**Earth and Space Sciences**

**MS-ESS2 Earth’s Systems**

**MS-ESS2-1 Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process**

Further explanation: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth’s materials. Potential Maine connections include Deer Isle granite, Rockland limestone, Maine tourmaline, Acadia National Park pink granite, along with Maine mining history at Bald Mountain or Katahdin Iron Works.

Developing and using models, earth’s materials and systems, stability and change

**MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales.**

Further explanation: Emphasis is on how processes change Earth’s surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate. Potential Maine connections include the Desert of Maine, glacial erratics, alluvial fans, Appalachian Trail and Baxter State Park, and the fjord on Mount Desert Island.

Constructing explanations and designing solutions, earth’s materials and systems, the roles of water in earth’s surface processes, scale proportion and quantity

**MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.**

Further explanation: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches). Potential Maine connections can be found in the Gulf of Maine, Georges Bank and the inner continental shelf.

Analyzing and interpreting data, the history of planet earth, plate tectonics and large-scale system interactions, patterns

**MS-ESS2-4 Develop a model to describe the cycling of water through Earth’s systems driven by energy from the sun and the force of gravity.**

Further explanation: Emphasis is on the ways in which water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.

Developing and using models, the roles of water in earth’s surface processes, energy and matter

**MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.**

Further explanation: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation). Potential Maine connections include “Bombogenesis” snow storms, coastal fog, Nor’easters, sea smoke and valley fog.

Planning and carrying out investigations, the roles of water in earth’s surface processes, weather and climate, cause and effect

**MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.**

Further explanation: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.

Developing and using models, the roles of water in earth’s surface processes, weather and climate, systems and system models