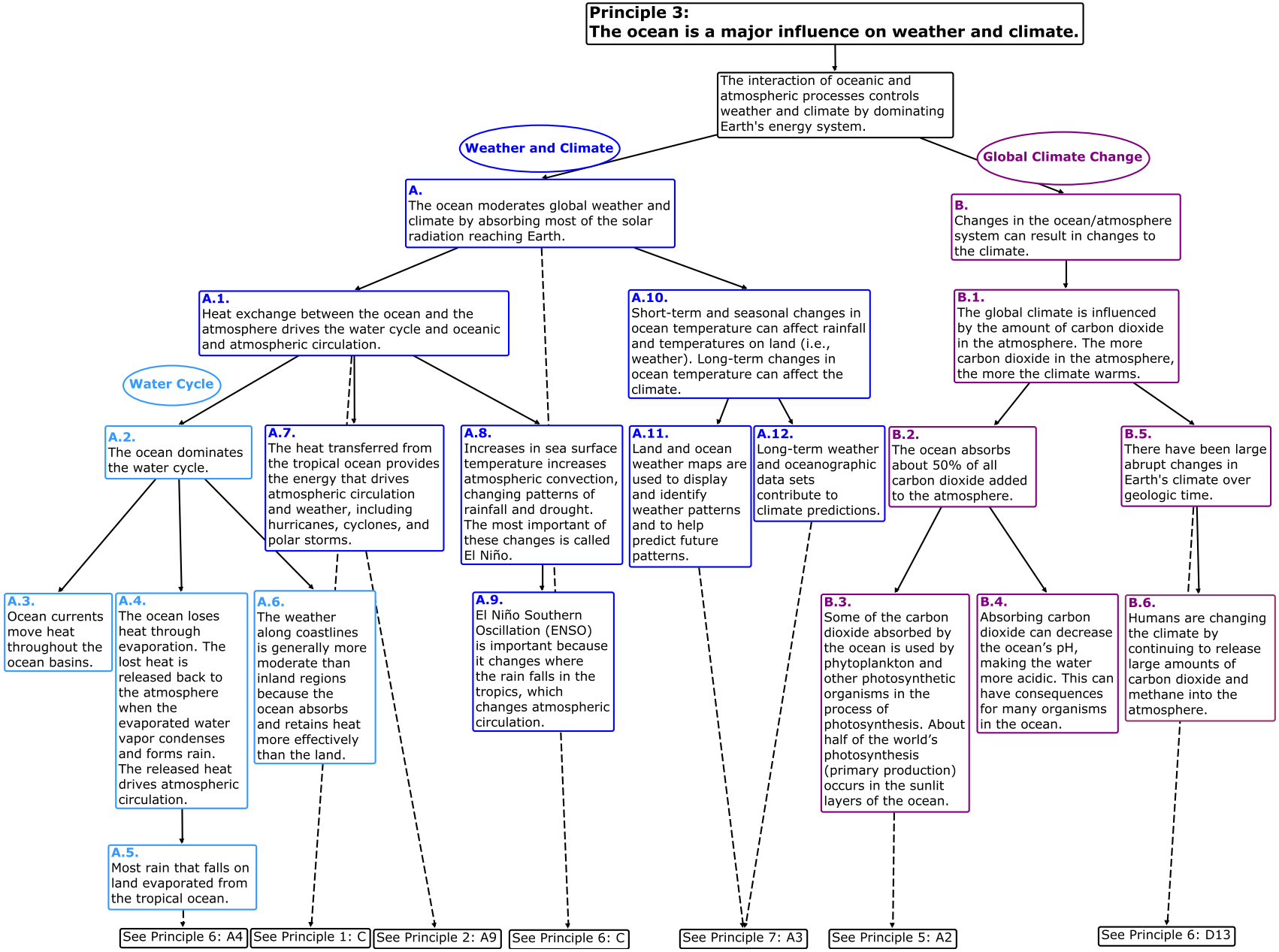
Principle 3:
The ocean is a major influence on weather and climate.
The interaction of oceanic and atmospheric processes controls weather and climate by dominating Earth's energy system.
Weather and Climate
Global Climate Change
A.
The ocean moderates global weather and climate by absorbing most of the solar radiation reaching Earth.
B.
Changes in the ocean/atmosphere system can result in changes to the climate.
A.1.
Heat exchange between the ocean and the atmosphere drives the water cycle and oceanic and atmospheric circulation.
A.10.
Short-term and seasonal changes in ocean temperature can affect rainfall and temperatures on land (i.e., weather). Long-term changes in ocean temperature can affect the climate.
B.1.
The global climate is influenced by the amount of carbon dioxide in the atmosphere. The more carbon dioxide in the atmosphere, the more the climate warms.
Water Cycle
A.2.
The ocean dominates the water cycle.
A.7.
The heat transferred from the tropical ocean provides the energy that drives atmospheric circulation and weather, including hurricanes, cyclones, and polar storms.
A.8.
Increases in sea surface temperature increases atmospheric convection, changing patterns of rainfall and drought. The most important of these changes is called El Niño.
A.11.
Land and ocean weather maps are used to display and identify weather patterns and to help predict future patterns.
A.12.
Long-term weather and oceanographic data sets contribute to climate predictions.
B.2.
The ocean absorbs about 50% of all carbon dioxide added to the atmosphere.
B.5.
There have been large abrupt changes in Earth's climate over geologic time.
A.3.
Ocean currents move heat throughout the ocean basins.
A.4.
The ocean loses heat through evaporation. The lost heat is released back to the atmosphere when the evaporated water vapor condenses and forms rain. The released heat drives atmospheric circulation.
A.6.
The weather along coastlines is generally more moderate than inland regions because the ocean absorbs and retains heat more effectively than the land.
A.9.
El Niño Southern Oscillation (ENSO) is important because it changes where the rain falls in the tropics, which changes atmospheric circulation.
B.3.
Some of the carbon dioxide absorbed by the ocean is used by phytoplankton and other photosynthetic organisms in the process of photosynthesis. About half of the world's photosynthesis (primary production) occurs in the sunlit layers of the ocean.
B.4.
Absorbing carbon dioxide can decrease the ocean's pH, making the water more acidic. This can have consequences for many organisms in the ocean.
B.6.
Humans are changing the climate by continuing to release large amounts of carbon dioxide and methane into the atmosphere.
A.5.
Most rain that falls on land evaporated from the tropical ocean.
See Principle 6: A4
See Principle 1: C
See Principle 2: A9
See Principle 6: C
See Principle 7: A3
See Principle 5: A2
See Principle 6: D13