Global and Local Surface Temperatures

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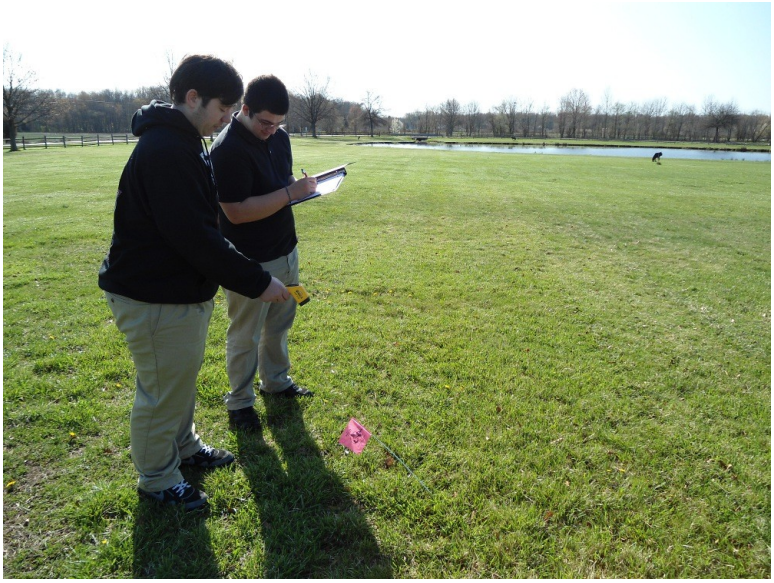

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Abstract:

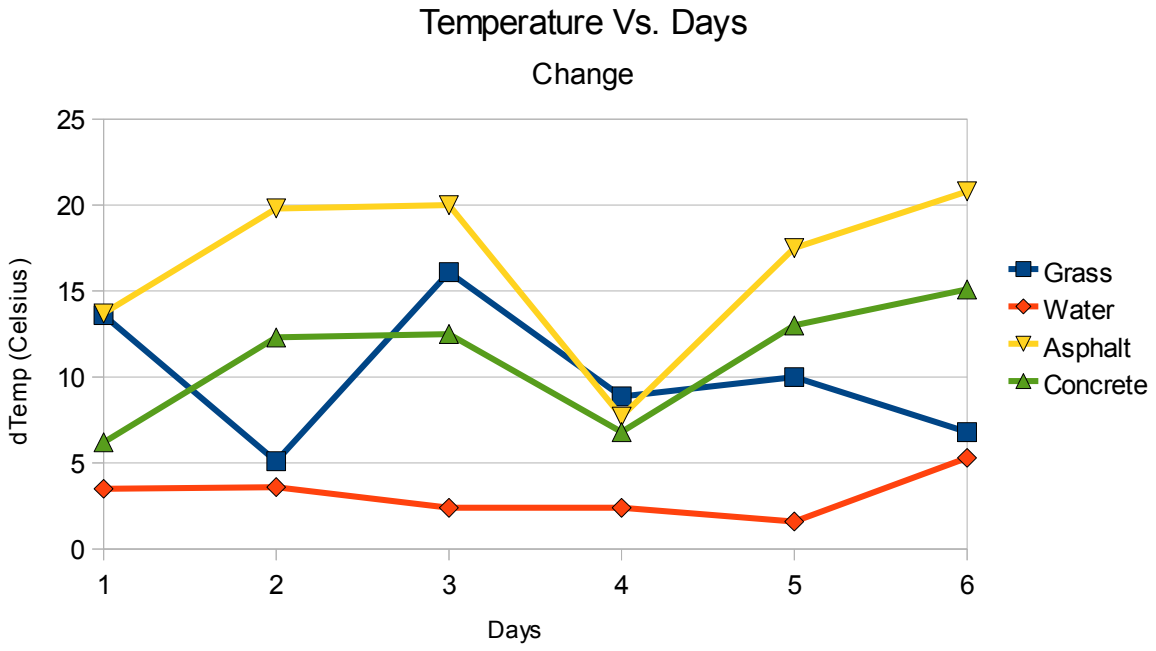
Our research was on surface temperatures. The purpose of the project was to compare the fact that global remote sensing agree with local ground observations. Satellite pictures (p.4) show ocean water to have the least variation in temperature and land has largest amount. We wanted to compare what satellites saw to what we see at our school. We hypothesized that, because of the fact that black holds the most radiation/energy, that the asphalt would have the largest variation of change in heat. We also hypothesized that the concrete would change the least due to it's white color.

