CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Katherine N. Bishop

Project Number

J0801

Project Title

How Does Temperature Affect the Intensity of Light Given Off by Fluorescent Rocks?

Abstract

Objectives/Goals

My project studied how temperature affects the intensity of fluorescence in fluorescent mineral samples. I studied four different rock samples (Argonite, Flourite, Scapolite, and Hackmanite) under three different temperatures (72 hours in a freezer, room temperature, and 500 degrees).

Methods/Materials

To measure the light intensity I built a light sensor using a photo resistor attached to an Arduino Uno. To control for the surrounding environment I built my own controlled environment to test the samples in. The minerals were placed in the bottom of the box, the light sensor was held a foot above the sample and the black light was atop of the box. Then the light intensity was recorded for each mineral at each temperature three different times.

Results

Argonite had the greatest intensity at extreme heat, then at extreme cold and finally at room temperature. Fluorite had its greatest light intensity at extreme cold, then extreme heat, and finally at room temperature. Scapolite's greatest light intensity was at extreme cold, then at room temperature, and then at extreme heat. Hackmanite had its greatest light intensity with extreme cold, and then the room temperature and extreme heat had the same average temperature.

Conclusions/Discussion

The correlation between temperature and light intensity in not a linear relationship and it depends on the mineral, but I did find an overarching pattern. The greatest light intensity for each mineral sample, was when it was at an extreme temperature, whether it be hot or cold.

Summary Statement

Extreme temperatures initiate the greatest change in the light intensity of a fluorescent rock.

Help Received

My Father, Jonathan Bishop, reviewed my poster and write up. Craig MacFarlane lent me the Arduino and helped locate light sensor construction tutorial. Leslie Tamminem lent me the black light.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Jackson Gobel; Billy Lynch

Project Number

J0802

Project Title

What Variables Affect the Rate of Water Evaporation?

Abstract

Objectives/Goals

Our Science Fair project investigated variables that affect the rate of water evaporation. We thought that the water with greater surface area will evaporate faster because more sunlight is hitting the surface and evaporation takes place at the surface of the water. We thought that the warm water will evaporate faster because the water molecules will have more energy and will evaporate faster. We thought that the water with wind would evaporate faster because the air pushes already evaporated molecules out of the way. This allows for new molecules to evaporate.

Methods/Materials

Our first procedure for our wind experiment started with us pouring equal amounts of water into equal size containers. We put a fan next to one of the containers and left both of them out. In 13 days, we collected the data checked if wind had an effect on evaporation. Our second procedure for our temperature experiment started with us pouring equal amounts of water into two uncovered and equal size containers. We put one container in light and one in shade. After 2 weeks we recorded the data and saw if temperature had an effect on water evaporation. Our third procedure for our surface area experiment started with us pouring equal amounts of water into two uncovered, one having a surface area of 24.434 square centimeters, and one having a surface area of 824.23 square centimeters. After 2 weeks we determined if surface area had an effect on water evaporation.

Results

Our graph shows that in the tub with the wind passing over it, all 1000 mL of water evaporated and in the tub without wind only 296 mL evaporated. In the tub that was shaded 344 mL of water evaporated and in the non-shaded tub, 496 mL of water evaporated. The tub with a bigger surface area had 508 mL of water evaporate, while the tub with a smaller surface area had 112 mL evaporate.

Conclusions/Discussion

All three of our hypotheses were correct. The tub with the wind passing over it had more evaporation than the tub without wind. The tub that was not shaded had more evaporation than the tub that was shaded. The tub with the bigger surface area had more evaporation than the tub with a smaller surface area. Our project could help gardeners who want to have the water stay with their plants rather than evaporate, so our experiment could tell them when to water their plants.

Summary Statement

Our project explores different variables that affect how fast water evaporates.

Help Received

Mother helped with supplies

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Alicia N. Hans

Project Number

J0803

Project Title

The Effects of Acids and Bases on Soil Permeability

Abstract

Objectives/Goals

My objective was to learn if the pH of the water affected the soil permeability.

Methods/Materials

Materials used: potting soil, plastic cups, a funnel, a pitcher, measuring tools for volume, water, vinegar to create an acidic solution, baking soda to create a basic solution, two stopwatches, a piece of fabric, rubber band, pH strips, marking pen.

