

Mechanisms that Influence the Earth's Climate System

For each area, identify what it is and how it is related to climate.

	What it is	How it works	How it influences weather
Earth's Tilt, Rotation and Revolution	The Earth revolves around the sun over a period of 365 days. At the same time the earth spins which takes 24 hours for a full rotation. The Earth spins on a tilted axis with an angle of 23.4°.	The Earth spins to conserve angular momentum and keep its balance. The tilt of the earth is a result of both its formation as well as collisions of large objects such as proto-planets. The Earth revolves around the sun at the optimal distance to maintain liquid water.	The tilt of the Earth on its axis drives the seasons. Summer occurs in the hemisphere that is tilted towards the sun and winter in the hemisphere tilted away. Rotation of the planet also causes the Coriolis Effect, while the constant sun on the equator due to tilt drives the prevailing winds.
Jet Streams	Jet streams are a narrow, variable band of very strong, predominantly Westerly air currents encircling the globe several miles above the earth. Typically, there are two or three jet streams in each Hemisphere.	The turning of the earth (Coriolis Effect) causes the air to flow to the right in the Northern hemisphere and left in the	Jet streams can push air masses around and effect weather movement patterns. The fast movement of these winds can interrupt or prevent the movement of air masses.
Hydrosphere	The hydrosphere is the water component of earth. It includes all the water on the Earth's surface such as lakes and seas. It also includes the water above the Earth's surface such as water in the atmosphere and below the surface in ground water and aquifers.	Earth's hydrosphere works as a cycle between ground water, surface water, and atmospheric water. This cycle or flow of water is primarily due to the heating and cooling of water due to the sun and atmosphere.	The hydrosphere is in constant movement, moving water and heat throughout the atmosphere in the form of water vapor and precipitation. As seen in the extreme weather video, changes in atmospheric water can impact storm cell creation.
Climate Zones	A climate zone is the divisions of the Earth's climates. It is divided according to the different climates. There are 3 main climate zones: Tropical, Temperate and Polar.	Climate zones exist due to all the climate factors. One of the largest factors is due to distance from the equator having a large impact on temperatures within the climate zone.	Weather within individual climate zones is typical of the zone in which it occurs. Tropical has almost completely hot weather and only two seasons wet and dry. Temperate is generally warm with differences in weather based on seasons. Polar is always cold.
Coriolis Effect	The Coriolis Effect is a pattern of deflection that seems to act on objects in motion that are not connected to the ground as they travel around the world.	An object moving long distances deflects toward the right in the Northern hemisphere and to the left in the Southern hemisphere in the direction of Earth's rotation. It is caused due to the rotation of the Earth and is zero at the equator and maximum at the poles.	Responsible for many large-scale weather events. Coriolis effect has an impact on the way the wind blows. It can also change the way hurricanes move. It causes storms to swirl clockwise in the Southern hemisphere and counter clockwise in the Northern hemisphere.

<p>Prevailing Winds</p>	<p>Prevailing winds are winds that blow consistently in a given direction over a particular region of Earth. There are three types: tropical Easterly (trade winds) 0 to 30° latitude, Westerly winds at 30° to 60°, and polar Easterly winds at 60° to 90°</p>	<p>Heat from the sun warms up the air around the equator where the sun's rays are the most direct and cause the air to expand and rise. As the air rises it cools and loses its water vapour as rain. The rising and falling of air causes it to circulate which creates wind spots around the planet. The air then continues to circulate due to the turning of the earth.</p>	<p>Prevailing winds are important for determining the amount of precipitation different parts of the world get. Example: Where hot air meets cold air, rain bearing depressions form and cause cool, rainy climates.</p>
<p>Ocean Currents</p>	<p>Ocean currents are constant movements of water throughout the ocean. They can occur at the surface or at deeper levels. Ocean currents are classified based on three categories: drift (direction of flow, current (shape), and speed.</p>	<p>The movement of water that is continuously generated by forces such as temperature, winds, salinity, and density. Coriolis Effect plays a large role in driving ocean currents. Currents depend on the wind's direction, the Earth's rotation, and tectonic shifts. Density differences between masses of water also affect current</p>	<p>Ocean currents move around warm and cold water which can have a large impact on weather. An example would be Trondheim, Norway having a temperature of -1°C while Iqaluit at similar latitude averages -30°C. This is due to the Gulf Stream driving warm waters from the Gulf of Mexico to the coast of Europe.</p>
<p>Solar Energy</p>	<p>Solar energy is light, and heat emitted from the sun. It is radiant energy. More solar energy will reach the equator, while other areas of the Earth will have more solar energy during the spring and summer.</p>	<p>The Sun undergoes a process of nuclear fusion. Fusion releases massive amounts of energy out into space. Of all the energy that reaches earth ~15% will get reflected into space. ~30% evaporates water which then reaches the atmosphere. Some energy is also absorbed into the Earth which acts to heat the surface.</p>	<p>The solar energy from the Sun heats the planet. The solar energy evaporates water which then rises in the atmosphere and thus creates precipitation. Water precipitating in the atmosphere releases energy which can "drive" storms to form.</p>
<p>Clouds</p>	<p>A visible mass of condensed water vapor in a layer of the atmosphere called the stratosphere up to the mesosphere.</p>	<p>Clouds form when moist, warm rising air cools and expands in the atmosphere. The water vapor in the air condenses to form tiny water droplets which are the basis of clouds.</p>	<p>Clouds warm/cool the earth's atmosphere by absorbing heat and radiating it to space. Clouds warm and dry Earth's atmosphere and supply water to the surface by forming precipitation.</p>
<p>Land Masses</p>	<p>Land masses are any large body of land. Land masses include continents or mountain structures, or islands. The land itself has many properties that affect climate as well as its structure itself.</p>	<p>Land masses through certain properties will play a role in influencing climate. Surface reflectivity or albedo will impact the level of solar energy reflected. Water-holding capacity will impact the amount of water put in the atmosphere through evaporation. Roughness of surface can affect wind flows.</p>	<p>Surface structures such as mountains can have further effects by acting as an obstacle to travelling air masses, forcing air to rise above and thus cool, forming rain and snow. This can lead to a dry climate on the opposite side of the mountain as the air will have lost water vapour.</p>

Big ideas to remember:

Remember that all these factors making up climate interact with each other and impact each other. Therefore, changes in one factor can influence the whole system.