Our procedure was, almost daily, that we would go outside and record the surface temperatures of four surfaces, the short grass field, the water of the pond, the asphalt, and the concrete around a school. Our result was that the temperature of the water had the least variation in temperature. Our conclusion was slightly off from our hypothesis. The water had the smallest amount of change in temperature.

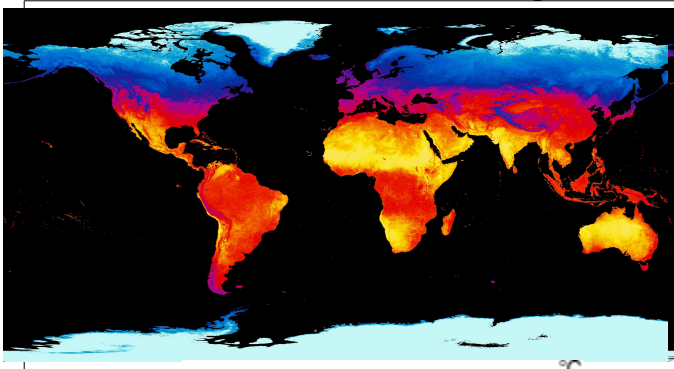
Research Question:

Does global remote sensing agree with local ground observation? We are studying hurricanes and want to understand how different surfaces heat up differently.

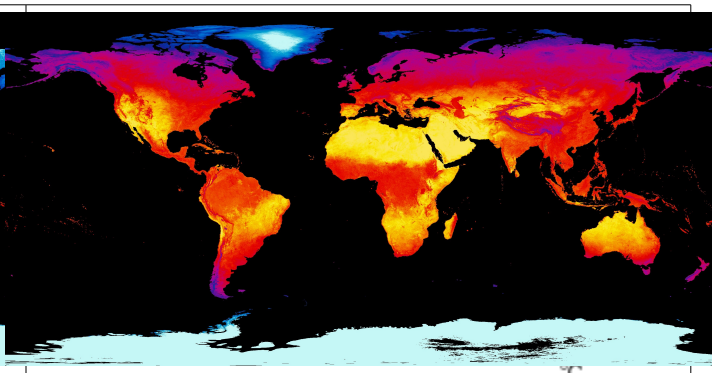
We hypothesized that the concrete would have the minimum temperature change due to it's white color, as that reflects heat. We also hypothesized water would have the least variation in temperature. We went outside many different days and we used a total of 6 days and recorded the surface temperature on each surface in multiple spots. After we obtained all the data, we placed it in a chart (seen below). We used this to visualize the change of each surface, all within the same chart.



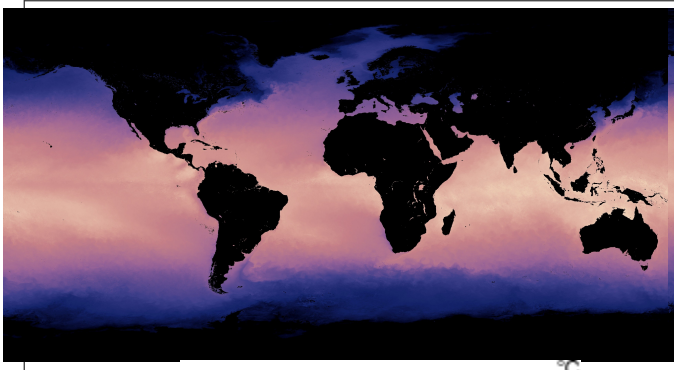
GLOBAL Temperature and Net Radiation Data Sets