First, I prepared the soils; 100 mL, five samples for each of three solutions. Then I saturated the soil, poured the saturated soil into the funnel (with the fabric attached to stop the soil from falling), measured the pH of the solution, poured in the solution, started both stopwatches, stopped the first one when five seconds passed between drops, stopped the second one when ten seconds passed between drops, continued timing until ten minutes had gone by, removed the funnel, measured the pH of the solution again, measured how much water had come through in ten minutes, and cleaned out the funnel and pitcher. I did this five times for each of three solutions and recorded all the data: starting pH of the solution, time when five seconds passed between drops, time when ten seconds passed between drops, second pH, and mL of water that came through in ten minutes.

Results

My results were extremely inconsistent. The ranges were large and overlapped each other. The average amount of water that came through in ten minutes for the acidic solution was 60.8 mL, basic solution was 33.2 mL, and neutral solution was 56.8 mL. The average time it took for there to be five seconds between drops for the neutral solution was 295 seconds, acidic solution 438 seconds, and basic solution 267 seconds. The average time it took for there to be ten seconds between drops for the neutral solution was 440 seconds, acidic solution was 534 seconds, and basic solution was 469 seconds. I can see a trend in the averages but the ranges are so large it is difficult to tell if the trend is significant.

Conclusions/Discussion

My conclusion was that, based on the trend I could see in the averages, my data did not support my hypothesis. The acidic solution produced the lowest average permeability rate and the basic solution produced the highest. The trend may not be significant, and if it is not, then I cannot find enough evidence to prove my hypothesis true or false.

Summary Statement

My project is about the effects of acids and bases on soil permeability.

Help Received

Parents ran stopwatches; mom helped find sources for research; dad helped with graphing program.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Jordyn Harper; Caelen McQuilkin

Project Number

J0804

Project Title

Freezing Warm: Thermopoles in the Snow

Abstract

Objectives/Goals

We wanted to find out why animals make subnivean (meaning in the snow) homes in the freezing cold snow during winter.

Methods/Materials

We conducted our experiment in January in Virginia Canyon, near our home in the Sierra Nevada Mountains at 9,740 feet (2,968 meters) elevation. This snowy location is home to lots of subnivean animals, like the Douglas tree squirrel. We wanted to measure the temperature of snow and air at the same time. To accomplish this, we invented the thermopole. Thermopoles are long PVC pipes that we drilled holes in every 3 or 9 cm to allow attaching iButtons with wire and mesh. An iButton is a thermometer that records the temperature at any interval you choose, and stores it. We placed 7 thermopoles in 4 different scenarios: open air, bush, snow-covered bush, and pure snow. We left the thermopoles out for a week. To test the effect of an animal's body heat in their subnivean home, we made a snow cave and spent the evening in it. We placed a thermopole in our cave along with other iButtons in the cave and outside of it.

Results

After analyzing our iButtons' data, we found that at night, it is much warmer under the snow than above. For example, on our Red Zebra thermopole in pure snow, on January 20th at 6 a.m., it was -2.5°C at the very bottom of the thermopole in the snow, while it was -11.5°C at the very top of the pole in the air. The warmest place for an animal to sleep at night is near the ground under the snow. Also, this location is warmer when there is more snow on top of the animal. We also found that body heat has a substantial affect on a snow cave's warmth. Snow isn't like a heater, but more like a blanket, keeping warmth instead of creating it.

Conclusions/Discussion

Our data show that it is warmer in the snow than in the air above at night. We concluded that this is why animals spend the night there. Another thing our data revealed was that in drought years like this one, animals have a much harder time surviving than usual because of the lack of snow; sleeping outside can kill them when it gets below about -20° C. Even further in the future, climate change will reduce the amount of snow drastically, causing animals to start freezing to death at night because there won't be cold snow to keep them warm at night.

Summary Statement

By making thermopoles to measure snow and air temperatures and placing them in different locations, we found that freezing snow is warmer than air at night.

Help Received

Dr. Connie Millar lent us the iButtons and gave us information about subnivean animals and snow. Our parents and Dr. Millar asked questions to help us analyze our data. Caelen's dad helped us use Excel and the iButtons. Jordyn's dad constructed our snow cave. Caelen's mom proofread the text for the board.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Zachary Z. Jimenez

Project Number

J0805

Project Title

Soil Moisture Content

Abstract

Objectives/Goals

My goal was to find out whether soil, gravel, or sand took the most moisture to compact.

