Earth's Systems Conceptual Flow

Earth has many cyclical processes that move at different rates and interact with each other.
2-ESS1-1, MS-ESS2-2

Earth processes happen in the geosphere, hydrosphere, biosphere, and atmosphere and are all connected.
5-ESS2-1

The atmosphere is the layer of gases surrounding the Earth.

Earth's atmosphere is made of 5 layers, from closest to Earth to farthest: troposphere, stratosphere, mesosphere, thermosphere, and exosphere

Weather is atmospheric conditions that happen over a short period of time. Climate is patterns in atmospheric conditions over a long period of time.

Both climate and weather are location specific.

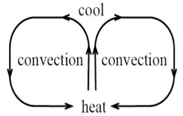
The bottom-most layer is the troposphere. It exists 10 km above the surface and is the most dense layer of the atmosphere.

Most weather occurs in the troposphere because most of Earth's water vapor is found there.

Temperature and precipitation are the two most important factors that determine a region's climate.

Air is circulated around the Earth by convection currents (aka Hadley cells) found in the troposphere.

The air circulation is caused by the uneven heating of the Earth. Cold air sinks and warm air rises.



MS-ESS2-6

Climates have changed over time and continue to change.

Evidence of climate changes can be seen in fossil records and rock formations.
4-ESS1-1

Weather is driven by air masses interacting. An air mass is a large body of air with uniform temperature, humidity, and pressure. Air masses are moved by strongly moving air currents called jet streams.
MS-ESS2-5

Weather is predictable.
K-ESS2-1, K-ESS3-2, 3-ESS2-1

The biosphere, also known as the ecosphere, is the worldwide sum of all ecosystems.

The climate in one part of the world is different than the climate in another, because climate changes with latitude and altitude. These differing regions are known as biomes.
3-ESS2-2, MS-ESS2-6

The hydrosphere refers to all water on Earth including ocean water, ground water, glaciers, icecaps, rivers, lakes, clouds, etc.

Water on Earth is recycled.

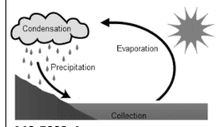
Liquid water can be "fresh" or "salt" water.
5-ESS2-2

Water can be found on Earth in liquid, solid, and vapor form.
2-ESS2-3

Water covers 71% of Earth's surface: 97% of that water is saltwater.

Oceans circulate water due to temperature differences. Cold water sinks while warm water rises.
MS-ESS2-6

The water cycle includes all forms of water and shows how water moves between different sources (ex: clouds, rain, and lakes). The water cycle is driven by heat and gravity.



MS-ESS2-4

Topography is the shape of the land. Topographic maps show the physical features, such as mountains and valleys, of the top region of the geosphere (lithosphere) and surface water, such as rivers and lakes, in the hydrosphere.
2-ESS2-2, 4-ESS2-2

The geosphere refers to the rocks, minerals, and landforms at Earth's surface and interior, including soil, sediments, and molten rocks.

All rock on Earth is recycled through the rock cycle.
MS-ESS2-1

Rocks can be broken down.

Weathering can cause problems for people, but engineers can generate solutions to slow down weathering.
2-ESS2-1

Weathering changes the shape of the land.
4-ESS2-1

Heat and pressure can return rocks to magma.

Mechanical weathering is caused by wind, water, or other physical processes that do NOT alter the chemical makeup of the rock

Chemical weathering is when the chemical composition of a rock changes due to a chemical reaction taking place (Ex: rusting or acid rain).

Deposition is the settling of sediment (earthen materials) by wind, flowing water, sea, or ice.

Erosion is the process in which earthen materials are worn away and then transported to another area.
4-ESS2-1

Rocks can be formed.

Rocks are formed in layers, but these layers may be disturbed over time.

You can determine relative geologic time scale by looking at an undisturbed cross-section of rock layers. Top layers are more recent, and bottom layers are older.
MS-ESS1-4

Rocks are formed from the cooling of magma/lava.

Sea-floor spreading drives plate tectonics.
MS-ESS2-3

Plate tectonics is the theory of how the surface of Earth is changing by slowly moving lithospheric plates on the mantle below.
MS-ESS2-3

Rocks are formed by pressure.

Some fossils are created when a plant/animal dies and is buried in mud or silt, which then undergoes immense pressure.

Another type of fossil is trace fossils (Ex: tracks, burrows, etc.)

Scientists have found fossils in locations where the fossilized species would not have been able to survive in the present climate.
4-ESS1-1 MS-ESS2-3