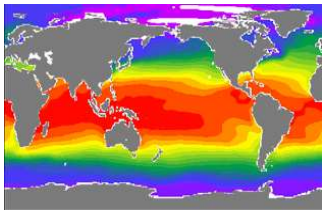
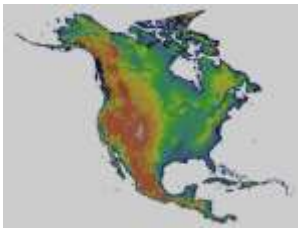
TEACHER BACKROUND:
WHAT IS CLIMATE?

Climate is defined as an area's long-term weather patterns. The simplest way to describe climate is to look at average temperature and precipitation over time. Other useful elements for describing climate include the type and the timing of precipitation, amount of sunshine, average wind speeds and directions, number of days above freezing, weather extremes, and local geography.

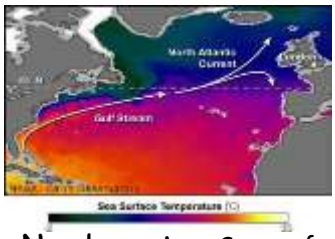
The climate of any particular place is influenced by a host of interacting factors. These include **latitude**, **elevation**, **nearby water**, **ocean currents**, **topography**, **vegetation**, and **prevailing winds**. The global climate system and any changes that occur within it also influence local climate. Each climate control factor below might control climate at any given location.



Latitude -Surface temperatures vary with latitude



Elevation-Climate zones match roughly with elevation ranges.

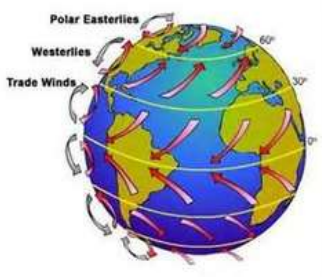


Nearby water-Sea surface temperatures affect land temperatures

Ocean currents-Water temperatures indicate transfer heat by currents

Topography-Local variations in elevation cause local variations in climate

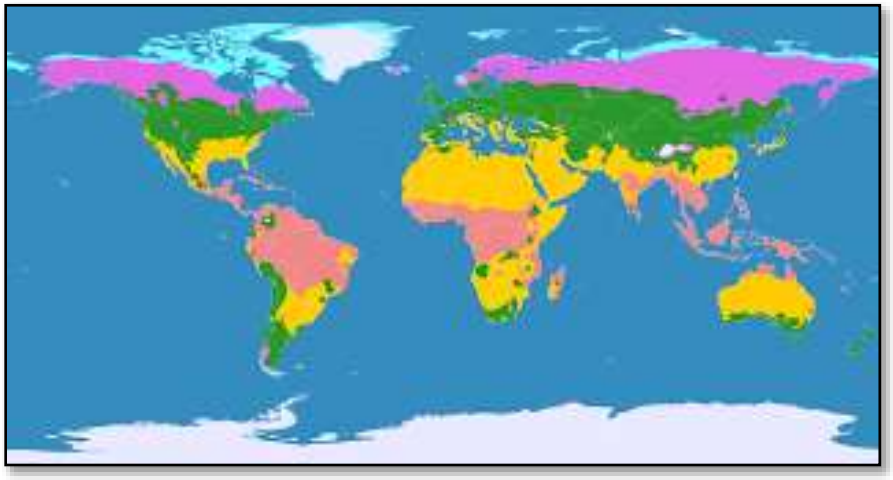
Vegetation-Type of transfer of cover and seasonal changes affect climate



Prevailing winds-Deliver air masses with specific properties

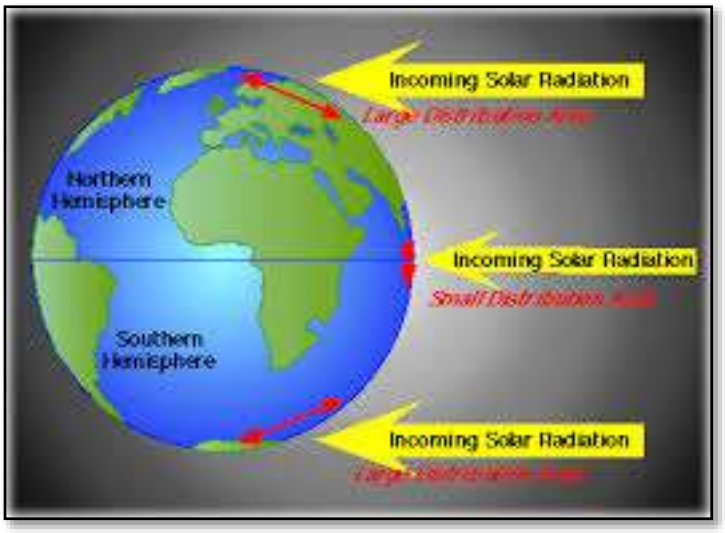
Climate represents the average of many years' worth of weather conditions. This averaging process evens out the blips caused by droughts, flood, tornadoes and hurricanes, and blizzards and downpours, but at the same time emphasizing the more typical patterns of rainfall and temperature highs and lows.