Methods/Materials

Soil
Sand
Gravel
Rammer
Cylinders/Molds
Straight Edge
Balances
Sieves
Sieve Shaker
Oven

Results

My results showed that the soil (silt sand) required the most moisture to compact. The silt sand and data indicated a maximum dry density of 121 pounds per cubic feet and moisture content of 10%.

Conclusions/Discussion

I concluded after compacting each type of sample that the soil took more moisture to compact than gravel or sand.

-Soil has a moisture content of 10% and a maximum dry density of 121 pounds per cubic feet.
-Sand has a moisture content of 9% and a maximum dry density of 118 pounds per cubic feet.
-Gravel has a moisture content of 7% and a maximum dry density of 140 pounds per cubic feet.

Summary Statement

My project is about which type of soil can hold the most moisture content.

Help Received

My father, Solin Jimenez, helped conduct experiment. My mother, Raquel Jimenez, helped me finalize reports and summaries.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Daniel J. Lorell

Project Number

J0806

Project Title

Magnificent Magnetic Micrometeorites

Abstract

Objectives/Goals

Objective: The objective of the experiment is to test whether micrometeorites fall in greater quantities in locations where earth#s magnetic forces increase.

Methods/Materials

Methods and materials: Thirty-two 12.5" x 20" sheets of freezer paper were taped to thirty-two metal tins and sent to eight different locations. Each location was associated with a magnetic intensity band#9 altogether. Inclement weather (wet, soggy paper) ruined the data from one intensity band. However, for the other 7, for 7 consecutive days, each sample was placed outdoors in an area that was unobstructed to the sky. At the end of a week, sample sheets were folded up and sent back to Los Angeles for testing. A magnet was run under the sheets, and the particles that moved with the magnet, which were metallic, were observed under a microscope. If the particle could be identified as a micrometeorite, it was moved to a microscope slide for storage. Micrometeorites were identified as small magnetic particles that have a metallic appearance or texture, showed signs of melting, or contained porous craters

Results

Results: The hypothesis was proven to be correct in that the area that had the strongest magnetic field showed an average of .75 micrometeorites per sample, whilst the samples from the weakest magnetic fields averaged 0 micrometeorites per sample.

Conclusions/Discussion

Conclusions: As the hypothesis was proven, it might be reasonable to take into account the strength of a magnetic field when planning an orbit, as it is a variable for orbits and or trajectories of micrometeorites. The magnetic field of earth reaches out 59,725 miles. This could be a consideration for planning out future orbits. Additional analysis would need to be conducted, but the results of this experiment suggest more research on micrometeorites and magnetic fields could be worthwhile.

Summary Statement

This project is testing whether or not micrometeorites fall in greater quantities as earth#s magnetic forces increase.

Help Received

Help Received in Doing Project My family across the country helped a great deal by cooperating and setting up experiments at their homes. My parents helped a great deal organizing experiment and assisted in formatting the final report. My school assisted by supplying a microscope to work with.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Matthew Perri; Hayden Pisano

Project Number

J0807

Project Title

Undeground Fluid Flow and Darcy's Law

Abstract

Objectives/Goals

The objective of this project is to build actual reservoir models using earth materials, then use Darcy's Law to calculate permeability and study the other factors affecting oil and water flow.

The following questions are the objectives of our science project:
1. Which reservoir material (pea gravel, aquarium gravel or sand) will result in the highest water flow rate? Why?
2. How important is pressure or the height of water on the amount of produced water?
3. How does oil flow compare with water flow? Does it flow more freely or less? Why?

Methods/Materials

We used 2-liter soda bottles to build reservoir models out of pea gravel, aquarium gravel and sand. We then flowed water through the three models and measured the amount of fluid collected. We used Darcy's Law to calculate permeability. We repeated the experiment with vegetable oil to understand the role of viscosity. Water was also flowed through the models at different heights to understand the effect of pressure (water column) on fluid flow.

Results

The pea gravel resulted in the highest water flow rate and highest calculated permeability, followed by aquarium gravel and then sand. Oil flow was considerably less when compared to water for the aquarium model (170 ml with oil vs. 580 ml with water). However, the calculated permeability was about the same (478 darcies with oil to 480 darcies with water). Water flow rate was highest when we had the highest height of water column.