Land Surface Temperatures, March 2013

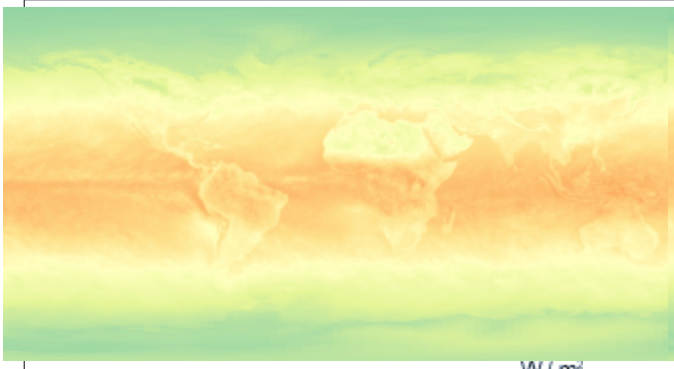


Land Surface Temperatures, September 2012

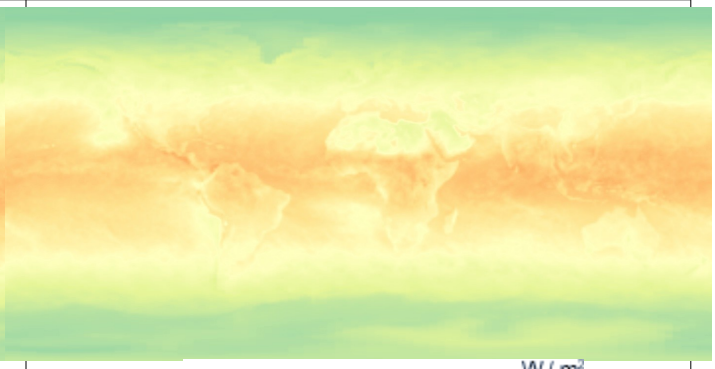


Sea Surface Temperatures, March 2013

Sea Surface Temperatures, September 2012



Net Radiation, March 2013



Net Radiation, September 2012

Materials and Method

The GLOBE protocols were surface temperature and air temperature. We used the infrared thermometer to gather our surface measurements. Also used an air temperature thermometer for the air temperatures. We took the different measurements throughout the day at 9:00 a.m. and 12:00 p.m. We took measurements off the short grass, concrete, asphalt, and water. Then used the numbers gathered to find the differences in temperatures during the day. We then averaged the measurements together and used them to find the complete temperature change.

Data Summary

Chart 1- Short Grass

This chart represents how the temperature of the short grass changed over the dates we measured. We measured twice on each of these dates, once at 9 am and again at 12 pm.

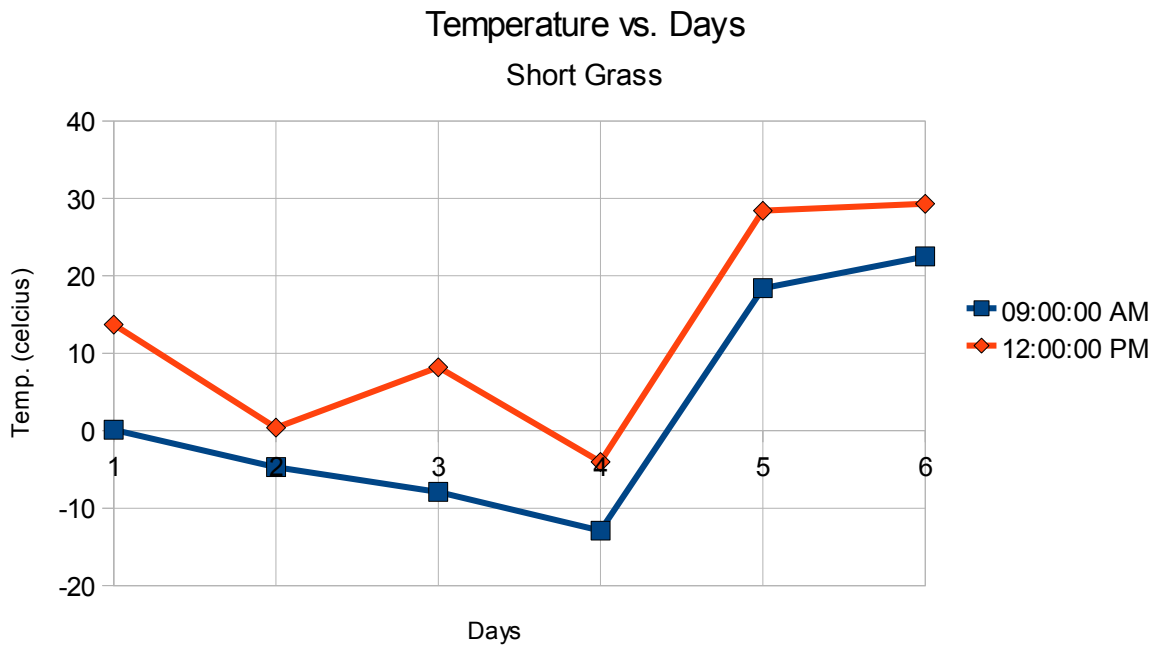


Chart 2- Water

This chart represents the temperature change of the water from our school lake over a period of six dates. We measured twice on each of these dates, once at 9am and once at 12pm.

