

**In this chapter, you will be able to**

- identify and describe the main characteristics of the atmosphere and hydrosphere;
- describe and explain heat transfer within the water cycle and how the atmosphere and hydrosphere store heat;
- describe and explain heat transfer in the atmosphere and hydrosphere and its effect on air and water currents;
- describe and explain the development of winds, clouds, and pressure gradients in the atmosphere;
- investigate factors that affect weather-related phenomena, such as the angle at which the Sun's rays strike Earth and the rate at which water evaporates;
- formulate and investigate questions about weather-related issues, including rescue operations during bad weather;
- explain how people have utilized their understanding of weather patterns to participate in activities such as hot-air ballooning.

## 13.2

## Earth's Energy Balance

- Almost all of the energy comes from the Sun.

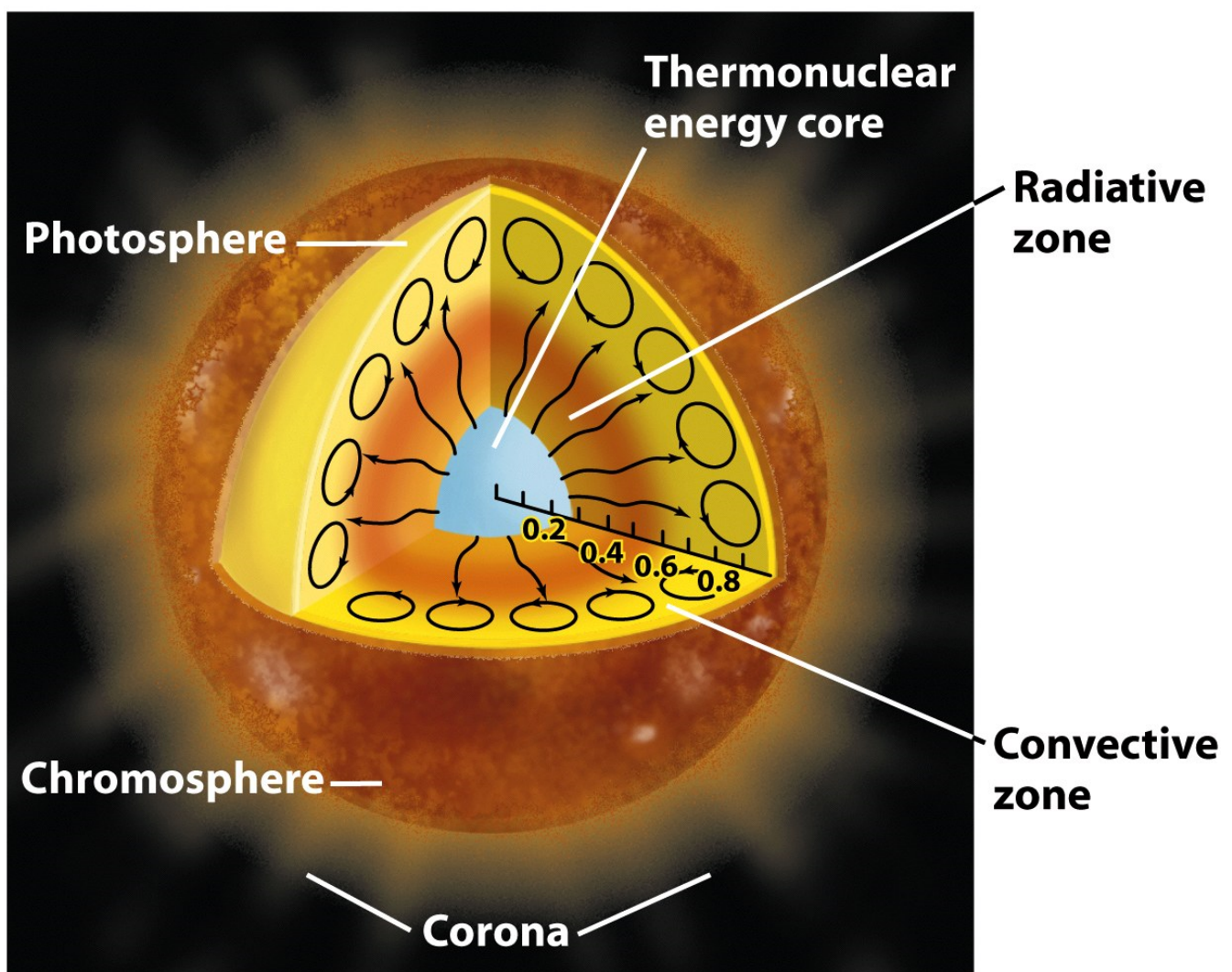


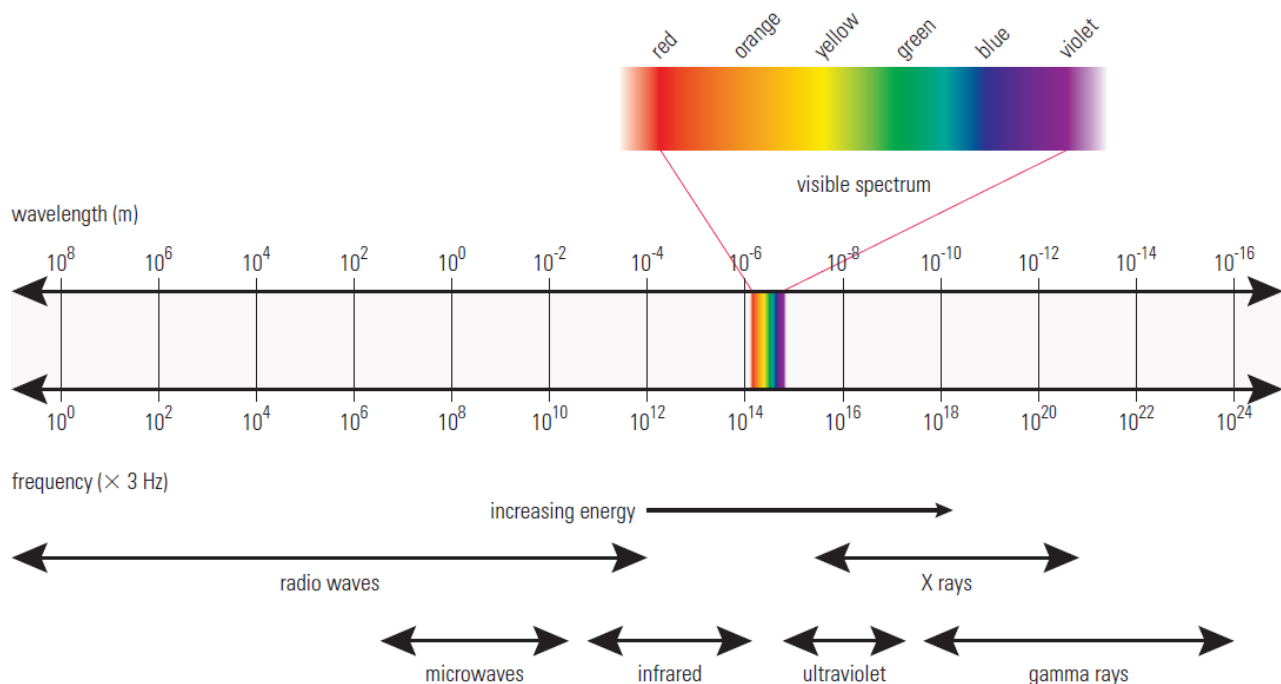
Figure 10-21a  
*Discovering the Universe, Eighth Edition*  
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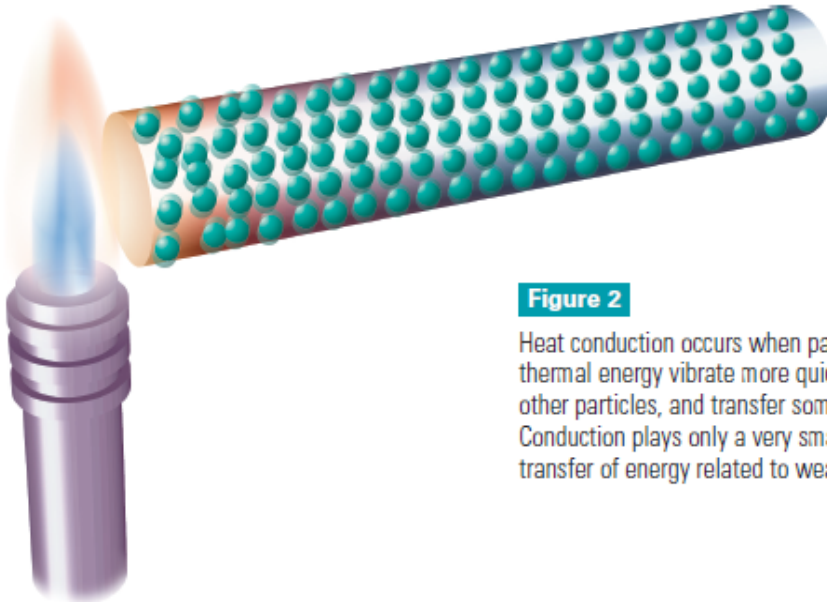
## Transfer of Energy