Conclusions/Discussion

1. The pea gravel reservoir has the highest permeability of the three reservoirs tested. This is because it has the highest porosity which is the pore space around the rock particles.
2. The sand reservoir has the lowest permeability of the three reservoirs tested. This is because it has the lowest porosity which is the pore space around the rock particles.
3. The lowest hole #4 had the highest flow rate. This is because the higher the height of water, the higher the pressure and the higher the flow rate according to Darcy#s Law.
4. Water flows easier than oil because oil is thicker. The thicker the fluid the higher the viscosity. According to Darcy#s Law, the higher the viscosity the lower the flow rate.

Summary Statement

Darcy's Law explains the important variables that control fluid flow in reservoir rocks.

Help Received

My Dad helped us with Excel plots and my Mom helped us with the board.

Name(s)

Carlos J. Rubio, Jr.

Project Number

J0808

Project Title

Impact in Three, Two, One: Determining if the Mass or Circumference of an Impactor Creates a Larger Impact Crater

Abstract

Objectives/Goals

Does the circumference or the mass of an impactor cause a larger impact crater as measured by the crater diameter, depth, and/or longest ejecta ray?

Methods/Materials

6 impactors were tested a total of fifteen trials per impactor. The impactors were divided into two groups; the small group had the same circumference size but each impactor increased in mass. The large group had the same circumference that was larger than the small group and each impactor increased in mass. Tests were completed by placing a large black covering on the floor and a tray was placed in the center of the cover. The tray was filled to the rim with flour and was compacted with another container. A meter stick was placed vertical to the lip of the tray and the impactor was placed at the one meter mark. The impactor was released and after impact, the impactor was removed from the crater with forceps. A ruler was used to measure the impact crater diameter, depth, and a meter tape was used to measure the length of the longest ejecta ray. The process was repeated in a new area of the tray for a total of fifteen trials. A new tray was used for each impactor.

Results

My results showed that the impactor with the greatest circumference and mass created the longest ejecta ray by an average of 7.5 cm. The deepest crater was created by the larger impactor with the second greatest mass; this impact crater measured at an average depth of 2.8 centimeters which was 0.1 centimeters deeper than the other impact craters. The largest diameter measured at an average of 2.8 centimeters and was created by the two largest impactors. My results from the small impactors consistently showed the impactor with the second greatest mass caused the longest ejecta ray, deepest crater, and widest diameter.

Conclusions/Discussion

In conclusion, the damage caused by impactors (ejecta ray length, crater depth, and crater diameter) does vary based upon the impactor size. Crater depth, diameter, and ejecta ray length can be correlated to the mass and circumference of an impactor but one also has to consider the surface that the impactor strikes and the velocity at which the impactor travels.

Summary Statement

This project investigates if the circumference or mass of an impactor causes a larger impact crater as measured by crater diameter, depth, and longest ejecta ray length.

Help Received

My science coach supplied testing materials and supported research; my father clarified how to measure for data.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Jakob Saloner

Project Number

J0809

Project Title

Do Solar/Lunar Positions Influence Earthquakes?

Abstract

Objectives/Goals

The Moon and the Sun have the largest gravitational effects on the Earth of all the celestial bodies. The resulting land tides may have the capability to trigger earthquakes, along with possible electromagnetic influences. The purpose of this project is to find any correlations, patterns, and abnormalities between the positions of the Sun, Moon, Earth and earthquakes.

Methods/Materials

To find correlations, patterns, or abnormalities, a master data set was created containing four hundred three earthquakes having magnitudes 4.5 and greater and having occurred between 1901 and 2001. The data were sorted by nearest phase (New Moon, First Quarter, Full Moon, and Third Quarter), and then by proximity to that phase. Each earthquake was recorded with its location including latitude, date of occurrence, day in the lunar cycle, whether or not it occurred on a perigee or apogee, and its magnitude. The data was also counted to find frequency, or, number of earthquake values. After counting, a statistical analysis was created to find discrepancy between the observed and expected frequency values, due to the complex nature of the data and its lack of a control set as this data is built upon earthquakes that had happened, instead of experimental outcomes.

