

## Notes for Suitcase Air and Weather Lesson

### LESSON 2: Why is the weather different in different places?

#### 1. In advance – for presenter

- A. Hang wall charts: vocabulary, water cycle, Oregon climate, Oregon Precipitation map
- B. Set up materials for demonstrations: lamp clamped to ring stand shining down on black cardboard, paper spiral.

#### 2. Review concepts from the last lesson:

Remind the students of the previous lesson. Ask them if they remember what happened when a spiral was held over the hot plate. Ask them for an explanation of this observation and review the concept of convection. Ask them if they know what creates air convection on Earth, clearly not a hot plate, but the sun. Demonstrate by using the lamp as the sun. The lamp warms up the cardboard the same way the sun warms up the land and oceans. First hold the paper spiral over the cold cardboard – the paper should not spin. Then turn on the lamp and show that it spins when the cardboard gets warm indicating that air is rising.

Pass out the water cycle hand-outs and review with them all components of the water cycle. Ask each of them to point on their handout as other students provide explanations of various components of the water cycle. Refer to the poster as needed. Ask them to explain where the largest body of water on Earth is, and explain that the oceans play a major role in controlling Earth's weather and climate. Involve students in active participation.

#### 2. Oregon's topography and weather discussion

Bring their attention to the map of Oregon weather zones and talk about the differences between the Willamette Valley and Eastern Oregon. Point to the pictures and ask them to describe how they are different and why: dry desert, wet coastal ranges, etc. Remind them of the concepts they learned in the last lesson: as air rises it cools, when it cools it holds less water. Ask the students to answer questions about the cartoon of the weather in Oregon (first page of their workbooks) by matching the number of the arrow with the name of the processes. The students can refer to the water cycle hand out to help them complete this worksheet. Use a transparency to show them how to fill in the worksheet with student's input. Ask them to check their own.

### **3. Oregon's precipitation**

Show them the precipitation map of Oregon. Explain to the class how these maps are created and how to read them. Remind them of how rain is measured (rain gauge, which they should have learned as part of the air and weather curriculum). Ask them to tell you where in Oregon is precipitation higher, where lower, and why. Direct them to the simplified version of the map (transparency). Tell them to pick 2 colors to use on the map. First color in the “key” with the highest rainfall. Then have students point to the area of the map with the most rainfall. Then have them color that area. Repeat for the next most rainfall. The least rainfall does not need to be colored as it is already grey.

### **5. Satellite observations.**

Explain that the processes that control the earth's climate occur in a global scale. If it is warm in the tropics, water evaporates, gets transported by the wind patterns and precipitation might occur many kilometers away. Therefore, meteorologists use satellite observations to predict the weather. Explain that other information that goes into weather prediction is wind direction, temperature, pressure.

Ask the students to turn to page 3 of their worksheets. Explain to the class that these images were taken from a satellite that is in a "geostationary" orbit around the Earth. The satellites orbit at the same speed as the Earth spins. With the help of a globe, show the students how a satellite remains stationary over one spot on Earth.

The US maintains such satellites to predict weather and study climate. [www.nesdis.noaa.gov](http://www.nesdis.noaa.gov). One of these satellites called the GOES-west, and anyone can access the images from <http://www.goes.noaa.gov/>. Show transparencies of the GOES in orbit. The GOES system maintains a continuous data stream in support of the National Weather Service requirements. Ask the students to color Oregon on the two images on their sheets. Discuss the cloud coverage and answer the question of whether it is cloudy.

### **6. Weather and the ocean**

Reiterate to the class that although they have studied the processes of evaporation, convection in a small scale (their classroom experiments), weather is controlled by processes that occur in global scales. Remind them of the satellite observations for scale. Explain to them that processes in the ocean are very important in controlling the weather patterns, as will be explained in the film. Sometimes, changes occur in the ocean that causes sea-surface temperature to change, and this results in major changes in weather. Tell the students that in many cases oceanographers work together with atmospheric scientist to explore the relationships between the ocean and

climate, how changes in ocean currents can change the climate, and how the Earth's climate changes in short and long time scales.

## **6. Recap**

Ask the students to name 3 things they learned about air and weather that they did not know before. Explain to them, that sometimes to understand complex phenomena, like weather, scientists need to understand the fundamental components (evaporation, condensation, convection). What they did in these 2 lessons was similar to this approach in that they looked at the processes, integrated their knowledge to explain a regional climate pattern (Oregon), and learned that controls on climate operate in a global scale. Thank them for their attention and ask them to fill in the assessment sheet as part of their homework (the teachers should collect these for you, and can mail them to COAS).