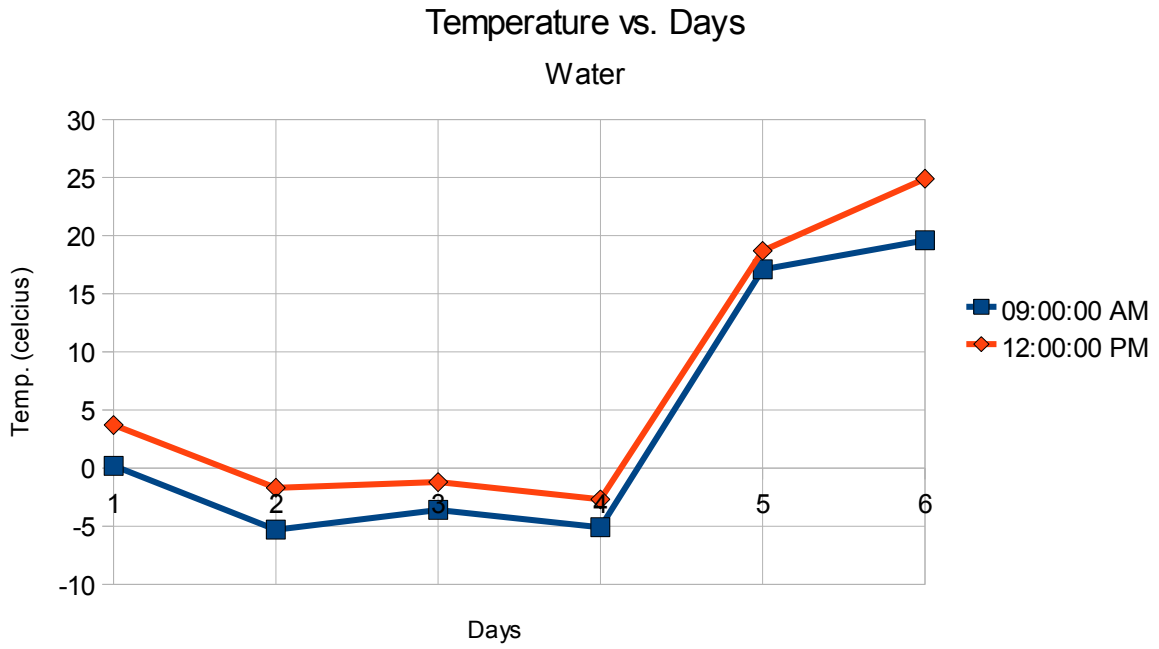


Chart 3- Asphalt

This chart represents the change in temperature in degrees Celsius of the asphalt found around our school pond. You can see the temperature has warmed up towards the last dates of our data collection.

