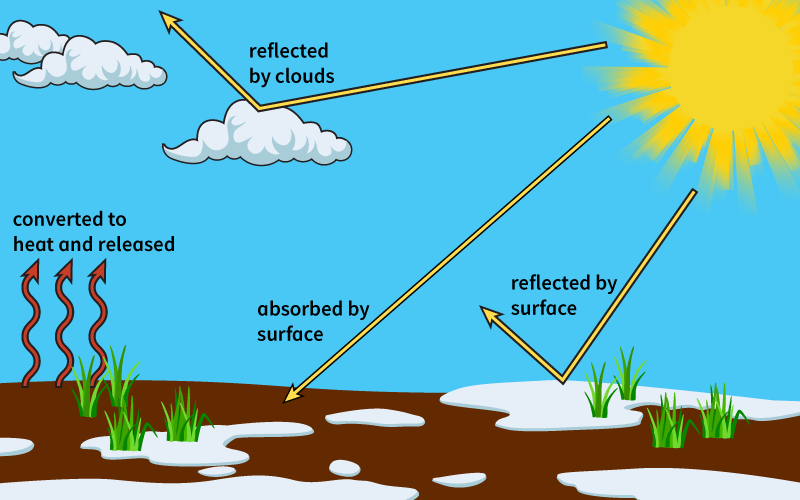
**Guided Notes: Heating Patterns**

The sun's uneven heating of Earth's surface is the primary driver of Earth's climate patterns.

**Key Concepts:**

* \_\_\_\_\_\_\_\_\_\_\_\_ refers to the general weather in a region over a long period of time.
* To \_\_\_\_\_\_\_\_\_\_\_\_ means to change from a liquid to a gas.
* A \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ is a climate characterized by average temperatures of less than 50°F (10°C).
* A \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ is a climate characterized as not having temperature or precipitation extremes.
* A \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ is a climate characterized by relatively constant warm temperatures.



**Real World Examples:**

1. In \_\_\_\_\_\_\_\_\_\_ regions near the equator, where the sun's rays strike the Earth most directly, the climate is warm and humid year-round due to the intense heat and evaporation of water.

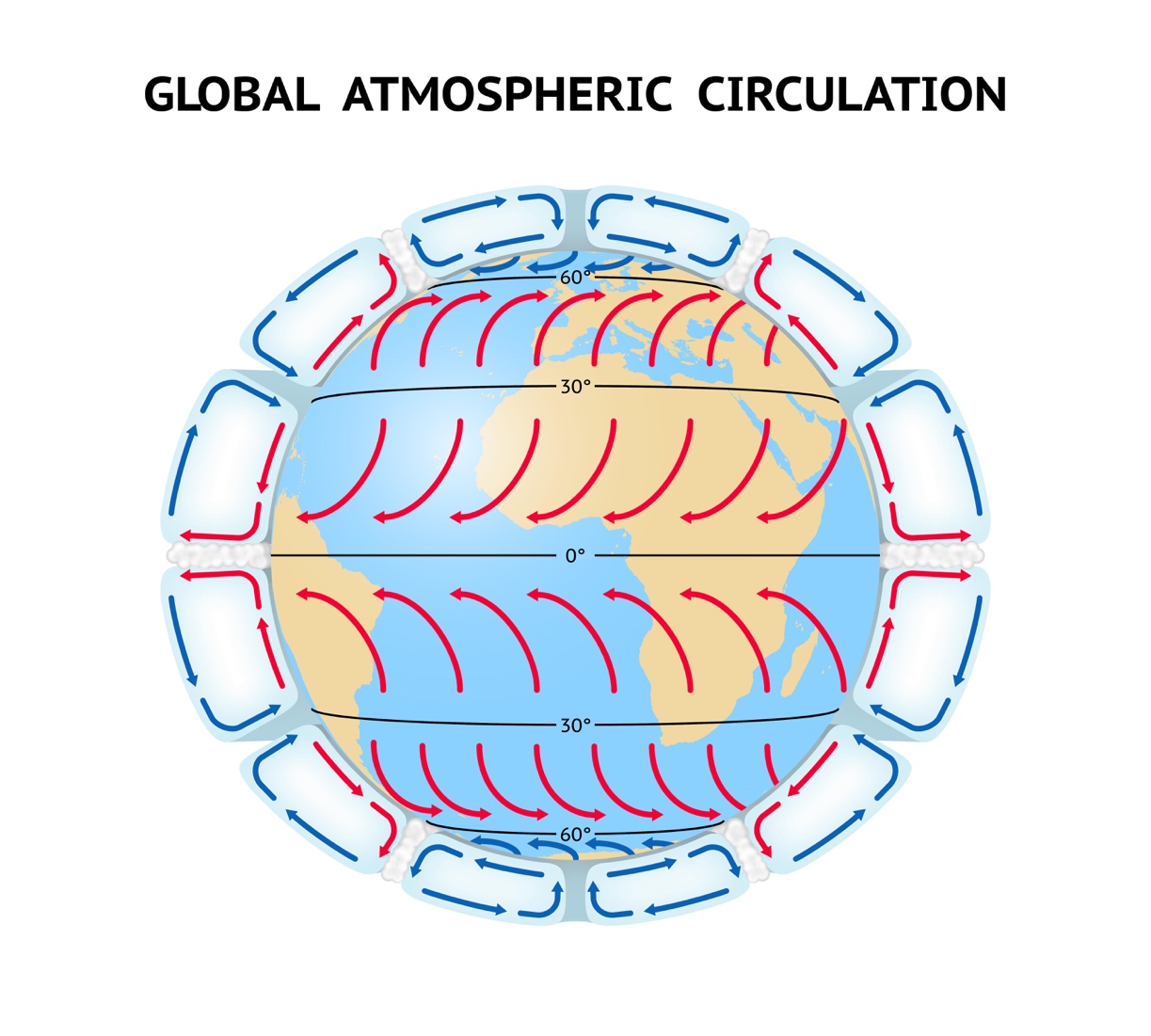
2. In \_\_\_\_\_\_\_\_\_\_ regions like Antarctica and the Arctic, the sun's rays strike at a very low angle, resulting in a polar climate with extremely cold average temperatures below 50°F (10°C).

