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Geography Essentials

Physical Systems

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Geography Standards: Essential Element Three

PHYSICAL SYSTEMS

STANDARD 7: The physical processes that shape the patterns of Earth's surface.

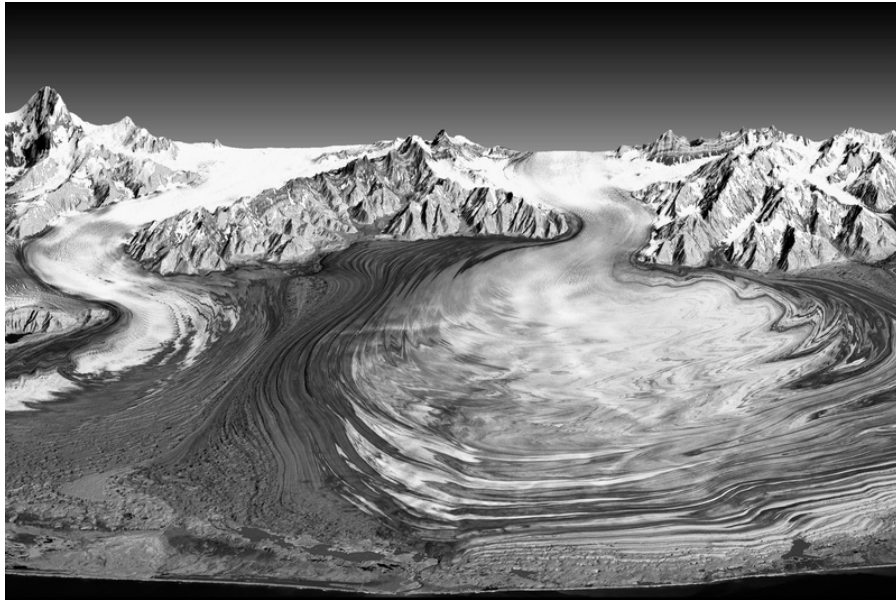
STANDARD 8: The characteristics and spatial distribution of ecosystems on Earth's surface.

**From the National Council for Geographic Education:
Eighteen National Geography Standards**
(<http://www.ncge.org/publications/tutorial/standards/>)



Physical Systems

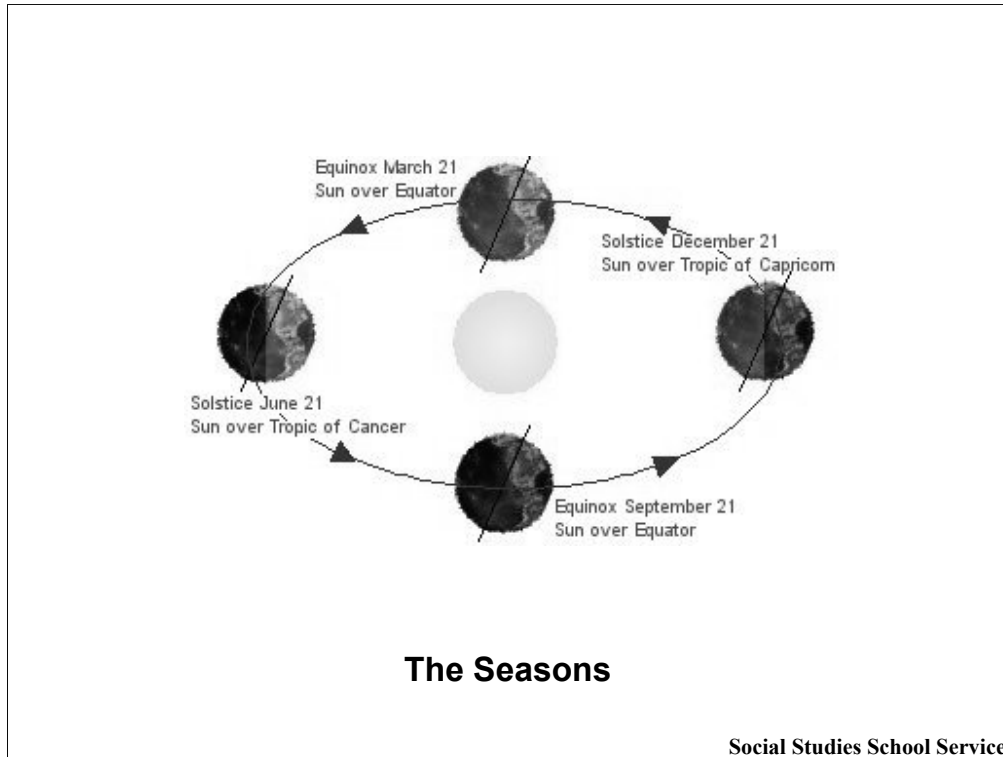
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(Geography Standard 7)

The earth's physical processes range from weather and climate to plate tectonics and erosion. All of these processes shape and change the features of the planet. Most of these changes occur gradually (such as erosion and movements of the earth's plates), but others can be sudden and catastrophic, such as earthquakes and tornadoes.



Let's start by examining climate, which is directly affected by the earth's relationship with the sun.

Look carefully at this diagram. Notice that you can see the same view of the earth in each of the four drawings of the planet. North America is always in the upper right portion of the globe.

The globe at the left side of the diagram is experiencing the northern hemisphere summer solstice on June 21. The globe at the right shows the northern hemisphere winter solstice on December 21. The amount of sunlight reaching the northern hemisphere is much greater in June than in December. These differences affect not only temperatures but also the length of days, which get much shorter in the winter.

