How heat energy is moved by Earth's systems

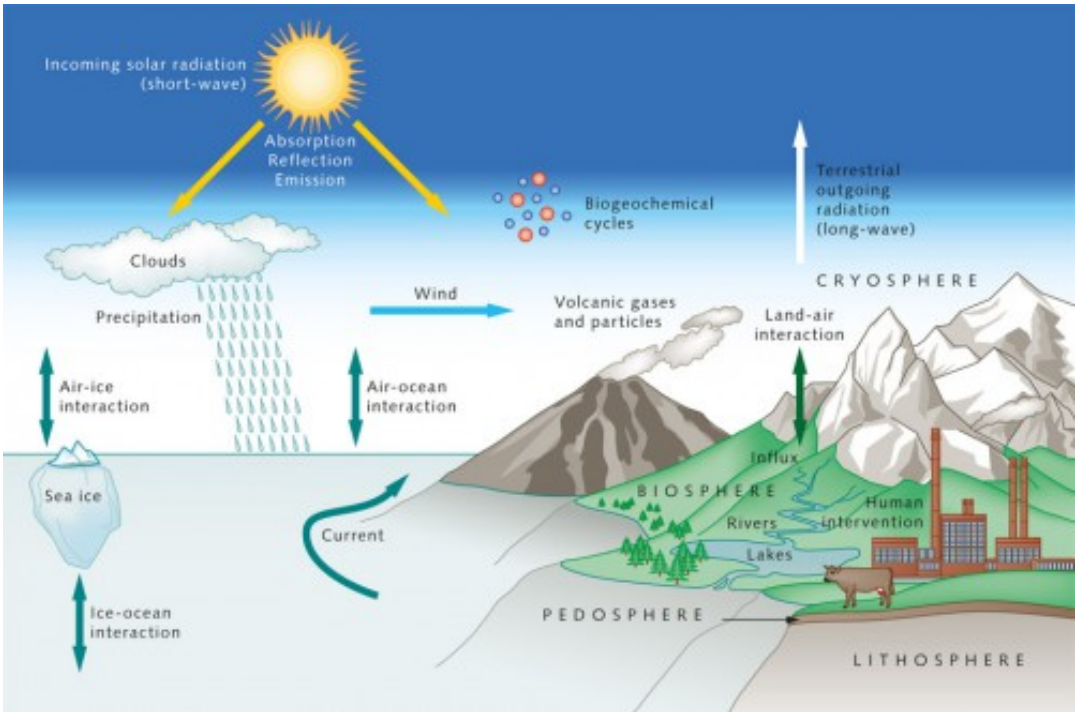
"The ocean and atmosphere are connected. They work together to move heat and fresh water across the globe. Wind-driven and ocean-current circulations move warm water toward the poles and colder water toward the equator. "
NOAA (http://oceanservice.noaa.gov/education/pd/oceans_weather_climate/)

https://www.youtube.com/watch?v=fHztd6k5ZXY This video from TEDed provides a succinct and clear discussion of energy on Earth, both in natural systems, and as part of human civilization (4:43)

Because of its complexity, we divide the Earth system up into components and study them separately to figure out how they work. However, in the end, we need to look at how they all interact to understand the whole.

Think about living things, probably the most familiar system to us. Living things have many components or subsystems such as the circulatory, respiratory and digestive systems. You study these systems in isolation first, to understand each one. Then you learn how the components work together to make the organism function. You learn about how feedbacks exist among the systems.

Now think of the major components of the global climate. Earth's climate is influenced by land (including soil, rocks), water (including clouds, water vapor and ice), air, and life. All these components are interconnected; changes in any one of them ultimately affects the others as well.



Interactions among various Earth systems components are shown in the diagram above. How many interactions can you see?
(From: http://worldoceanreview.com/en/wor-1/climate-system/earth-climate-system/)

All these components are interconnected; changes in any one of them ultimately affects the others as well. In the following sections, each component is described in turn. But first, here is a quick review of what you have already learned in the Weather and Climate units.

Solar energy input affects weather and climate. Because the Earth is a sphere, the amount of solar energy per unit area depends on the angle at which the solar radiation arrives. At the equator, the sun's rays come in more or less perpendicular. This means that a maximum amount of heat is received. At the poles, on the other hand, the sun's rays come in slanted at a shallow angle and much less heat is received.

The uneven distribution of heat leads to convection currents that "try" to equalize heat everywhere. Simply, heated air at the equator rises up, and spreads north and south towards the poles. There it gradually cools, sinks down, and then flows back across the Earth surface to the equator. There the cycle is repeated. Because Earth rotates, these currents don't take a straight course north and south. (This is called the Coriolis effect.)

Atmospheric circulation also moves water vapor around the globe. Water evaporates from surfaces, condenses into clouds, and returns to Earth as precipitation. Heat from the sun evaporates water. When the water vapor condenses back into water drops in clouds, the heat returns to the air. Thus, the evaporation-condensation cycle is an important mechanism for transferring heat energy from Earth's surface into the air, and then around the globe from there.

Ocean circulation is another important mechanism that transfers heat around the globe.

More information:

- Follow the energy from the sun as it moves to Earth and its atmosphere (Scroll down the page to find the interactive, *Energy flow)*
  http://serc.carleton.edu/eslabs/weather/2b.html