**Guided Notes: Atmospheric Currents**

Earth's rotation and uneven heating create atmospheric circulation patterns that generate global wind systems.

**Key Concepts:**

* The \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ is the movement of air to the right in the northern hemisphere and to the left in the southern hemisphere due to Earth's rotation.
* \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ are cold winds that blow from east to west between 60°N and 90°N and between 60°S and 90°S.
* \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ are winds that blow from east to west between 30°N and 30°S.
* \_\_\_\_\_\_\_\_\_\_\_\_ are winds that blow from west to east between 30°N and 60°N and between 30°S and 60°S.



**Real World Examples:**

1. Early explorers and traders utilized the predictable \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_ blowing from east to west near the equator to help propel their ships across the oceans when sailing west.

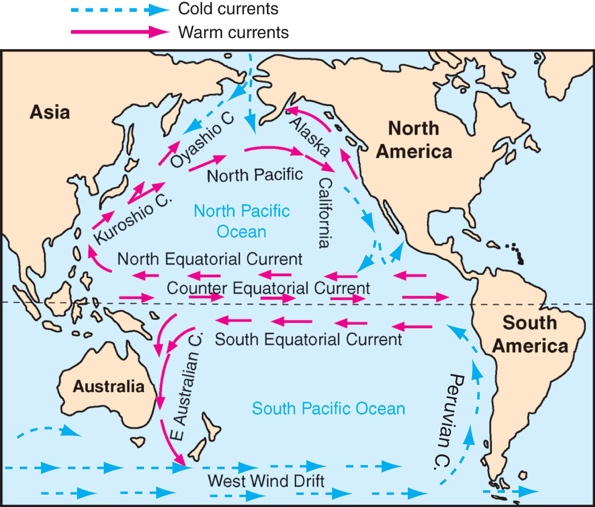
2. Soaring birds like eagles take advantage of thermal updrafts of rising \_\_\_\_\_\_\_\_ air to gain altitude and conserve energy rather than constantly flapping their wings.

**Guided Notes: Ocean Currents**

Ocean currents are caused by the heating and rotation of Earth and they have a major influence on global climate patterns.

**Key Concepts:**

* Benjamin Franklin discovered the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_, a warm current that flows from the Gulf of Mexico across the Atlantic Ocean.
* A \_\_\_\_\_\_\_\_\_\_\_\_ is the continuous movement of ocean water in a specific direction.
* Ocean currents are caused by \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ blowing over the water's surface.
* \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ air and water circulation patterns generate the prevailing winds that cause currents.
* The \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ causes currents to turn right in the Northern Hemisphere and left in the Southern Hemisphere.
* The \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ is a warm current that flows down the east coast of South America.
* Changes in ocean currents like \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ can have widespread impacts on global climate patterns.
* During an El Niño year, the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ weaken, causing warm water to shift eastward in the Pacific Ocean.