### Did You Know?

A small portion of energy available on Earth comes from nuclear reactions in Earth's core.

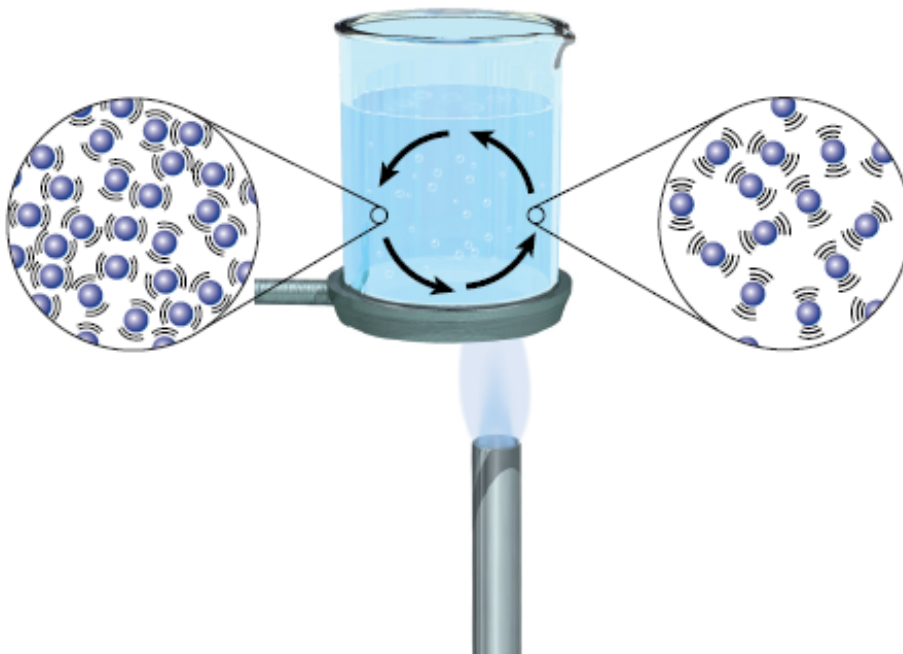
- Radiation
  - > Transfer of energy via waves.
  - > Travel from Sun to Earth.
  - > Earth receives the entire electromagnetic spectrum of radiation from the Sun.



