# Principle 3: Grades 9-12

**Principle 3:**
**The ocean has a major influence on weather and climate.**

The interaction of oceanic and atmospheric processes control weather and climate by dominating Earth's energy system.

**Weather and Climate**

**A.**
Global climate and weather are determined by energy transfer from the sun. Energy transfer from the sun is influenced by the ocean, the topography of the land, by processes such as cloud cover and Earth's rotation, and other factors.

**A.1.**
The ocean absorbs most of the solar radiation reaching Earth. Differential heating of Earth results in circulation patterns in the atmosphere and ocean that globally distribute the heat.

**A.2**
The ocean's absorption of heat moderates the global climate.

**A.5.**
Heat exchange between the ocean and the atmosphere drives oceanic and atmospheric circulation and the water cycle.

**A.16.**
Seasonal and short-term changes in ocean temperature can affect rainfall and temperatures on land (i.e. weather). Long-term changes in ocean temperature can affect the climate.

**A.3.**
The weather along coastlines is generally more moderate than inland regions due to the greater heat capacity of the ocean.

**A.4.**
Ocean currents move heat throughout the ocean basins.

**A.6.**
Heating of Earth's surface and atmosphere by the sun drives circulation of the upper layers of the ocean.

**A.8.**
Heat exchange between the ocean and atmosphere can result in dramatic global and regional weather phenomena, including impacting patterns of rain and drought.

**A.13.**
Heat stored in the tropical ocean provides energy for weather, including hurricanes, cyclones and polar storms.

**A.7.**
Differential heating causes vertical convection in the atmosphere, which helps drive horizontal wind patterns. Those winds transfer energy to the ocean through surface wind stress, which drives the upper layer circulation patterns of the ocean.

**A.9.**
El Niño Southern Oscillation (ENSO) and La Niña events are significant examples of global ocean/atmosphere phenomena, and cause important changes in global weather patterns because they alter the sea surface temperature patterns in the Pacific.

**A.14.**
Most precipitation that falls on land evaporated from the tropical ocean.

**A.10.**
The increase in sea surface temperature increases atmospheric convection, changing patterns of rainfall and drought.

**A.11.**
El Niño and La Niña events affect ocean ecological communities.

**A.12.**
El Niño and La Niña events can affect terrestrial processes, such as fire frequency, drought, flooding, etc.

See Principle 1: C14

See Principle 1: C1

Principle 6: C