**Real World Examples:**

1. If the Gulf Stream current weakens, it could lead to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ temperatures and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ conditions in northern Europe in the future.

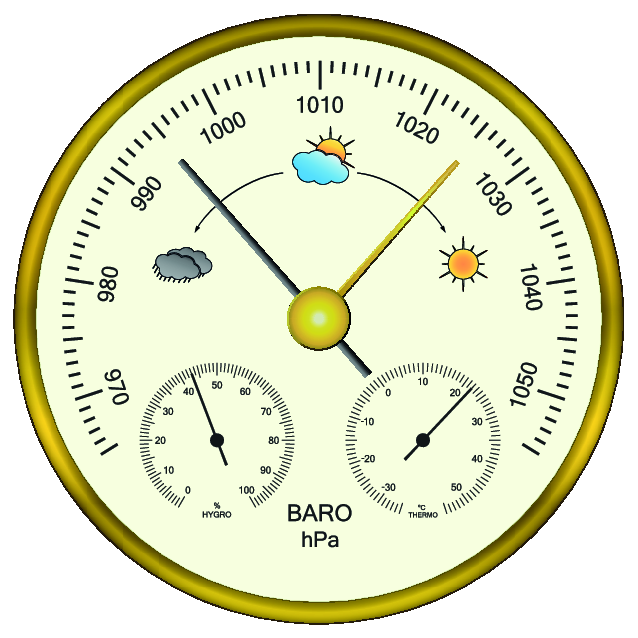
2. During an El Niño year, areas that are usually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ may experience heavy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, while typically \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ regions can have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Guided Notes: Atmospheric Circulation**

Atmospheric circulation patterns caused by variations in air pressure significantly influence regional and global climate patterns.

**Key Concepts:**

* Air \_\_\_\_\_\_\_\_\_\_\_\_ is the weight of the air above the Earth's surface.
* A \_\_\_\_\_\_\_\_\_\_\_\_ measures air pressure to help predict weather.
* Rising air creates a \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ system with clouds and precipitation.
* Sinking air creates a \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ system with warm, dry conditions.
* Areas between 0-30° latitude and 60-90° latitude are dominated by \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ that circulate air.
* The \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ is a narrow band of strong winds in the upper atmosphere that forms at 60° latitude.
* The \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ is a natural process that traps heat from the sun's rays in the atmosphere.
* Human activities are increasing levels of \_\_\_\_\_\_\_\_\_\_\_\_ gases like carbon dioxide, intensifying the greenhouse effect.



**Real World Examples:**

1. Many of the world's \_\_\_\_\_\_\_\_\_\_\_\_ are located around 30° latitude because the sinking air has lost its moisture by that latitude, creating a dry \_\_\_\_\_\_\_\_\_\_\_\_ climate.

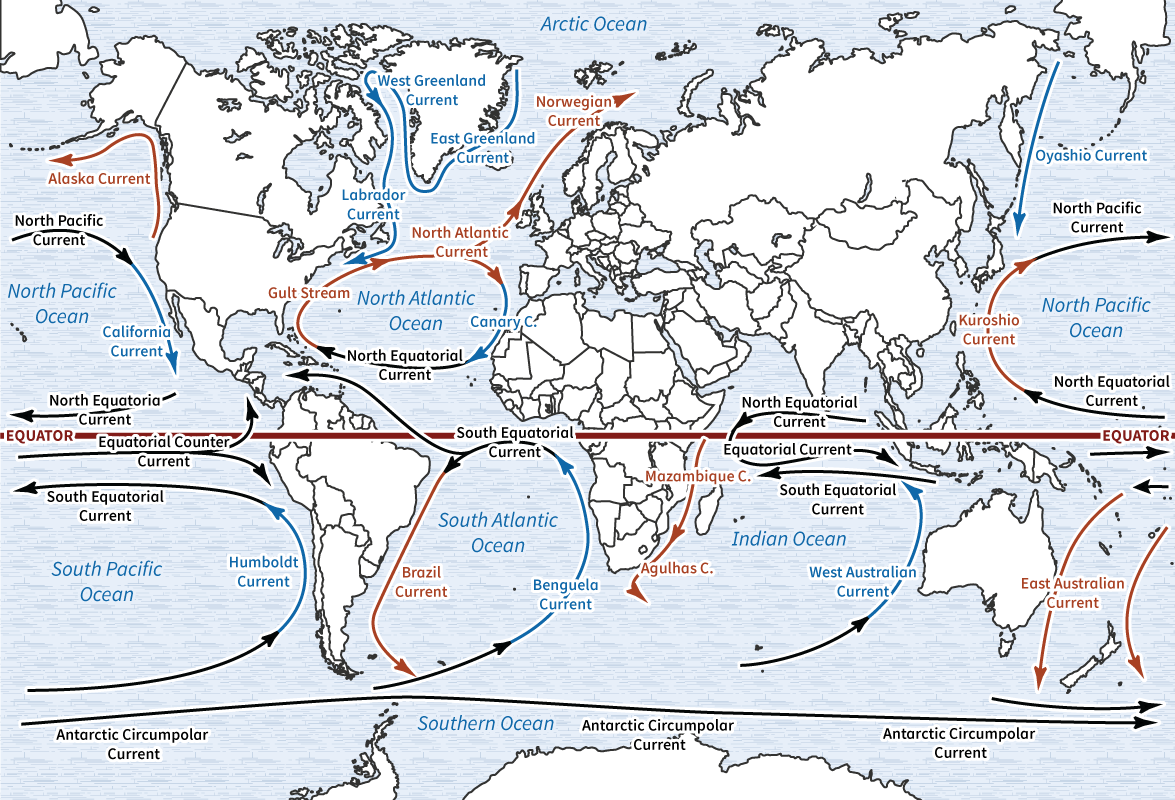
2. During an El Niño year, the \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ weaken, causing warm water in the Pacific to shift eastward, altering precipitation and temperature patterns worldwide.