Results

The distribution of the number of earthquakes over the Lunar cycle trended toward a cyclic pattern with a slight decrease of frequency when the Moon#s position approached alignment with the Earth and the Sun (syzygy) and then again when it approached the first quarter. The third quarter was an exception with a slight increase in the number of Earthquakes. Earthquakes occurred 25% more frequently at perigee than at apogee. There was a 75% correlation between the occurrence of earthquakes within the lunar month and the absolute latitude of the same set of earthquakes.

Conclusions/Discussion

This indicates that the greater the number of earthquakes that occur on any day in a lunar month, the farther away from the earth#s equator they will be. The statistical analysis indicated that the farther away a day is from and two adjacent lunar phases across the lunar month, earthquakes will occur 13% about more frequently. There was no significant difference in the distribution of magnitude within the Lunar cycle. Overall, this project supported the theory that the Moon#s position in relation to the Earth and Sun has some connection to earthquake activity.

Summary Statement

The purpose of this project is to find any correlations, patterns, and abnormalities between the positions of the Sun, the Moon, the Earth and earthquakes.

Help Received

Mrs. Sniffen helped in techniques for displaying the data and assembling the board.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Joseph F. Silva

Project Number

J0810

Project Title

How Water Erosion Affects Dirt and Sand on Hillsides

Abstract

Objectives/Goals

To learn how much soil can be carried away by water from a hillside

Methods/Materials

1 large sheet of wood; 2 long pieces of wood; miter box; Saw; Power Drill; Hot Glue Gun & Glue; Spray paint; Screws; Square; Tape measure; Grass seed; Paint pan; Sand; Dirt; Buckets; Water; 16 ounce container; 3 Tupperware bowls; Stopwatch; Spatula; Shovel; Pie tins; Wire Hole poker; Measuring cups.

Method: Build a model hillside with 3 slots. Pack each slot with a soil type. Pour 16 ounces of water over the soil types: sand, plain dirt and planted grass. Vary the length of pouring; 20 seconds; 40 seconds; 60 seconds.

Results

Water, 20 seconds: Plain soil: I had to get the dirt out from the Tupperware bowls and the bottom of the hillside and drain off all the water. I put my dirt into pie tins. I drained off more water. Then I measured the dirt in a measuring cup. There was 1/4 cup of dirt lost from the hillside. Sand: Sand and water went everywhere. It went out the model and over the sides. I measured the amount of sand left in the model. I used a spatula to get all the sand into a measuring cup. There was 3 3/4 cups of sand lost. Grass Soil: There was no dirt runoff.

Water, 40 seconds: Plain soil: lost ¼ cup. Sand: lost 3 ½ cups. Grass Soil: There was no dirt runoff.

Water, 60 seconds: Plain soil; While the water was running down the dirt on this test I saw a channel start to form and pick up a lot of soil in the run-off, lost 1 1/3 cups. Sand lost 3 ¼ cups. Grass Soil, no runoff.

Conclusions/Discussion

I think my experiment went really well. I had a lot of fun building my model hillside. My hypothesis; Sand will be most affected by water erosion was correct. Observing hillside erosion I learned it is important to also watch how water travels downhill, it can cause a large increase in erosion if water can form a channel or stream. The grass was the least effected by erosion. I do not want a beach house.

Summary Statement

How Water Erosion Effects Dirt and Sand on Hillsides

Help Received

Mom helped type the report and take pictures. Dad taught me how to use a miter box.

Name(s)

Jack C. Standish

Project Number

J0811

Project Title

Does Altitude Affect Background Radiation?

Abstract

Objectives/Goals

This experiment was conducted to find out whether altitude affects background radiation. The hypothesis stated that an increased altitude would result in increased background radiation.

Methods/Materials

The experiment used a cloud chamber, a cup that uses alcohol vapor to expose radioactive particles, to test the presence of background radiation. The cup was prepared and observed for 30 minutes, but no results were visible. The procedure was then modified to induce results. These changes included the method of securing the felt to the container, the size and shape of the container, the method of dry ice application, the material that the container was composed of, the time of day during the testing, the strength of the flashlight, the depth of the pan holding the dry ice and cloud chamber, and the altitude of the testing. All of these changes were implemented in 7 different rounds of testing. However, there were still no results. The cloud chamber was then replaced by a digital radiation monitor. Background radiation was measured at 41 different altitudes, from 0 to 12000 meters.

Results

When the raw data was placed in a graph, a pattern emerged. It suggested that background radiation increased exponentially with altitude. This pattern confirmed the hypothesis.