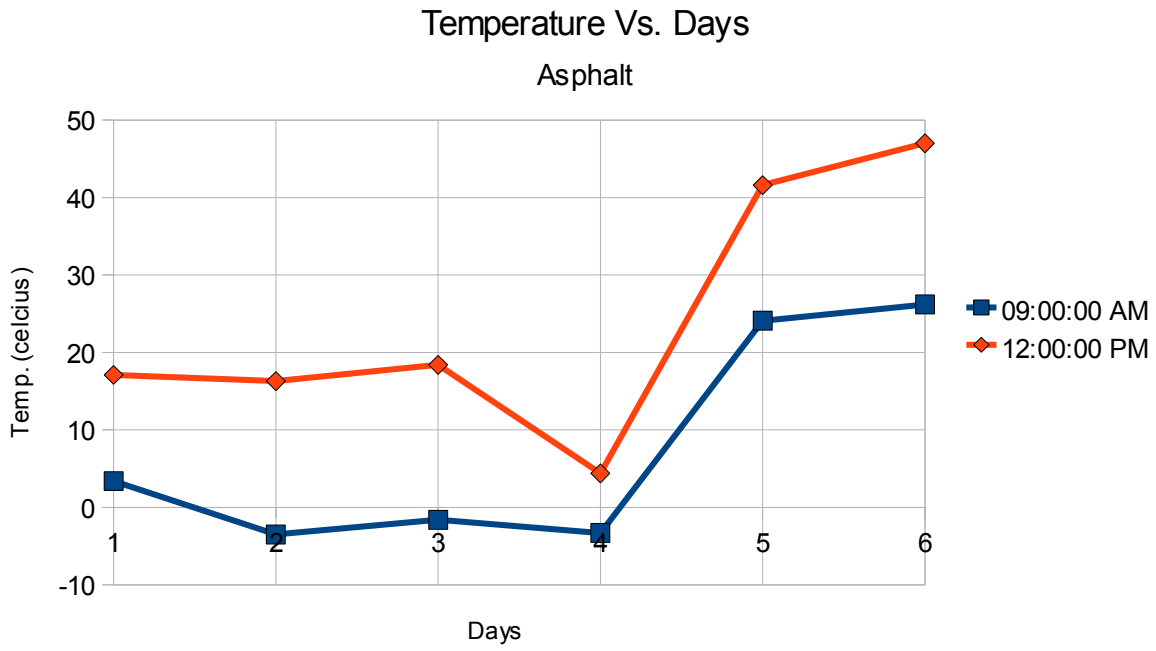


Chart 4- Concrete

The data in this chart shows how the temperature of the concrete measured with an infra-red thermometer has changed over the period of this experiment.

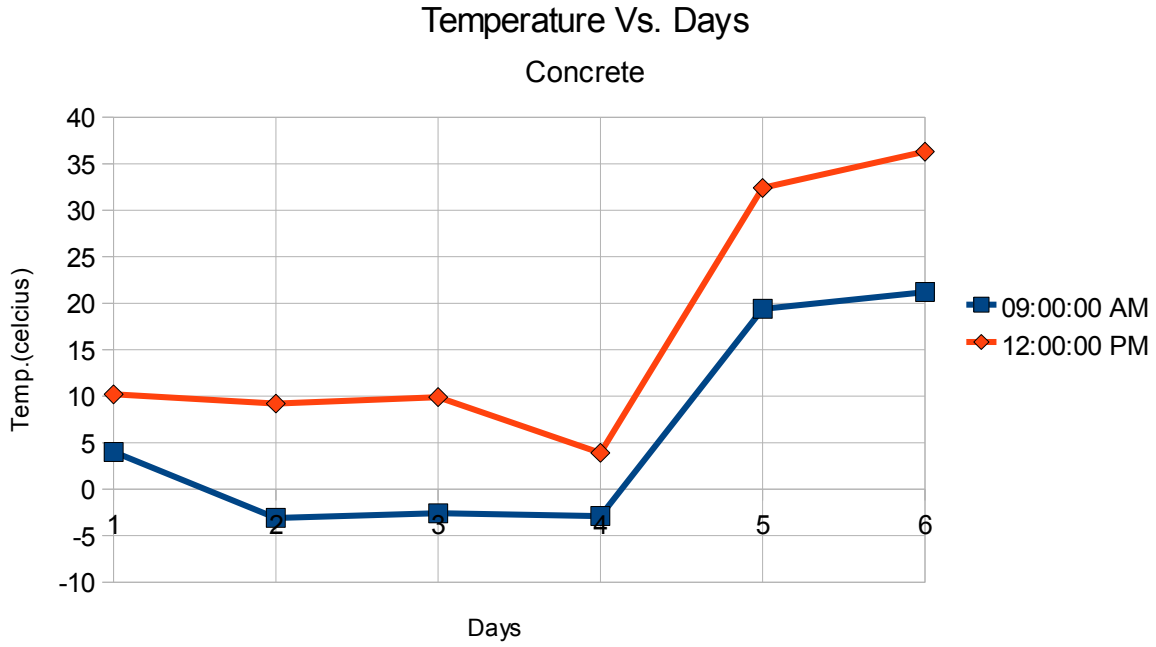
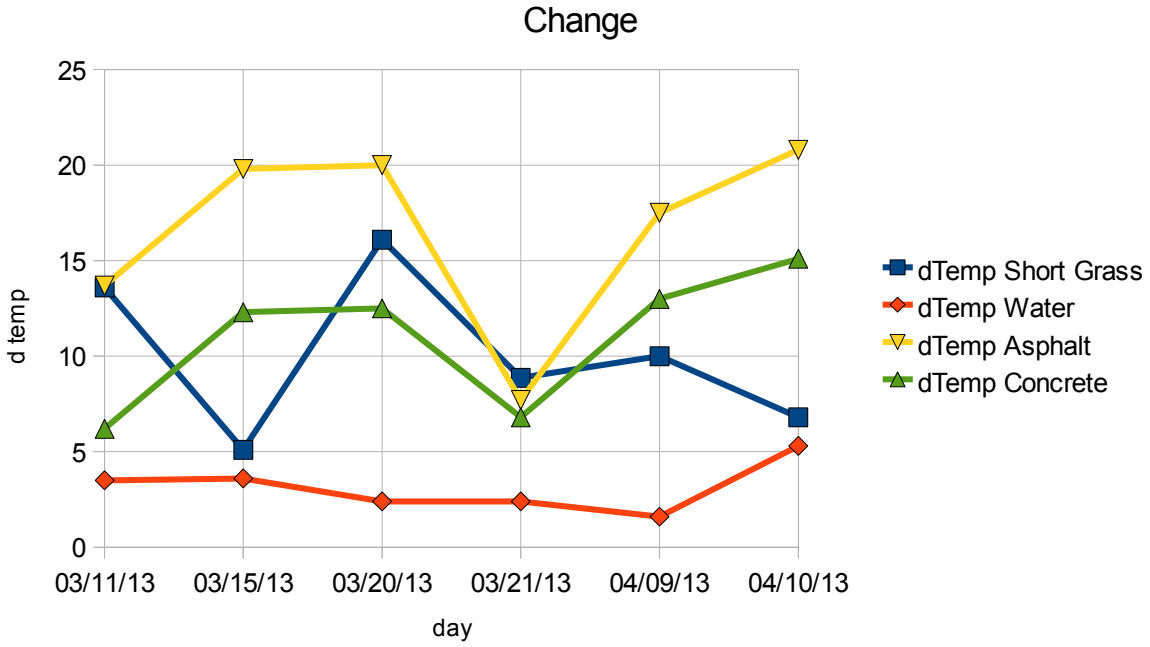


