

Unit Introduction and Core Concepts

Processes That Shape the Earth

The Earth's surface is in a constant state of change. Mountains are built up and broken down. Bodies of water change the land around them by picking up and moving sand and rocks. Wind blows sand around from place to place. Earthquakes, volcanoes, and other large-scale changes make massive changes to the surface of our planet. *The energy used to cause all of these changes to the Earth's surface is transferred from two sets of convection cells: the convection in the Earth's mantle, and the convection in the Earth's atmosphere.*

Convection in the Earth's mantle transports hotter magma from the bottom of the mantle to the top, causing the plates of crust above the magma to spread and grow, move, crash into, and sink under one another. These processes are called Plate Tectonics, and are responsible for the uplifting of mountains, the cause of earthquakes and volcanoes, as well as the slow motion of the Earth's continents.

Convection in the Earth's atmosphere is generalized in the water cycle. While the water cycle itself is not one of the core concepts of this unit, students need to understand that it is a) powered by the sun and b) it uses the sun's energy to transport water from the oceans, into the

atmosphere, and then down to many elevations of the Earth including the tops of mountains. This basic understanding is necessary for students to understand where the energy comes from when weather reshapes the surface of the Earth.

All natural changes on the surface of the Earth can be traced back to one or both of these two systems of convection. Understanding these systems and the roles that they play in processes that shape Earth will lead students to a far clearer and more conceptual understanding of Earth Science than the isolated teaching of various geologic phenomena. Relate the various concepts in this unit back to these two convection cycles whenever practical.

CORE CONCEPTS: PROCESSES THAT SHAPE THE EARTH

Grade 4, Unit 3

Key Prior Knowledge (from the Matter and Energy Units)

- Thermal energy can be transported through radiation, conduction, and convection.
- The transfer of enough thermal energy (heating) in and out of matter will cause matter to change states. (Evaporation, condensation, freezing, melting)
- Matter that is less dense will rise in a medium that is more dense, and vice-versa.

CORE CONCEPTS

- The **Earth is made up of 3 layers**, the crust, the mantle, and the core. The core heats the bottom of the mantle, causing convection. The convection currents in the mantle cause changes in the crust. (SC.D.1.2.4, SC.D.1.2.5)
- Precipitation (caused by the **water cycle**) and wind cause rocks to be broken into smaller pieces in the process called **weathering**. The rock is then transported away through **erosion**. Together, these two processes are responsible for taking material from higher places, and depositing it in lower places. (SC.D.1.2.1, SC.D.1.2.2, SC.D.1.2.3, SC.D.1.2.4, SC.D.1.2.5)
- Rocks in the Earth's crust vary in their form and structure based on process that made them. The constant changing of the form and structure of rocks is called the **rock cycle**. The energy powering the rock cycle comes from the sun and the earth's core. (SC.D.1.2.4, SC.D.1.2.5)
- The **Earth's History** can be read by looking at and interpreting the features of the Earth's surface and the layers of rock buried underground.
(SC.D.1.2.4, SC.D.1.2.5)