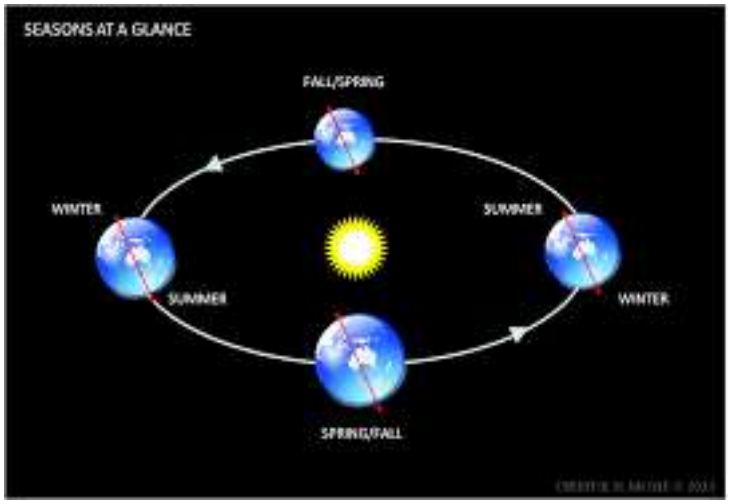
Climate is so predictable because it is dependent on regularly fixed features of the Earth, including its form, the shape of its orbit around the Sun, and the tilt of its axis of rotation. Other factors are the fact that it has an ocean, continents, and a layered atmosphere composed of many different gases. To simplify the classification of the many regions or ***climate zones*** of the Earth it is unnecessary to focus in on two of the approximately 7 factors that were mentioned: the latitude of a location and its proximity to the ocean.



Earth's climate zones

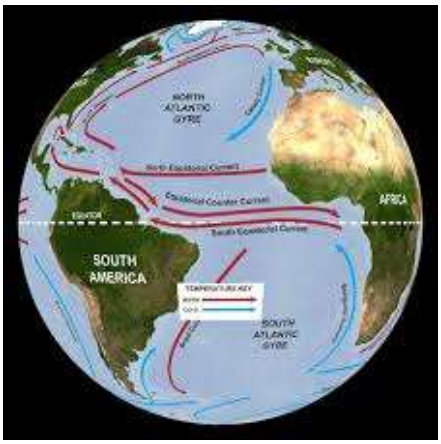
Radiation from the Sun plays a major role in Earth's climate. The amount of solar radiation received from the Sun basically depends on latitude. At the equator the Sun's rays are most directly overhead and most directly focused on Earth's surface. As you move toward the poles, the position of the Sun is lower in the sky and for that reason the energy received is spread out over a larger area making it less intense. This is why the tropics are warm and the poles are so cold.



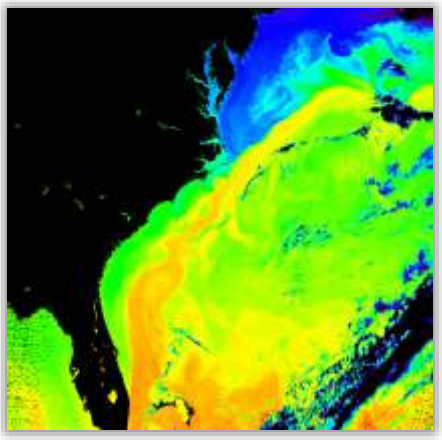


Seasonal contrast: How hot the summers are and how cold the winters are, also changes with latitude. The seasons themselves are do not depend on latitude, but on the fact that the Earth's axis is tilted. When the axis is tilted toward the Sun, summer occurs. When the axis is tilted away, it is winter. The effect of this tilt is felt the most in the polar regions and is why these regions experience 24 hours of daylight in summer and almost total darkness in winter.

