

## Rose Colored Glasses

Visual and satellite data observation and interpretation activity

### CA science standards

Grade 5 Earth Sciences: Energy from the sun a, b, c, d, e; grade 6, Energy in earth systems; Grade 9 through 12 Earth science, Energy in the earth system

### Materials

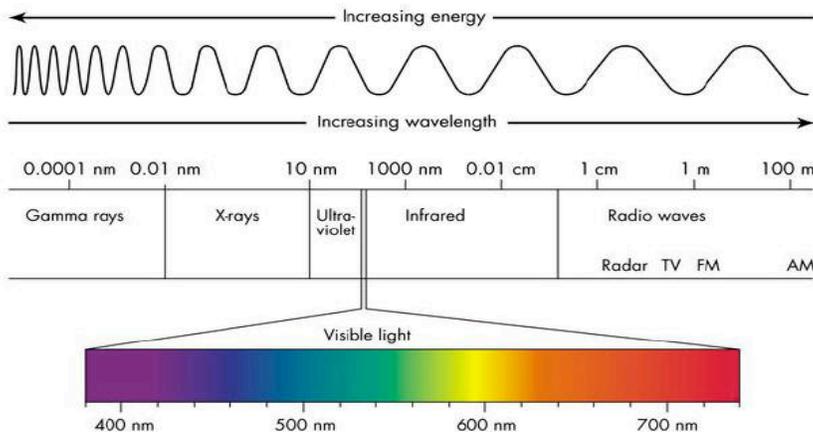
Map of LA region that includes markings in blue and/or red (or substitute any multicolored image and list a few details for students to find)

Satellite images of sea surface elevation from JPL: <http://sealevel.jpl.nasa.gov/science/elinopdo/elينو/>

Paper goggles with red or blue cellophane lenses, or strips of colored plastic

### Introduction

Satellites are equipped with instruments that are sensitive to different wavelengths of radiation. Visible light appears in different colors to our eyes because we have receptors that can perceive the different wavelengths of the colors.



In this activity you will use color filters to “see” like a satellite that is designed to collect data with certain characteristics.

**Part I: data filtered for a certain wavelength** Look through the red or blue colored glasses or colored plastic strips and view the map of the Los Angeles region. Try to locate the items on the list while wearing the glasses, then without them. Write down your observations about what colors are most and least visible through each color filter.

Red glasses:

- |  |                         |
|--|-------------------------|
| Rose Bowl                                | Santa Ana Freeway label |
| Santa Monica Mountains Recreational Area | Santa Anita Park        |
| Los Angeles Civic Center                 | Long Beach Harbor       |

Blue glasses:

- |                                |                        |
|--------------------------------|------------------------|
| San Gabriel River              | Santa Ana River        |
| Los Angeles/Orange county line | Puddingstone Reservoir |
| Labels for route 5, 10, or 405 | Pacific Ocean label    |

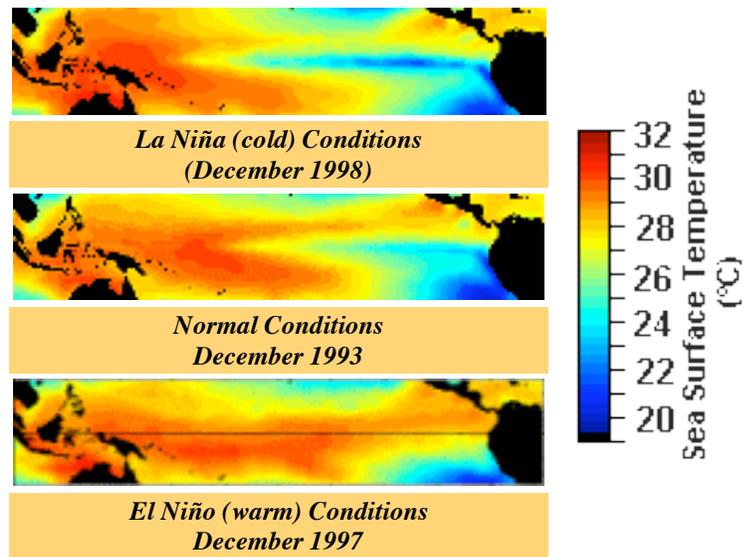
### Part II: Interpreting satellite data

**Background: El Nino and La Nina** "El Niño" refers to a climate event in the Pacific Ocean where the trade winds weaken and warm, nutrient-poor ocean water builds up in the eastern Pacific Ocean, disrupting fisheries and resulting in severe weather events worldwide.

"La Niña" events are defined by stronger trade winds, and cold, nutrient-rich water occupying much of the tropical Pacific Ocean. Most of the precipitation during these events occurs in the western tropical Pacific Ocean, so rain is abundant over Southeast Asia. Cold La Niñas tend to follow El Niños in the ocean/climate seasonal cycles.

Shown below is the Reynolds sea surface temperature in the equatorial Pacific from Indonesia on the left to central America on the right (20N - 20S, 100E - 60W).

Normal Equatorial Pacific Ocean surface temperatures (December 1993) are shown in the middle panel, including cool water, called the 'cold tongue', in the Eastern Pacific (in blue, on the right of the plot) and warm water in the Western Pacific (in red, on the left). Strong La Niña conditions during December 1998 are shown in the top panel. The Eastern Pacific is cooler than usual, and the cool water extends farther westward than is usual (see the blue color extending further to the left). Strong El Niño conditions, in December 1997, are shown on the bottom panel, with warm water (red) extending all along the equator. El Niño and La Niña are opposite phases of the El Niño-Southern Oscillation (ENSO) cycle, with La Niña sometimes referred to as the cold phase of ENSO and El Niño as the warm phase of ENSO.



**Activity:** The teacher should choose a set of satellite images from the Ocean Surface Topography Mission (OSTM)/Jason-2 satellite images [http://sealevel.jpl.nasa.gov/science/el\\_nino\\_pdo/el\\_nino/](http://sealevel.jpl.nasa.gov/science/el_nino_pdo/el_nino/) for students to use.

1. Carefully observe the images. Can you decode the color data? Which colors indicate higher elevations, and which indicate lower elevations of the ocean surface?
2. How are the elevations related to temperature?
3. Do the colored goggles or plastic strips enhance any colors in the images? Which colors stand out?
4. Which images show El Niño conditions? Which show La Niña? Which appear to show intermediate conditions?
5. How do conditions in the Pacific basin relate to conditions in other parts of the globe that are shown in the images?
6. Can you find any patterns in the images that would allow you to predict where higher or lower regions typically occur?

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