

How Heat is transferred

Heat is the transfer of thermal energy from a hotter object to a cooler one. **Heat is transferred in three ways: radiation, conduction, and convection.**



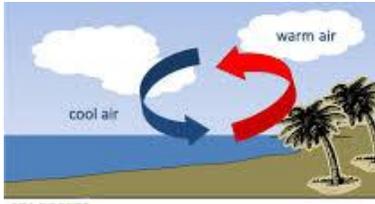
Radiation: Have you ever felt the warmth of the sun's rays on your face? You were feeling energy coming directly from the sun as radiation. Radiation is the direct transfer of energy by electromagnetic waves. Most of the heat you feel from the sun travels to you as infrared radiation. You cannot see infrared radiation, but you can feel it as heat.

Conduction: Have you ever walked barefoot on hot sand? Your feet felt hot because heat moved directly from the sand into your feet. The direct transfer of heat from one substance to another substance that it is touching is called **conduction**. When a fast-moving sand molecule bumps into a slower-moving molecule, the faster molecule transfers some of its energy.

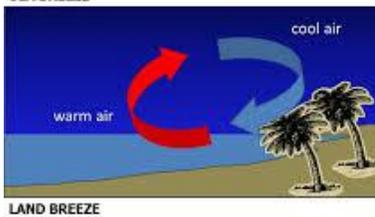


Molecules in a substance that are closer together are more effective at conducting heat. Conduction works well in some solids, such as metals, but not as well in liquids and gases. Air and water do not conduct heat very well.

Convection: In fluids (liquids and gases), particles can move easily from one place to another. As the particles move, their energy goes along with them. The transfer of heat by the movement of a fluid is called **convection**.



Heating the Troposphere: Radiation, conduction, and convection work together to heat the troposphere. During the day, the sun's radiation heats Earth's surface. The land becomes warmer than the air. Air near Earth's surface is warmed by both radiation and conduction. However, heat is not easily transferred from one air particle to another by conduction. Only the first few meters of the troposphere are heated by conduction. Thus, the air close to the ground is usually warmer than the air a few meters up.



Within the troposphere, heat is transferred mostly by convection. When the air near the ground is heated, its particles move more rapidly. As a result, they bump into each other and move farther apart. The air becomes less dense. Cooler, denser air sinks toward the surface, forcing the warmer air to rise. The upward movement of warm air and the downward movement of cool air form **convection currents**. Convection currents move heat throughout the troposphere.

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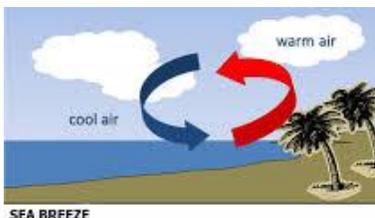
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