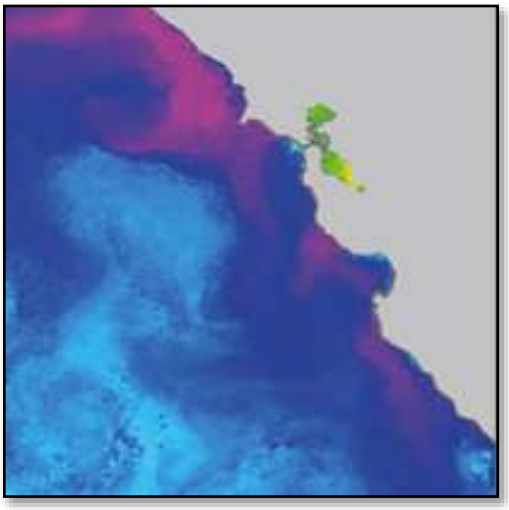
Another factor that is incredibly important to consider when investigating regional or local climate is its proximity to the oceans. The oceans play a critical role in storing heat. When the earth's surface cools or is heated by the sun, the temperature change is greater - and faster - over the land than over the oceans.



Ocean currents circulate the effects of temperature change slowly for great distances through straight up and down mixing and surface movements. Horizontal currents, particularly those moving north or south, can carry warmed or cooled water as far as several thousand miles. The displaced water can then warm or cool the air and, indirectly, the land over which this air blows.

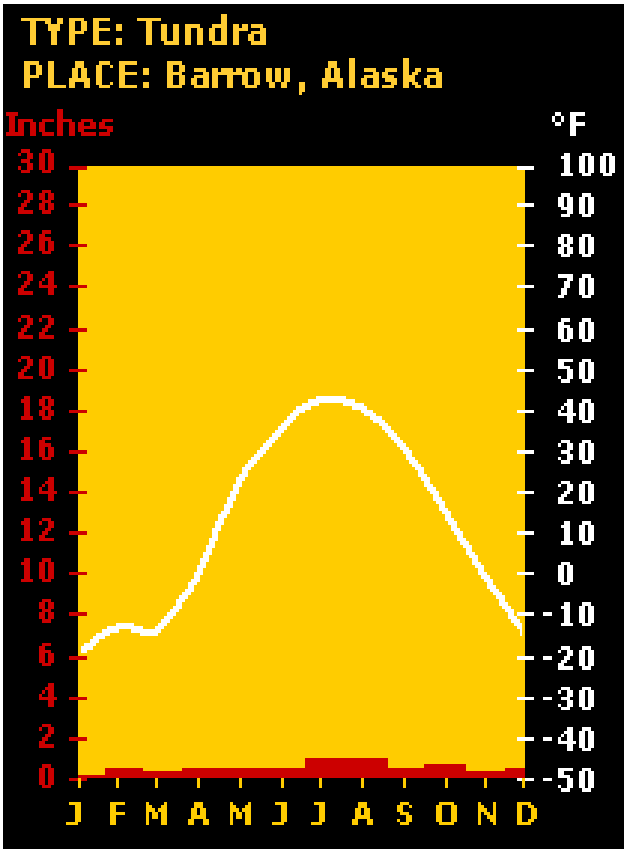


So coastal regions profit from their moderating influence, while the interiors of the continents experience rapid and more intense seasonal changes. For example, water from the tropical and subtropical Atlantic, including some from the Gulf of Mexico, moves north through the Atlantic in a current called the ***Gulf Stream***, which appears above in orange and yellow. It eventually reaches the shores of Western Europe, which has a climate that is surprisingly mild for that latitude.



In addition to currents, ***up-wellings*** of cold water in places where the wind blows surface water away can also affect climate. San Francisco, influenced by coastal up-welling, is hardly warmer than Dublin, Ireland, which is influenced by the Gulf Stream, despite being over 1,600 km further south. The purple and blue in the photo to the left identify the cold water upwelling of San Francisco Bay.

A quick way to get an idea of the climate of a particular place is to look at a "climate graph," or "climgraph." A ***climate graph*** is what scientists create to show a particular location's average temperature and precipitation during the year. Below is a climate graph for Barrow, Alaska. A description of each of the parts is given below. In addition latitude, longitude and elevation made be included.



- The type of biome associated with the place.
- The place where the temperature and precipitation were measured.
- A scale used to indicate inches of precipitation.
- The months of the year. (Note: The letters J, F, M, etc., stand for January, February, March, etc.)
- The temperature scale in degrees Fahrenheit.
- A bar graph showing the average precipitation for each month. (Note: Values for this graph are found on the left-hand scale.)
- A line graph showing monthly temperature during the year. (Note: Values for this graph are found on the right-hand scale.)