

Your Own El Niño



Virginia National Guard helicopter rescuing an individual from the James River. Note: rescued man halfway up to helicopter. Helicopter crewman standing on debris in river. Courtesy NWS Collection.

"Fifteen years ago, storms battered the West Coast of the United States...There were droughts in Australia, Indonesia, and India...Worldwide, 2,000 people died...Economic losses amounted to billions of dollars...In Indonesia and Borneo, dry conditions fed raging forest fires that consumed hundreds of thousands of acres. Smoke blanketed the area..."

~ from the PBS news program, "Bracing for El Niño"
October 7, 1997

What You Will Do

Create a working model that shows the El Niño effect, trade winds, and upwelling

What caused these disasters? Just some warm water in the Pacific Ocean!

Every two to seven years, trade-winds in the Pacific Ocean slow down or reverse their direction (no one is sure why). Normally, the Pacific trade winds blow vigorously towards the west. This causes warm surface water to pile up in the western Pacific, so that the sea surface is actually about 1/2 meter higher at Indonesia than at Ecuador. These winds also cause sea surface temperatures to be about eight degrees Celcius higher in the west, with cool temperatures off South America, due to an upwelling of cold water from deeper levels. This cold water also brings up nutrients that support the growth of marine plants, which provide food for major fisheries.

But when the trade winds slow down, everything changes. Water temperatures become warmer in the eastern Pacific and colder in the west. Nutrient upwelling slows, and fish populations become much smaller along the Pacific coast of South America. Rainfall follows the warmer water, causing flooding in Peru and drought in Indonesia and Australia. Changes in the circulation of Earth's

- *atmosphere bring unusual weather to other regions that are far away from the*
- *tropical Pacific. Fishermen in South America noticed that these changes usually*
- *happen around Christmas time, and named the event "El Niño," which means*
- *"the (Christ) Child."*
- *El Niño isn't all bad; some of the changes it causes in atmospheric circulation*
- *can reduce the chances of severe hurricanes in the North Atlantic. But many*
- *other changes are highly destructive and dangerous, so advance warning of*
- *El Niño's approach is extremely important for emergency preparation. NOAA*
- *satellites are constantly collecting information on sea surface temperatures*
- *around the globe. NOAA also operates a network of buoys that measure*
- *temperature, currents, and winds in the tropical Pacific Ocean. Every day,*
- *these buoys transmit data that are immediately available to researchers and*
- *forecasters around the world.*
- *Here's a way for you to create a miniature El Niño in your own kitchen!*

What You Will Need

- Clear plastic rectangular container, about 18 inches long, four inches high, and four inches deep (such as a food storage container)
- Water
- Mineral oil, about one cup
- Food coloring
- Hair dryer
- Funnel
- Red oil-based paint, about one ounce (two tablespoons)

Warnings

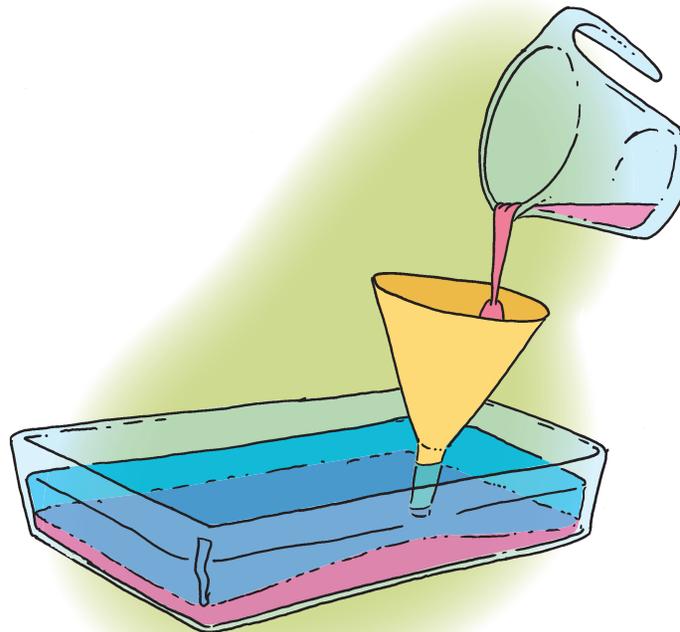
Have an adult help with the hair dryer, and be careful with any electrical appliance around water! Follow warnings on the paint container label concerning ventilation and handling.

How to Do It

1. Fill the plastic container with water to within one inch of the top.
2. Add food coloring to the water. Blue is good, since we're dealing with the ocean. Allow some of the food coloring to settle to the bottom so you can demonstrate upwelling.
3. Pour the mineral oil into a dish and mix in one to two tablespoons of the red paint.

4. Hold the funnel so that the narrow end is against the side of the container, just above the surface of the water. Gently pour mineral oil through the funnel onto the surface of the water.

5. The liquids in the plastic container represent the warm layer of surface water (the mineral oil) and the cold deep water (colored water) in the Pacific Ocean. Turn on the hair dryer and point it into one end of the container. This end represents the eastern side of the Pacific Ocean. Notice that the "warm" water piles up in the western end of the container.



Plastic container

This is the normal condition for the Pacific Ocean near the equator. If your food coloring contained sediment particles, you may see these moving upward toward the water surface at the eastern end of the container—just like upwelling in the eastern Pacific!

6. Turn off the hair dryer, and watch what happens when the trade winds stop.

Want to Do More?

You can find out more about El Niño at:

- NOAA's Climate Prediction Center Web site www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml
- NOAA's El Niño Web page climate.gov/enso
- The El Niño story page www.pmel.noaa.gov/el_nino/what-is-el-nino
- NASA's Jet Propulsion Laboratory Web site www.jpl.nasa.gov/climate-sciences/projects/enso/index.html

This activity was adapted from "Make Your Own El Niño in the Classroom," <https://sealevel.jpl.nasa.gov/files/ostm/make-your-own-el-nino.pdf>, by Kelly Perry (Jet Propulsion Laboratory), Johan Berlin (Raytheon Corporation), James Kendall (Jet Propulsion Laboratory), and Ruby Krishnamurti (Florida State University) presented on NASA's Jet Propulsion Laboratory Education Web page (<https://www.jpl.nasa.gov/edu>).