The globe at the top shows the vernal equinox (the beginning of spring) on March 21. The globe at the bottom shows the autumnal equinox (the beginning of autumn) on September 21. The northern hemisphere receives the same amount of light at both of these times. At both the vernal and the autumnal equinox, the sun lies directly over the equator.

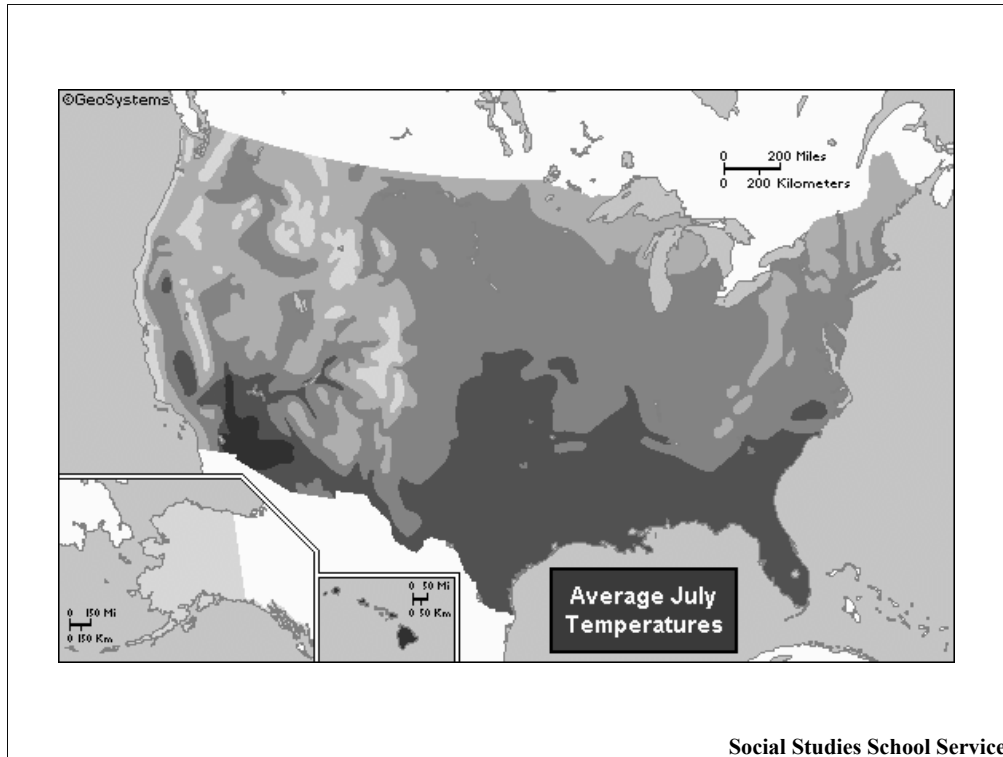
The sun's position in relation to the earth directly affects climate, making the polar regions cold, the equatorial regions hot, and the regions between the poles and the equator varying degrees of warm and cool, depending on their latitude.



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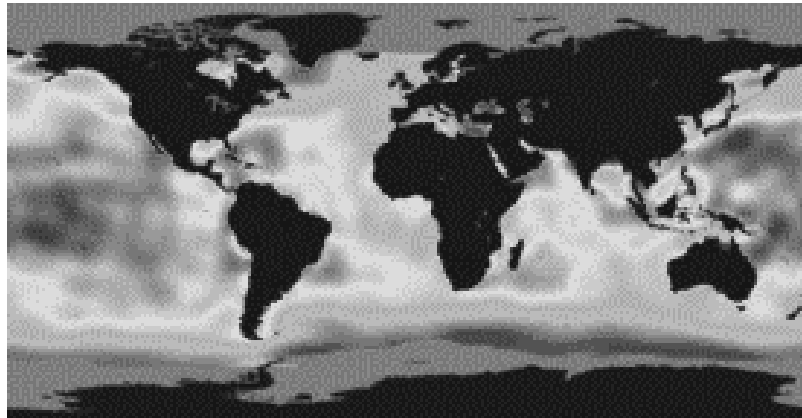
Ocean temperatures and currents also have a major impact on climate.

Have you ever realized that inland areas such as the Midwest have greater temperature extremes throughout the year than the coastal areas, particularly the Pacific Coast? The surface of an ocean (or a large lake) warms and cools more slowly than the surface of land does. The temperature of the air above the water is affected by the water temperature. Thus, if a body of water has a moderate temperature, it will make air temperatures near that body of water more moderate than air temperatures further inland.



This is particularly true for land areas that lie immediately downwind of large bodies of water. Since wind generally flows eastward, land areas east of large bodies of water tend to have the most temperate climates. This is why the West Coast of the United States has more moderate temperatures than the East Coast, although the area directly on the Atlantic coast has more moderate temperatures than areas slightly inland.

Take a look at this map. Notice how the average July temperatures are lower along the Pacific Coast than slightly inland, even at the same latitudes. (The lighter the shade of red, the cooler the temperatures).



Ocean Currents

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The red areas on this map represent warmer currents. Green areas are less warm, and blue, purple, and gray each become progressively colder.

Cold currents at the surface form in the polar and temperate regions and flow toward the equator. Similarly, warm currents form near the equator and flow toward the temperate regions. Currents are propelled primarily by the earth's rotation and wind patterns.

Cold waters tend to be nutrient-rich. Deep, cold water will rise toward the surface, and nutrients and animal life rise with it. Where on this map do you think you'd find particularly nutrient-rich waters?