Lab #4: Atmospheric Circulation & El Niño (18 pts)

* * * All websites can be accessed directly from Blackboard (External Links/Lab 4) * * * *

Part One: The Coriolis Effect

Go to http://www.eoascientific.com/campus/earth/multimedia/coriolis/view_interactive
Read the instructions and then click on the North Button.

1. Click once to fire at the ship. Try your two additional chances and see if you can hit the ship. Were you able to? What happened to your cannon ball? (½ pt)

2. Now click on the South button. Try again to hit the ship. Were you able to hit the ship this time? What happens to your cannonball, now that you are in the southern hemisphere? (½ pt)

3. Click on the Explain button and read what it says. What is your response to the question at the bottom? (What would happen to your cannonball if you were to fire from higher latitudes?) Explain what happens in the northern and southern hemispheres. (1 pt)

Part Two: El Niño

In this part of the lab, you will generate sea surface temperature (SST) maps and consider whether or not they represent El Niño conditions. Go to http://www.giss.nasa.gov/data/update/gistemp/maps/ and use the following settings:

Data Sources: Land: unadjusted 1880-1999
                Ocean: Had1/Reyn_v2
Map Type: Anomalies
Mean Period: Winter (Dec-Feb)
Base Period: Begin 1951 – End 1980
Smoothing Radius: 1200 km
The map may take a minute to generate. Once it appears, check SST along the equatorial part of the eastern Pacific Ocean (near South America). Remember that during El Niño conditions, SST is above normal in that part of the Pacific Ocean. To see a classic SST pattern during El Niño, go to http://rst.gsfc.nasa.gov/Sect14/originals/Fig14_68.jpg for comparison, if you’d like.

You will use several different dates for the Time Interval. **Use the same year for Begin and End.** The table on the next page contains the years you should use. For each year, write the temperature change shown on the map and decide whether the sea surface temperature (SST) anomalies indicate El Niño conditions. Just pick the range of temperatures that is most prominent on the map. I have filled in the first row of data for you.

After completing columns 2 and 3, you will use the campus weather station data to see if El Niño has a noticeable impact on our weather here in Oxford. Go to: http://www2.oardc.ohio-state.edu/centernet/stations/mihome.html and look up data for December through February for the same dates you used in the previous page. This time, you need to specify December from the year before the one in the table and February for the year shown in the table. For example, the row I filled in used this range:

Be sure to change February to 28 instead of 31 or you will get an error. On the results page, there is a table at the top containing averages and totals for the time period you selected. Fill in columns 4 and 5 using average dec-feb temperature and total precipitation, as indicated by the summary at the top of the page. You do not need to access the raw data in the table you used last time. Finally, calculate the difference between each year’s temperature and precipitation and “normal” conditions for those months.

4. So does it seem that El Niño impacts our winter weather here in Oxford? Why or why not? (1 pt)

5. All of the years you studied that did not exhibit El Niño conditions were considered La Niña. Do those years seem to have larger deviations from averages? (1 pt)
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Columns 2 & 3: ½ point each (5 points total)
Columns 4-7: ½ point each (5 points total)
**Part Three: Impact of Wind Direction**

Global circulation patterns impact more than just wind direction. To see an example, go to: http://www.classzone.com/books/earth_science/terc/content/investigations/es1806/es1806page01.cfm?chapter_no=investigation and read the introduction. View each photo more closely.

6. Make a prediction: Which way do you think the wind blows over Oahu? *(Remember: Wind direction is always described with the direction from which it blows. For example, a wind blowing from west to east is called a west wind. You can use what you’ve learned about global circulation patterns to answer this one, too)* (½ pt)

7. What evidence did you use to make your prediction? (½ pt)

8. Describe the pattern of vegetation you see on Oahu. In which areas are plants concentrated? Which areas are bare or have little vegetation (½ pt)

Go on to the next page and view the relief maps of Oahu (including the 3-D) model. Continue onto the third page and play the animation.

9. Describe what happens to moist air as it moves up the windward slope of the mountain, crosses the summit, and moves back down the leeward slope. (1 pt)

10. How would rainfall amounts differ between the two sides of the mountain? (½ pt)

11. If the wind doesn’t change direction, how would vegetation patterns reflect the rainfall amounts on each side of the mountain? (½ pt)

12. What does the vegetation pattern on Oahu suggest about the wind direction? (½ pt)