

EarthComm: Earth's Fluid Spheres

The three fluid spheres covered in this module are the oceans, the atmosphere, and the cryosphere (glaciers). This module is not a complete review of oceanography, meteorology, and glaciology, but rather each chapter addresses an event or process, which occurs in each of the spheres. Activities and background text enable students to understand the complex processes involved in each event. In the first chapter, students examine El Nino, an event that occurs in the Equatorial Pacific. In the second chapter, students examine the evolution of a thunderstorm and associated weather phenomena. In the last chapter, students examine the effects on the world's glaciers in the event of a global temperature increase. The order in which chapters are presented is based on the hydrologic cycle. The pathway of water as it moves from the oceans into the atmosphere and back to the Earth in the form of precipitation (snow) reinforces the cyclic nature of the hydrologic cycle.

Themes

Through their inquiry in this module, students develop understandings of the complex Earth systems interactions associated with the Earth's oceans, atmosphere, and cryosphere. The major themes addressed include the following: portions of the National Science Content Standards for Grades 9-12:

- Energy and matter flows between the three spheres producing changes in each.
- Since both short-term and long-term cyclic change occurs in each sphere, predictions can be made of future occurrences.
- The predominant source of energy that drives change in the spheres is the sun.
- Patterns of circulation and movement can be established in each sphere.
- The physical properties of the fluids, air, water, and ice, affect the movement within each sphere.
- A change in any of the three spheres can lead to dramatic and or catastrophic change to society however by understanding how each sphere operates can lead to wise decisions.

Oceans and Your Community

The Chapter Challenge for Oceans and Your Community is for students to prepare a report that will help their community leaders decide whether or not they should host a conference on preparing for El Nino events. Students begin the chapter with a review of the basics of ocean circulation by looking at wind and Coriolis forces as the driving mechanisms of surface ocean circulation and temperature and salinity as the driving mechanisms of deep ocean circulation. Students then examine the patterns of surface ocean currents and winds and look for variations between "normal" and "El Nino" years. Students look at sea surface temperature data during "normal" and "El Nino" years and make inferences on how El Nino events impact the ocean food chain, global climate, and specifically, their community.

Severe Weather and Your Community

The Chapter Challenge for Severe Weather and Your Community is for students to prepare a report evaluating the potential for severe weather in their community, which will be submitted to an entertainment company who is considering building an arena with a retractable roof in the community. Students are introduced to severe weather through the study of thunderstorms. Students learn the conditions necessary to create thunderstorms and learn how thunderstorm clouds develop and mature. Students examine the techniques used by meteorologists to track thunderstorms. Students then move on to the study causes of hazards associated with severe weather, specifically flash flooding, lightning, and high winds and tornadoes.

Cryosphere and Your Community

This chapter provides students the opportunity to explore the effects of ice on the world around them. The focus in this chapter is on the effects of glaciers in their communities in the past, present, and the future. Students explore the properties of ice, study the relationships between climate, glaciers and sea level changes, and discover how glaciers interact with the geosphere to form

various landscapes. Students also examine non-glacial components of the cryosphere, including ice in the atmosphere and non-glacial ice on the Earth's surface. Students will use this information to assess how changes within the cryosphere caused by a shift in the global climate could effect their community. Students will conclude the chapter by preparing an informational video explaining the effects of glaciation.