Chart 5- Change of Temperatures

This chart shows the difference of the temperatures taken on the first date measured and the last date measured of the short grass, water, asphalt, and concrete.



Analysis and Results

To analyze the data we viewed the differences between the charts information and how they related to one another. The math that we did for this project was determining the differences of temperatures each day and then averaging them all together in the end for our results. Our results showed that water had the least amount of change over all four surfaces.

Conclusions

After gathering the data and finding that each surface retained heat differently. The pond we measured had the minimum change in heat. We then measured the black asphalt in front of the school finding that it retained the most heat of all the surfaces. The white concrete also retained a good amount of heat but not as much as the asphalt. The measurements from the short grass had a small fluctuation but still greater than the water. Using the measurements gathered around the world for surface temperatures, we have concluded that the minimal change of temperature in ocean water ties directly to the minimum change in the pond in our area.

Discussion

Some improvements we could make to our research is a temperature taken later in the afternoon around 3 p.m. This part of the project was a part of a bigger project where we calculated the area and heat content of the pond. We then used the same equation to calculate the heat content of the sea, so we could then investigate the energy of hurricanes. With these extensions we were able to find the height and area of hurricanes along with there energy.

Acknowledgments

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Dr. Frank Ranelli – School Principal, allowed for setup.

1st Block Physics Class – Collected data at 9 a.m.
Heather Faircloth
Katlyn Christensen
Tyler Yacono
Brandon Szychoski
Kristopher Steinmetz
Samantha Wittenberger
Hassan Tucker
Milagros Mendez
Vincent Rutherford
Ladylee Toe

3rd Block Geospacial Class – Collected data at 12 p.m.
Bethany Thomas
Alvaro Bonilla

References/Bibliography

NASA Earth Observations, http://neo.sci.gsfc.nasa.gov/
Space Science and Engineering Center, http://www.ssec.wisc.edu/data/