**Figure 2**

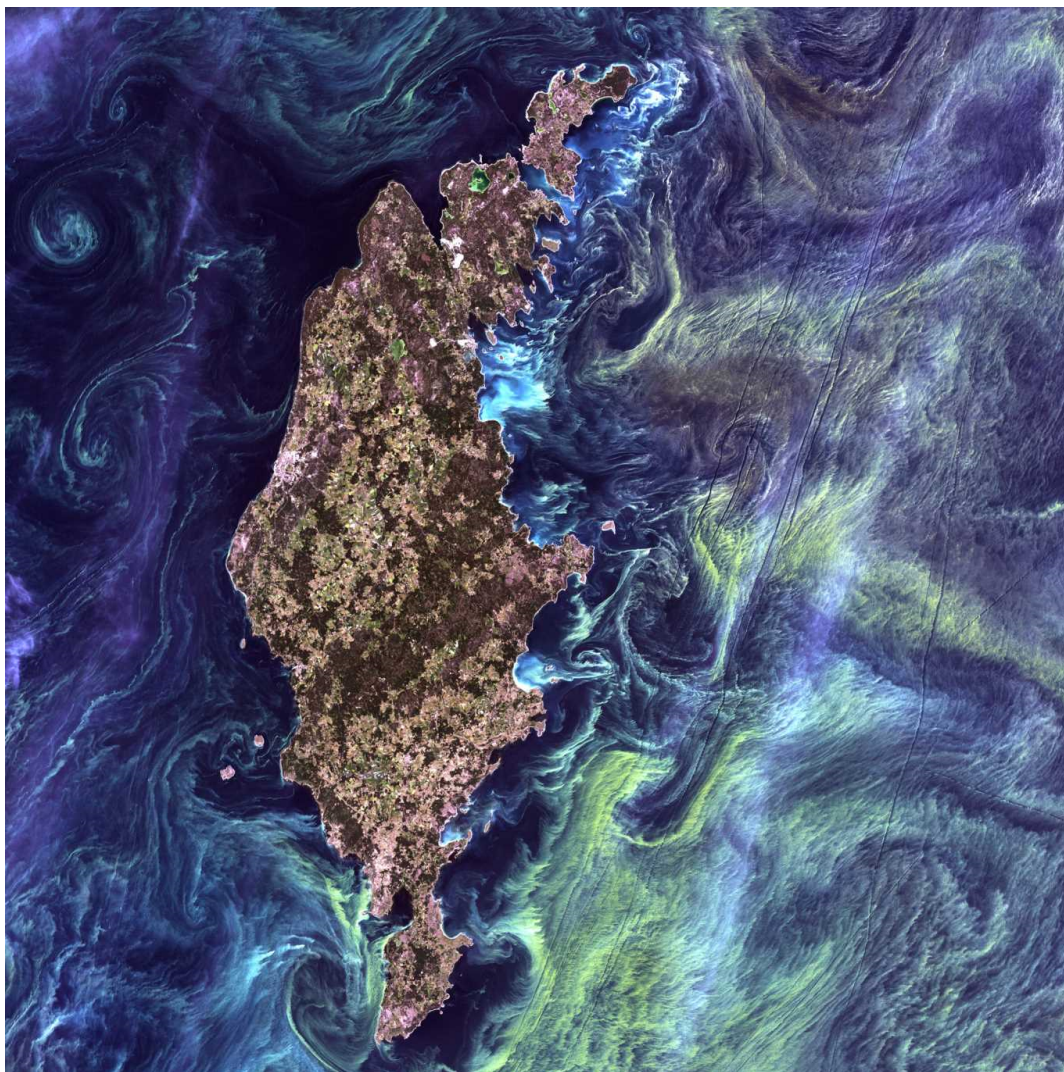
Heat conduction occurs when particles with greater thermal energy vibrate more quickly, collide with other particles, and transfer some energy to them. Conduction plays only a very small role in the transfer of energy related to weather.

- Conduction
  - > Transfer of energy through the collision of particles.
- Convection (vertical) & Advection (horizontal)
  - > transfer of energy by the movement of particles in a fluid.

