Make Your Own El Niño in the Classroom

Purpose: Hands on demonstration of the El Niño effect, trade winds, and upwelling.

Materials:
- Clear plastic oblong container (approx. 18"x4"x4", smaller will work, food containers are ideal),
- Water,
- Mineral oil,
- Blue food coloring,
- Hair dryer
- Red Oil-based Paint - optional
- Paper sheet map showing the Pacific Ocean

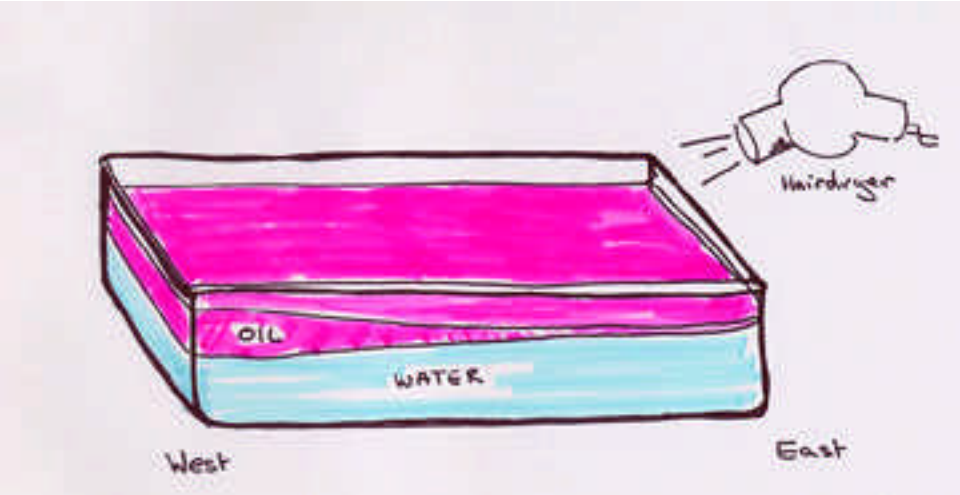
Set-up time: Less than 5 min.

Preparation:
- Fill the tray with water to within 1" of the top.
- Add blue food coloring to the water in until a nice "ocean blue." Some of the food coloring will settle to the bottom which is fine because this will show the upwelling.
- Optional: Pour some mineral oil in a bowl and mix in some red oil-based paint until the oil is evenly colored. If you do not have oil-based paint, it does not affect the outcome … we don't use it in our demos here.
- Gently pour the oil over the surface of the water. It's okay if it mixes a bit because it will separate out again.
- Put the container on the paper and mark East and West at either end, Indonesia and South America.
- Plug in hair dryer, being careful to keep it away from any water spills.

Explanation:
The liquids in the plastic container represent a slice across the Pacific Ocean in the vicinity of the equator. The oil (possibly colored red) represents the warm layer of surface water that has been heated by the sun. The blue water represents the colder water below the surface warm layer – where the two layers meet is the thermocline. The hairdryer is about to represent the trade winds.

Action! (Stage 1)

- Have a student turn on the hairdryer (no heat needed) and direct the 'wind' it across the surface of the oil-topped water from the East to the West. Ask the class to describe what effect this has on the "warm" and "cold" water.



Comments:

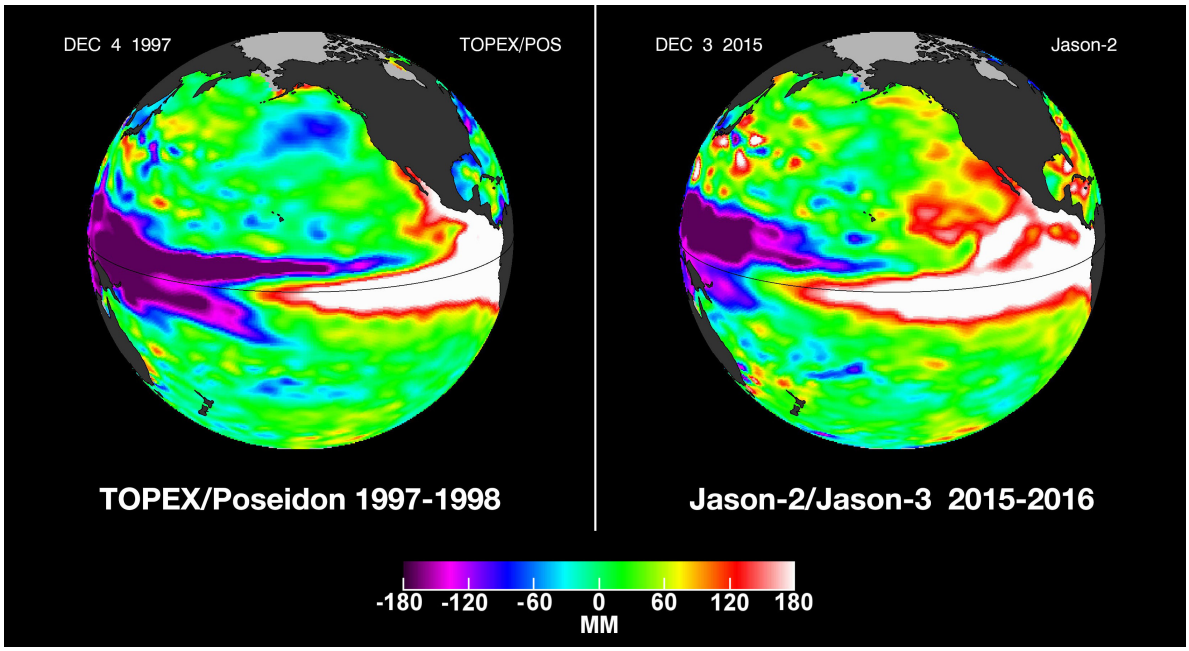
Note that the "warm" water piles up in the West as it is blown by the "trade winds" (hair dryer). This is the normal condition for the equatorial Pacific Ocean. Discuss the location of the warm water on the globe. Discuss what will happen to the air above the warm water in terms of how much moisture the air can hold. (Optional: Have them design an experiment to test the relative moisture holding capabilities of warm and cold air.)

You may notice that the sediment of the blue food dye moves upwards towards the surface at the east end (this will only happen if there is a sediment). This is upwelling which, in the Pacific Ocean, brings nutrient-rich bottom waters to the surface. Plankton feed on the nutrients, and in turn fish feed on the plankton, so these areas tend to be rich in fish and other sea life.

Action! (Stage 2)

- Have the student turn off the "trade winds" and ask the class to describe what happened when the trade winds stop.

Comments: You may need to do this several times to observe the motion. The "warm" water pulses across the "ocean" from West to East, this pulse of water is the warm water that is the oceans part of the El Niño condition.



In the real ocean, the water also deflects up and down the coastline of South and North America.

Note that in your model the "upwelling" previously seen while the trade winds were blowing is no longer present, so no nutrient rich water surfaces to feed marine life. Now a thick layer of warm water (oil) covers the surface in the East, this cuts off the nutrient-rich cold water from upwelling to the surface.

Want to know more?

There is a lot of material available about El Niño's and La Niña's. A good starting point is the Ocean Surface Topography website's El Niño La Niña Watch: https://sealevel.jpl.nasa.gov/data/el-nino-la-nina-watch-and-pdo/overview/

The latest sea surface height imagery is updated monthly here: https://sealevel.jpl.nasa.gov/data/el-nino-la-nina-watch-and-pdo/data/