

# Earth Systems

Adopted 2016

Obtain, evaluate, and communicate information to investigate the composition and formation of Earth systems, including the Earth's place in the solar system. [SES1](#)

- a. Construct an explanation of the origins of the solar system from scientific evidence including the composition, distribution and motion of solar system objects. [SES1.A](#)
- b. Ask questions to evaluate evidence for the development and composition of Earth's early systems, including the geosphere (crust, mantle and core), hydrosphere and atmosphere. [SES1.B](#)
- c. Develop a model of the physical composition of Earth's layers using multiple types of evidence (e.g., Earth's magnetic field, composition of meteorites and seismic waves). [SES1.C](#)

Obtain, evaluate, and communicate information to understand how plate tectonics creates certain geologic features, landforms, Earth materials, and geologic hazards. [SES2](#)

- a. Construct an explanation based on evidence that describes the mechanisms causing plate tectonic motion. [SES2.A](#)
- b. Develop and use models for the different types of plate tectonic settings (convergent, divergent and transform boundaries). [SES2.B](#)
- c. Construct an explanation that communicates the relationship of geologic features, landforms, Earth materials and geologic hazards to each plate tectonic setting. [SES2.C](#)
- d. Ask questions to compare and contrast the relationship between transformation processes of all rock types (sedimentary, igneous, and metamorphic) and specific plate tectonic settings. [SES2.D](#)
- e. Construct an argument using multiple forms of evidence that supports the theory of plate tectonics (e.g., fossils, paleomagnetism, seafloor age, etc.). [SES2.E](#)

Obtain, evaluate, and communicate information to explore the actions of water, wind, ice, and gravity as they relate to landscape change. [SES3](#)

- a. Plan and carry out an investigation that demonstrates how surface water and groundwater act as the major agents of physical and chemical weathering. [SES3.A](#)
- b. Develop a model of the processes and geologic hazards that result from both sudden and gradual mass wasting. [SES3.B](#)
- c. Construct an explanation that relates the past and present actions of ice, wind, and water to landform distribution and landscape change. [SES3.C](#)

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- d.** Construct an argument based on evidence that relates the characteristics of the sedimentary materials to the energy by which they were transported and deposited. [SES3.D](#)
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Obtain, evaluate, and communicate information to understand how rock relationships and fossils are used to reconstruct the Earth's past. [SES4](#)

- a.** Use mathematics and computational thinking to calculate the absolute age of rocks using a variety of methods (e.g., radiometric dating, rates of erosion, rates of deposition, and varve count). [SES4.A](#)
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- b.** Construct an argument applying principles of relative age (superposition, original horizontality, cross-cutting relations, and original lateral continuity) to interpret a geologic cross-section and describe how unconformities form. [SES4.B](#)
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- c.** Analyze and interpret data from rock and fossil succession in a rock sequence to interpret major events in Earth's history such as mass extinction, major climatic change, and tectonic events. [SES4.C](#)
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- d.** Construct an explanation applying the principle of uniformitarianism to show the relationship between sedimentary rocks and their fossils to the environments in which they were formed. [SES4.D](#)
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- e.** Construct an argument using spatial representations of Earth data that interprets major transitions in Earth's history from the fossil and rock record of geologically defined areas. [SES4.E](#)
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Obtain, evaluate, and communicate information to investigate the interaction of solar energy and Earth's systems to produce weather and climate. [SES5](#)

- a.** Develop and use models to explain how latitudinal variations in solar heating create differences in air pressure, global wind patterns, and ocean currents that redistribute heat globally. [SES5.A](#)
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- b.** Analyze and interpret data (e.g., maps, meteograms, and weather apps) that demonstrate how the interaction and movement of air masses creates weather. [SES5.B](#)
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- c.** Construct an argument that predicts weather patterns based on interactions among ocean currents, air masses, and topography. [SES5.C](#)
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- d.** Analyze and interpret data to show how temperature and precipitation produce the pattern of climate regions (zones) on Earth. [SES5.D](#)
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- e.** Construct an explanation that describes the conditions that generate extreme weather events (e.g., hurricanes, tornadoes, and thunderstorms) and the hazards associated with these events. [SES5.E](#)
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- f.** Construct an argument relating changes in global climate to variation to Earth/sun relationships and atmospheric composition. [SES5.F](#)
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Obtain, evaluate, and communicate information about how

- a.** Construct an argument from evidence that describes how life has responded to major events in Earth's history (e.g., major climatic change, tectonic events) through extinction, migration, and/or adaptation. [SES6.A](#)

life on Earth responds to and shapes Earth's systems. [SES6](#)

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- b.** Construct an explanation that describes how biological processes have caused major changes in Earth's systems through geologic time (e.g., nutrient cycling, atmospheric composition, and soil formation). [SES6.B](#)
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- c.** Ask questions to investigate and communicate how humans depend on Earth's land and water resources, which are distributed unevenly around the planet as a result of past geological and environmental processes. [SES6.C](#)
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- d.** Analyze and interpret data that relates changes in global climate to natural and anthropogenic modification of Earth's atmosphere and oceans. [SES6.D](#)