**Guided Notes: Ocean Circulation**

Ocean currents play a major role in regulating the climate patterns across the globe.

**Key Concepts:**

* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a warm-water current that brings warm temperatures from the equator to Northern Europe.
* The \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ is a cold-water current that brings cold temperatures to the western coast of the United States.
* Ocean water absorbs \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ from the sun and can hold onto it for long periods of time.
* Warm ocean currents carry \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ water from the equator towards the poles.
* Cold ocean currents carry \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ water from the poles towards the equator.
* Warm currents are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ currents, while cold currents are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ currents.
* Ocean currents affect the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ above them, influencing climate patterns.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ refers to the long-term weather patterns in a specific place.



**Real World Examples:**

1. The mild climate in Iceland, with warm, damp summers and mild, windy winters, is due to the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ surrounding the island with warm, moist water, despite its location near the Arctic Circle.

2. San Francisco, California, has cooler July temperatures and a smaller difference between average high and low temperatures compared to Wichita, Kansas, because the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ influences San Francisco's climate.

**Guided Notes: Thermal Energy**

The flow of thermal energy, transferred through radiation, conduction, and convection, drives weather patterns and climate on Earth.

**Key Concepts:**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the transfer of thermal energy by waves that does not need a medium.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the transfer of thermal energy when particles come in contact.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the transfer of thermal energy by moving particles in a fluid.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the energy of the motion of particles in a substance at a given temperature.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the transfer of thermal energy.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ refers to the long-term weather patterns in a specific place.



**Real World Examples:**

1. When you run across a hot parking lot barefoot, the heat from the pavement is transferred to your feet by \_\_\_\_\_\_\_\_\_\_.

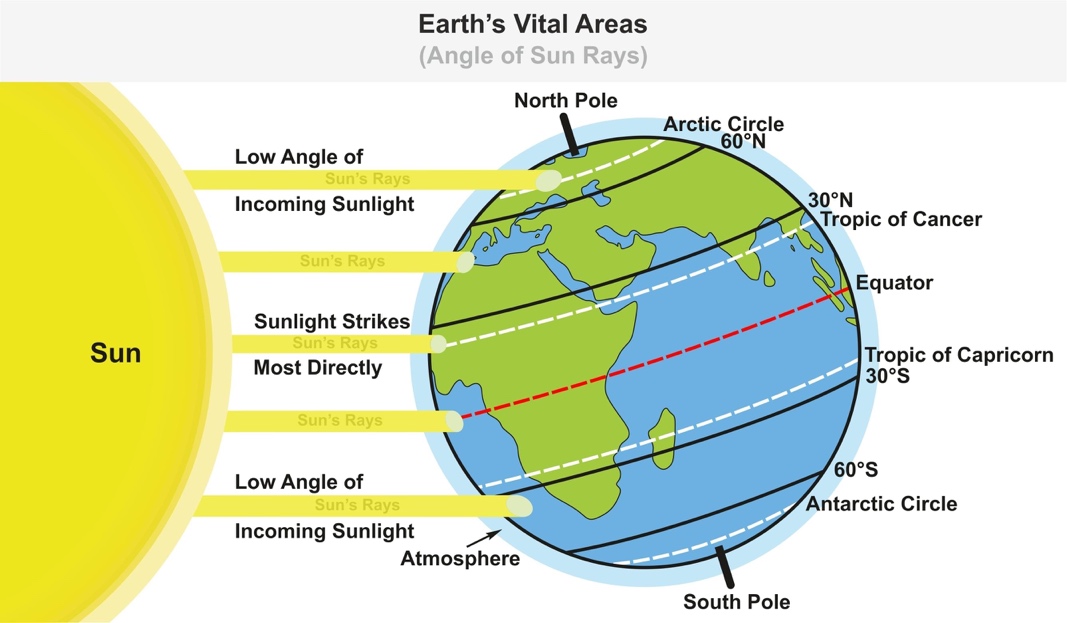
2. During the day, the land heats up faster than the water. The \_\_\_\_\_\_\_\_\_\_ air over the land rises, and the \_\_\_\_\_\_\_\_\_\_ air from over the water moves in, creating a sea breeze.

