

Photo Description



Big waves crash into dark rocks by the ocean. The water splashes high into the air. You can see foam and bubbles where the water hits the rocks.

Scientific Phenomena

This image shows the Anchoring Phenomenon of wave energy transfer and erosion. Ocean waves carry energy from wind across the water's surface. When waves hit solid objects like rocks, the water's kinetic energy is transferred upon impact, creating dramatic splashing and spray. Over time, this repeated force breaks down rock surfaces through mechanical weathering, gradually changing the shape of coastlines.

Core Science Concepts

1. Energy Transfer: Waves carry energy from one place to another and release it when they crash
2. Force and Motion: Moving water pushes against rocks with great force
3. Weathering: Water slowly breaks down rocks over long periods of time
4. States of Matter: Water exists as liquid droplets and foam (tiny air bubbles in water)

Pedagogical Tip:

Use hand motions to help students understand wave energy - have them move their arms in wave motions and then "crash" their hands together to show energy transfer.

UDL Suggestions:

Provide multiple ways for students to experience wave motion through kinesthetic activities like using a rope to create waves, water tables, or even making waves with a blanket.

Zoom In / Zoom Out

1. Zoom In: At the molecular level, water molecules are constantly moving and bouncing off each other. When waves crash, these tiny particles hit the rock surface millions of times, slowly wearing away microscopic pieces of mineral.
2. Zoom Out: This coastal erosion is part of the larger rock cycle and ocean system. Eroded materials become sediment that travels through ocean currents, eventually forming new beaches and land formations elsewhere on Earth.

Discussion Questions

1. What do you think makes the waves move toward the rocks? (Bloom's: Analyze | DOK: 2)
2. How do you think these rocks might look different after many years of waves hitting them? (Bloom's: Evaluate | DOK: 3)
3. What sounds do you think you would hear if you were standing near these crashing waves? (Bloom's: Apply | DOK: 2)
4. Where does the splashing water go after it hits the rocks? (Bloom's: Understand | DOK: 1)

Potential Student Misconceptions

1. Misconception: "Rocks are too hard for water to break them"
Clarification: Water is very powerful when it moves fast and hits repeatedly over long periods of time
2. Misconception: "The splashing water just disappears"
Clarification: The water falls back down into the ocean and continues moving in the wave cycle
3. Misconception: "Waves only happen during storms"
Clarification: Waves happen all the time because wind is always blowing somewhere on the ocean

Cross-Curricular Ideas

1. Math - Measurement & Counting: Have students count how many rocks they can see in the photo, or measure the height of the splash using non-standard units (like handspans or blocks stacked together). Create a simple bar graph showing "big waves" vs. "small waves."
2. ELA - Descriptive Writing & Sensory Language: Read books about the ocean, then have students draw and write simple sentences describing what they see, hear, and feel at the beach using sensory words like "splashing," "wet," "loud," and "cold."
3. Social Studies - Community Helpers: Discuss lifeguards and coast guard workers who help keep people safe at the beach. Take a virtual field trip to a local beach or aquarium to learn about ocean communities and coastal habitats.
4. Art - Water Movement & Color Mixing: Students can paint or use watercolors to create their own ocean waves, experimenting with blues, whites, and greens. Have them use sponges to create foam and splash effects on paper, mimicking the photograph's dynamic movement.

STEM Career Connection

1. Ocean Scientist (Marine Biologist): Ocean scientists study the plants, animals, and rocks in the ocean. They watch waves and learn how they affect the coastline and sea creatures. Some ocean scientists even dive underwater! Average Salary: \$65,000/year
2. Geologist: Geologists are rock scientists! They study how rocks change and break down over time due to waves, wind, and weather. They help us understand coastlines and predict where erosion might happen. Average Salary: \$93,000/year
3. Beach Engineer: Beach engineers design and build structures like breakwaters and seawalls to protect beaches and towns from big waves and erosion. They use science to figure out how to stop rocks and sand from washing away. Average Salary: \$87,000/year

NGSS Connections

- Performance Expectation: 1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate
- Disciplinary Core Ideas: 1-PS4.A - Sound can make matter vibrate, and vibrating matter can make sound
- Crosscutting Concepts: Cause and Effect - Simple cause and effect relationships

Science Vocabulary

- * Wave: Moving water that carries energy from one place to another
- * Energy: The power to make things move or change
- * Force: A push or pull on something
- * Erosion: When water or wind slowly wears away rocks and soil
- * Foam: Bubbles of air mixed with water
- * Impact: When one thing hits another thing hard

External Resources

Children's Books:

- Waves by Kimberly Brubaker Bradley
- The Magic School Bus at the Waterworks by Joanna Cole
- Water Is Water by Miranda Paul