

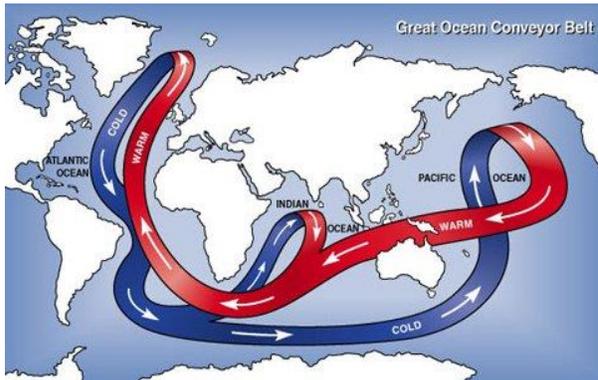
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INTERACTION BETWEEN SUN, OCEAN, AND WEATHER

The Sun is the source of most of the heat energy on Earth. The energy travels through space and enters the Earth system through the atmosphere. Some of the energy is absorbed by land and oceans and some is released back into space. The balance between energy absorbed and energy released is delicate. The balance means the difference between the planet being too warm or too cool. Currently, the system maintaining Earth's heat is out of balance.

The heat energy from the Sun provides the "fuel" for Earth's weather. Since the earth is tilted on its axis, areas of the earth do not receive heat energy equally. The equator receives more direct energy, while the poles receive much less. This uneven heating causes differences in temperature and pressure of large air masses. Because of the differences, the air masses move, creating Earth's weather.

Oceans act as a system to distribute heat energy around the globe. Since land and water differ in specific heats, each absorbs and holds heat energy differently. Water heats slowly and once heated, loses energy slowly. Oceans and other large bodies of water have a great effect on the lands they border.



Picture illustrates a global ocean circulation between deep, colder water and warmer, surface water strongly influences regional climates around the world.

Image courtesy Argonne National Laboratory.

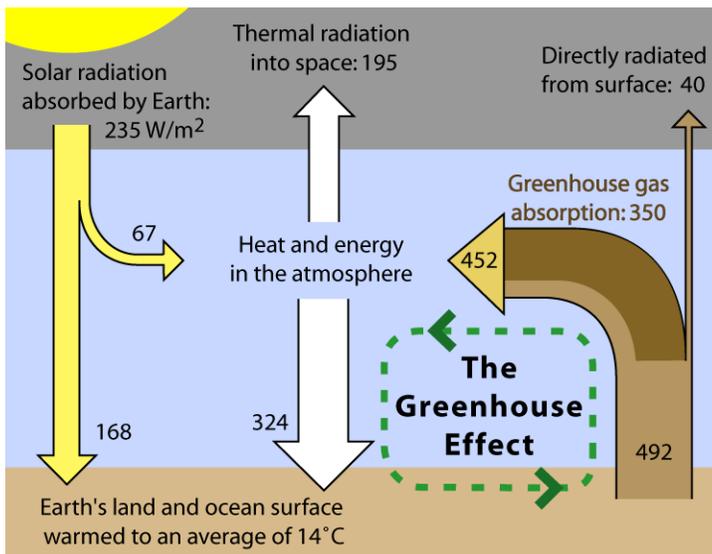
Climate is the average weather of an area over many years. The climate of a region is affected by the amount of sunlight the region receives and different geographic factors, such as how close the area is to an ocean. Areas close to oceans receive the heat carried by ocean currents. Large masses of air warmed by the ocean's energy, move toward coastal regions and give up their heat to the land. Two cities,

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located at the same **latitude**, can have very different climates if one is in the middle of the **continent** and the other is on a **coast**.

If the distribution of heat by the oceans is **disrupted** or the amount of heat absorbed or released is **changed**, climate can be affected. Currently, the amount of heat absorbed in the Earth system is **increasing**. One of the factors causing the increase is called the **greenhouse effect**. Gases, such as water vapor, methane, nitrous oxide and carbon dioxide allow the atmosphere to **absorb** heat energy that is released by the earth. These gases trap the heat energy and do not allow it to **radiate** back into space.

There are a lot of contributors to greenhouse gases. **Carbon dioxide** is released by burning fossil fuels and through forest fires. **Volcanic eruptions** also release carbon dioxide into the atmosphere. **Methane** is produced by farm animals and microbes in natural wetlands. Nitrous oxide is produced when **fertilizers** are overused and breakdown in the soil.



The greenhouse effect **disrupts** the Earth's heat energy balance. The trapped energy **heats** the globe, which in turn **melts** glaciers and ice caps. This may cause sea levels to **rise**. The additional fresh water added to the ocean dilutes the **salinity** (amount of salt) of some ocean currents and changes the **density**. The **movement** of the ocean current system is altered by

the change in density. Since ocean currents distribute **heat** energy, the climate of coastal areas can be changed. For example, areas with **moderate** climates begin to experience less moderate weather.



Scientists fear that polar bears may become extinct within 100 years as their Arctic habitat shrinks due to global warming.

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