.
- In North America, the westerlies often bring storms from the Pacific Ocean across the country.

3. Polar Easterlies (from 60° to 90° latitude)

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These global winds create patterns that help shape **climates**, **weather**, and **ocean currents**. They are part of the reason some places are rainy, others are dry, and some get strong storms.

What Else Do These Wind Patterns Affect?

Wind belts don't just move air—they help move **clouds**, **storms**, and even **ocean water**.

Here are some ways atmospheric circulation affects life on Earth:

- **Rain and Dry Zones:**

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- **Storms:** The Coriolis effect also causes **hurricanes and cyclones** to spin. In the Northern Hemisphere, they spin **counterclockwise**. In the Southern Hemisphere, they spin **clockwise**.
- **Ocean Currents:** Winds blow over the surface of the ocean and



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Why Should You Care?

Understanding atmospheric circulation helps us predict the weather. It helps farmers know when to plant crops. It helps pilots fly planes safely. It helps scientists understand climate change.

Summary:

- The Sun heats Earth unevenly, creating latitudinal bands.
- Warm air rises at the Equator, and cool air sinks at the poles, setting up big loops of air flow.
- The Earth's spin causes the Coriolis effect, curving wind direction.
- This creates **prevailing winds** like trade winds, westerlies, and polar easterlies.
- These wind belts affect weather, storms, climate, and even ocean currents.

So next time you feel a breeze, remember—you're standing inside one part of a huge, planet-sized air system. Atmospheric circulation is always at work, shaping the world around you.

Reading Comprehension Questions

1. What
2. What are the three major atmospheric circulation cells called?
3. What is the Coriolis effect?
4. In which
5. What are prevailing winds?
6. What are
7. Why are
8. How do the westerlies affect North America?
9. What
10. How does wind affect ocean currents?

Extension Questions

1. What
2. What are jet streams, and how do they influence weather and air travel?
3. How do
4. How might
5. How do sailors and pilots use knowledge of prevailing winds today?

Reading Comprehension Questions KEY

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Extension Questions KEY

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