**Guided Notes: The Climate System**

The climate system is an interconnected set of parts, driven by the sun's uneven heating of Earth's surface, that regulates long-term weather patterns and climate across the globe.

**Key Concepts:**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a description of long-term weather in one place.
* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a set of parts working together as an interconnected whole.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_ gases trap heat in the atmosphere, contributing to the greenhouse effect.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the process used by plants and algae to make their own food, using the energy of sunlight.
* The sun's uneven heating of Earth's surface creates \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ that drive atmospheric circulation.
* Atmospheric circulation generates \_\_\_\_\_\_\_\_\_\_\_\_\_\_ winds and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ currents.
* Warm ocean currents transport heat towards the \_\_\_\_\_\_\_\_, while cold currents move towards the \_\_\_\_\_\_\_\_\_\_\_\_.
* Human activities like burning \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ release greenhouse gases into the atmosphere.



**Real World Examples:**

1. The \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ is a warm ocean current that brings warm temperatures from the equator to Northern Europe, allowing certain marine life to travel farther north than usual and creating a milder climate in areas like Iceland.

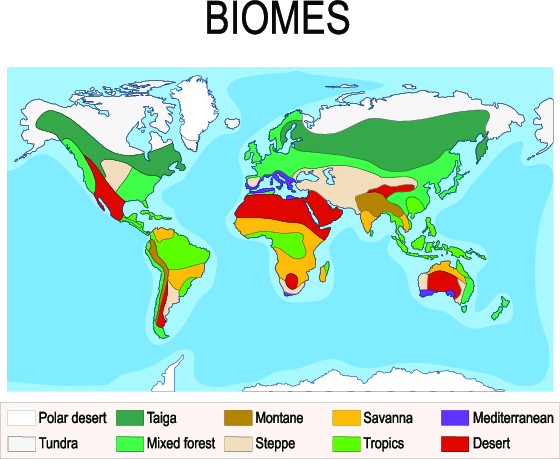
2. In the fall, many areas experience stronger winds than in the summer months. This is because the increased temperature difference between the equator and the poles leads to more intense convection currents in the atmosphere, generating stronger prevailing winds.

**Guided Notes: Earth’s Biomes**

A biome is a group of regions on Earth that have similar plant and animal life due to similar climatic conditions.

**Key Concepts:**

* A \_\_\_\_\_\_\_\_\_\_\_\_ is a group of regions on Earth that have similar plant and animal life.
* The major terrestrial biomes include tropical rainforest, \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ forest, grassland, taiga, desert, and tundra.
* Tropical rainforests receive over \_\_\_\_\_ cm of precipitation per year and have warm temperatures year-round.
* Deciduous forests have \_\_\_\_\_ summers but cold winters, with trees shedding leaves seasonally.
* Grasslands receive \_\_\_\_\_ to \_\_\_\_\_ cm of precipitation per year and have grasses and flowering plants.
* The taiga gets \_\_\_\_\_ to \_\_\_\_\_ cm of precipitation, mostly in summer, and has pine, spruce, and fir trees.
* Deserts are the driest biomes, receiving no more than \_\_\_\_\_ cm of precipitation per year.
* The tundra is extremely cold, with permanently frozen soil called \_\_\_\_\_\_\_\_\_\_\_\_\_\_.



**Real World Examples:**

1. The \_\_\_\_\_\_\_\_ trees found in tropical rainforests are among the tallest in the world, with kapok trees able to grow over \_\_\_\_\_\_\_\_ feet tall.

2. In the \_\_\_\_\_\_\_\_ biome, trees and plants cannot grow deep roots because of the layer of permanently frozen soil called \_\_\_\_\_\_\_\_\_\_\_\_\_\_.