



Teacher Guide to Activities

Purpose

Students apply their understanding of ocean currents and develop their knowledge about the connection of the Peru Current to the biosphere. They will learn about the relationships between air temperature, seasurface temperature, rainfall, and chlorophyll concentrations.

Students learn about systems and system models, cause and effect, and patterns. They are asked to analyze and interpret data and construct explanations (NGSS: ESS2.C.2, ESS2.D.1, ESS2.D.2).

Contents

- Student Activity 2
- Teacher Guide Section 4

Data Learning Objective

- The student will read and make meaning from a variety of data visualizations and relate the data to real events and physical processes .
- The student will relate multiple data parameters to each other and to real events and physical processes.

Description

Students read about the Peru Current and learn about upwelling. Students use the two visualizations of sea surface temperature and chlorophyll concentrations in this activity to identify and describe evidence of upwelling along the Peru coastline in order to better understand the phenomenon.



READING

The Peru Current

The Peru Current, shown in Figure 3.13, is an eastern boundary current and is relatively wide and slow. It carries cold, low-salinity water from Antarctic waters toward the equator.

As the Peru Current flows along the coast of Chile, Peru, and southern Ecuador, it cools the air and thus the climate of these coastal areas. Cool air doesn't hold much water, so there is very little precipitation along the coast. Because of the cool air and the position of the Andes Mountains to the east, which also prevent moisture from reaching the coast, the strip of land along the coast between the ocean and the mountains is one of the driest deserts in the world. In fact, there is evidence that the Atacama Desert in northern Chile, shown in Figure 3.14, had no significant rainfall from 1570 to 1971.



FIGURE 3.13
The Peru Current flows from south to north along the west coast of South America.



FIGURE 3.14
The Atacama Desert along the coast of northern Chile receives virtually no rainfall.

However, an amazing contrast exists along this parched coast. This barren desert borders one of the most productive marine ecosystems in the world, supporting an incredible abundance of marine life. How is this possible?

However, an amazing contrast exists along this parched coast. This barren desert borders one of the most productive marine ecosystems in the world, supporting an incredible abundance of marine life. How is this possible?

As it turns out, under normal conditions, the prevailing winds along the coast of Peru push the water away from the land, causing a phenomenon called upwelling (the upward movement of ocean water). As water is moved away from the coast, cold, nutrient-rich water rises from below to replace it. These nutrients, when brought to the surface by upwelling, act as plant fertilizers and promote the growth of photosynthesizing organisms such as phytoplankton (photosynthesizing microscopic organisms that float in sea water), which in turn provide a food source for millions of fish. The abundance of fish in the Peru Current supplied Thor Heyerdahl and his companions with a rich diet as they drifted on their raft. In fact, this current is so full of life that it feeds much of the world. Approximately 18%–20% of the world’s fish catch comes from the Peru Current Large Marine Ecosystem (LME). As such, if you’re a fish eater, there’s a good chance this current has provided a meal for you.

Think About It The two images in Figure 3.15 show the sea-surface temperature and chlorophyll concentrations off the coast of Peru. When chlorophyll is detected in the seawater, it indicates that photosynthesizing plants, such as phytoplankton, are present. What evidence of upwelling do you see in these images?

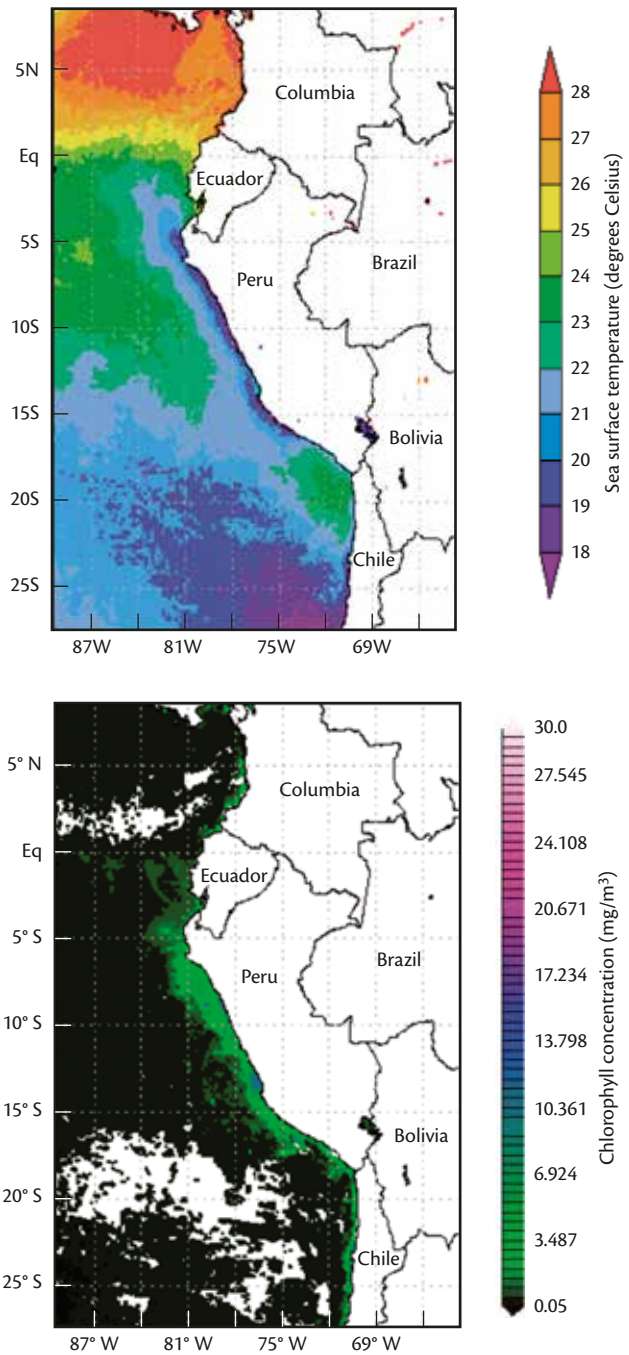


FIGURE 3.15
Sea-surface temperatures (top) and chlorophyll concentrations (bottom) off the coast of Peru during December of 2004. (These measurements were taken by instruments on satellites. The white areas in the chlorophyll map are areas where no data could be collected because of clouds.)⁷

READING**The Peru Current**

This reading describes the Peru Current and how changes in the strength and direction of currents, such as during ENSO events, can have far-reaching effects on marine ecosystems and the climate of land areas.

Response to *Think About It*

Think About It The two images in Figure 3.15 show the sea-surface temperature and chlorophyll concentrations off the coast of Peru. When chlorophyll is detected in the seawater, it indicates that photosynthesizing plants, such as phytoplankton, are present. What evidence of upwelling do you see in these images? *The water just off the coast of Peru is relatively low in temperature, which is evidence that deeper, cooler water is rising to the surface in this area. The higher levels of chlorophyll in the water along the coast reflects the fact that nutrient-rich water from the ocean bottom is rising to the surface, spurring the growth of photosynthetic organisms.*