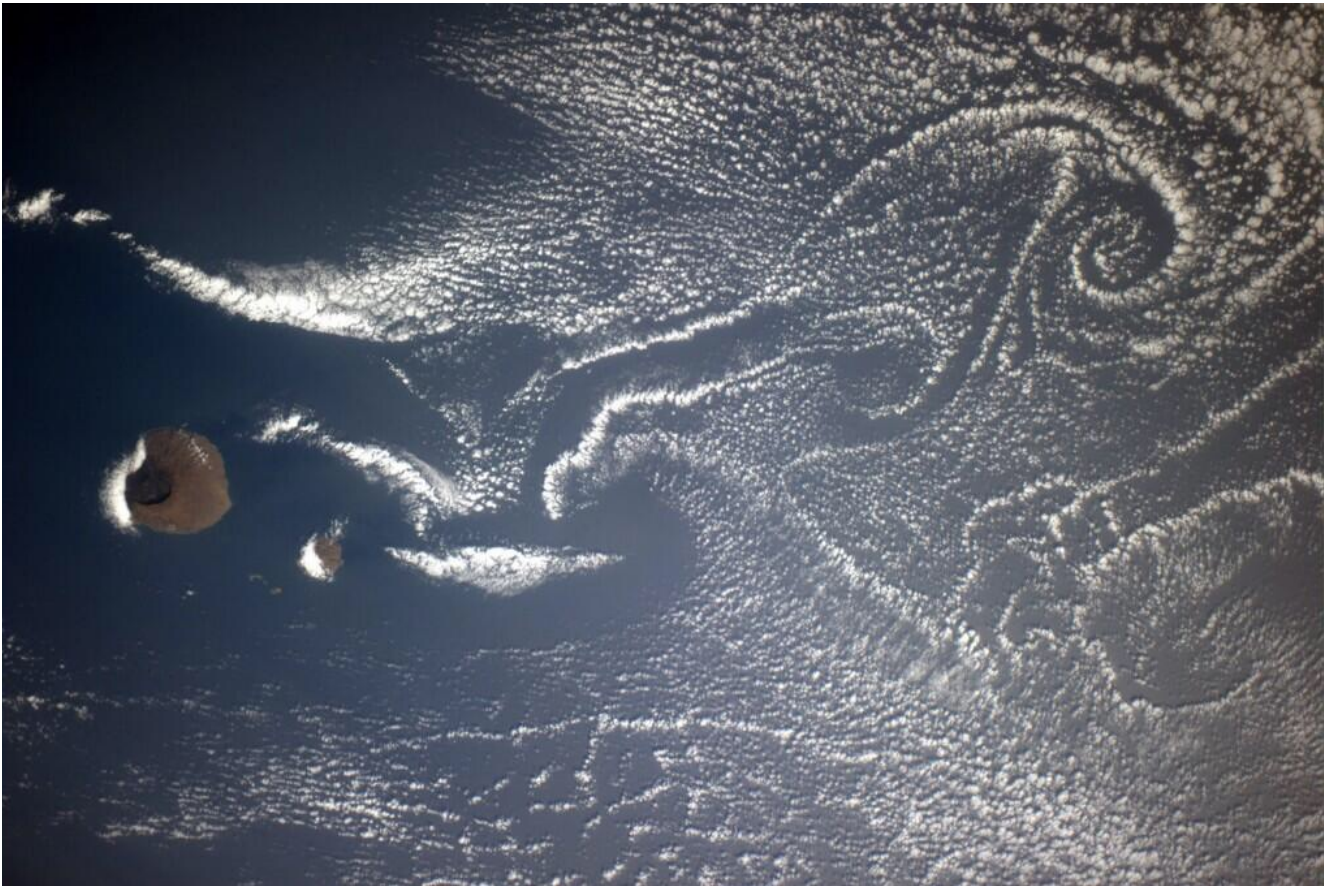
**Figure 3**

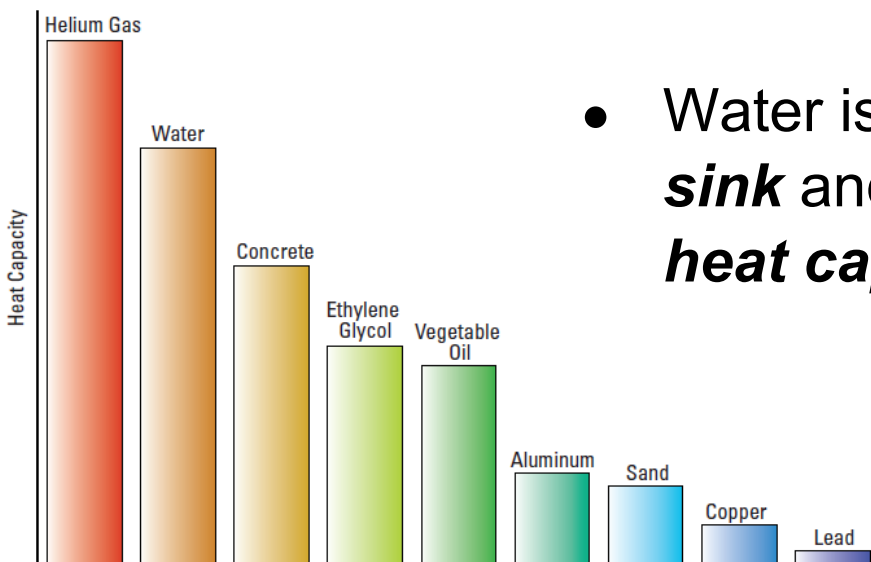
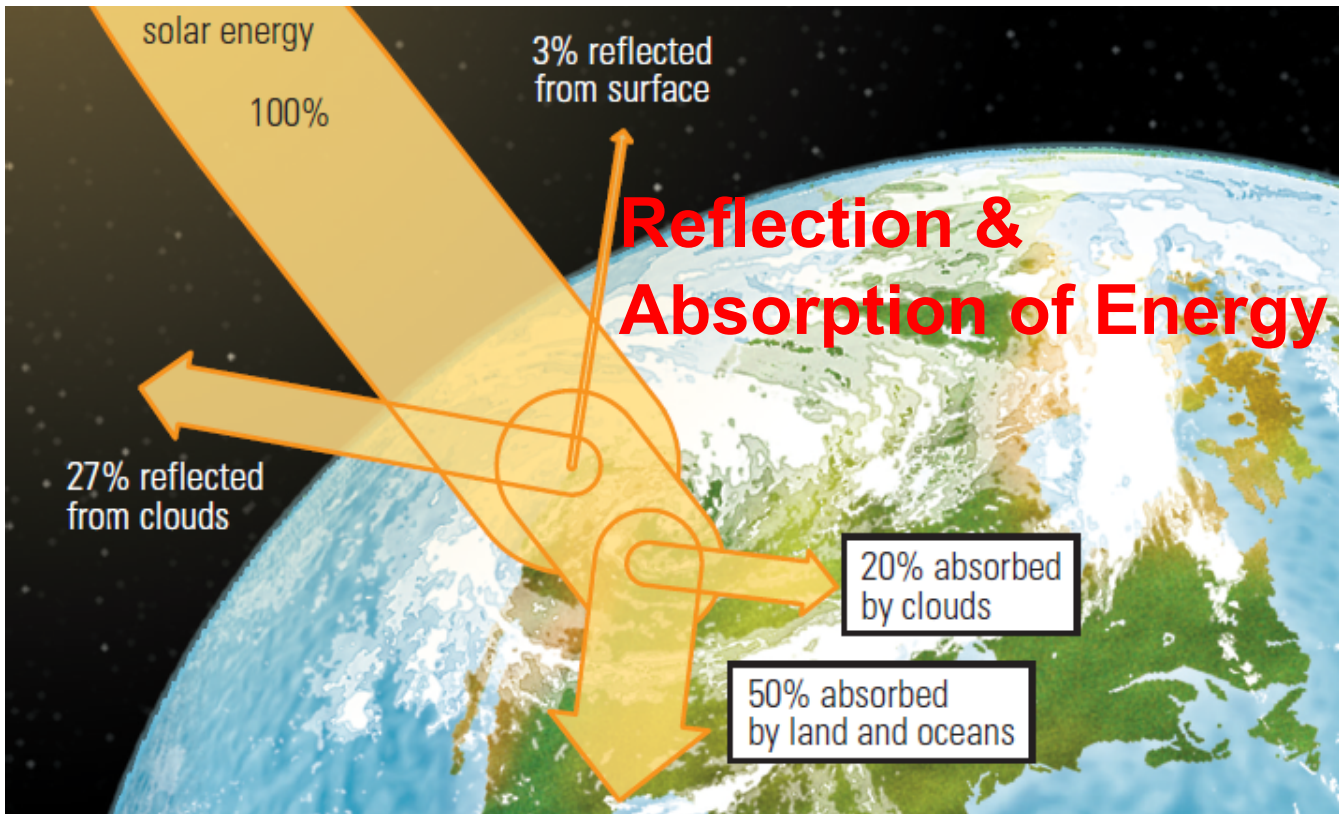
A convection current is set up when particles of a fluid gain energy. As their movement increases, they spread apart and that part of the fluid become less dense than the surroundings, and so it rises. The warm fluid is replaced by cooler fluid as the flow of the convection current begins.

## Can the atmosphere be considered a fluid?









- Water is a good **heat sink** and has a high **heat capacity**.