Conclusions/Discussion

After repeated trials and data evaluation, it was discovered that background radiation increased with an increase in altitude. Altitudes from 0-8000 meters had relatively safe radiation levels, up to around one microsievert per hour. At higher elevations, (8000-12000 meters) background radiation increased, posing a small but present health risk. This information can help people like airline pilots, extreme mountain climbers, frequent airline flyers, and astronauts by informing them on the health risks of background radiation at high altitudes. Knowing that background radiation increases with altitude can help individuals to know when to use protection against radiation and also when it is unnecessary. Additional research might include the collection of more data points to more accurately predict trends in background radiation levels at various altitudes.

Summary Statement

This experiment was conducted to find out whether altitude affects background radiation.

Help Received

Mother provided transportation to some locations where background radiation was measured; Father took some digital meter readings on a domestic airline flight.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Hannah M. Steagall

Project Number

J0812

Project Title

Does Soil Density Affect Water Evaporation Rates?

Abstract

Objectives/Goals

My project was to determine if soil density affects water evaporation rates in soil. I believed that soils with greater densities will have lower water evaporation rates than less dense soils.

Methods/Materials

Four different types of soils were weighed and calculated for density. Then they were filled with 1/2 cup of water and weighed in grams every 12 hours for a total of 72 hours. After the 72 hour test I calculated the total evaporation by subtracting the weight of the soil from the last weighing interval from the weight of the soil from the first weighing interval

Results

The least dense soil had the least total evaporation rate. The second most dense soil was the soil with the greatest total evaporation.

Conclusions/Discussion

My conclusion was that the density of a soil does not affect the total water evaporation rate.

Summary Statement

This project describes the relationship between soil density and total water evaporation rates.

Help Received

My mother helped type my report; Mr. Jones helped select my project.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Natalie C. White

Project Number

J0813

Project Title

Flight of the Falcon: Measurement of Cosmic Rays in the Upper Atmosphere

Abstract

Objectives/Goals

The primary objective was to determine the relationship between altitude and the cosmic ray count. The secondary objectives were to make measurements of temperature, pressure, and wind speed as a function of altitude. Finally, three high resolution video cameras were used to record the flight.

Methods/Materials

An instrument package was constructed and then launched using a helium filled weather balloon. The primary instrument was a Geiger counter sensitive to beta and gamma rays. Prior to each flight, computer simulations were run to determine the likely flight path and landing spot. Two flights were made. The first was launched on 8 December 2013 near Gilroy, ascended to about 29,000 m, and landed in Death Valley. The flight lasted for 5 ½ hours. After the first flight, the instrument package was upgraded with solar panels to run the cameras and flight computer. The second flight was launched on 15 February 2014 from Kettleman City but was lost over the Sierras near Owens Lake when the GPS failed. A replacement instrument package was constructed but has not yet flown.

Results

It was found that at altitudes below 3,000 m, the cosmic ray count was small and constant. At altitudes up to 8,000 m, the count increased gradually. Above 8,000 m, the count increased dramatically but then leveled out at 550 cpm at 12,000 m. The radiation at high altitudes was a factor of 27.5 times higher than the radiation at ground level. Also, it was found that the horizontal wind speed increased steadily with altitude, topping out at speeds of about 50 m/s at altitudes between 8,000 and 9,500 m. At even higher altitudes, the wind speed decreased. Air temperature was found to drop gradually with increasing altitude before leveling out at a temperature of -34 C at an altitude of 9,500 m. Air pressure was found to decrease smoothly with altitude.

Conclusions/Discussion

On the first launch, I did not put enough helium in the balloon giving a balloon ascent rate of only 1.7 meters/second. The slow ascent rate meant that the balloon drifted much further than I had expected and the flight lasted longer. Although the balloon ascended to the expected altitude of 29,000 meters, the flight computer failed at 16,340 meters. Likewise, the cameras stopped working at an altitude of 10,000 meters. The most likely explanation is that the batteries ran out of charge due to the longer than expected flight time.

Summary Statement

I launched a weather balloon with a Geiger counter, cameras, and other instruments to an altitude of 30,000 meters.

Help Received

Father taught me how to solder, obtained helium, and drove me to Gilroy for the launch. Simon Gonzales and his friends drove to Death Valley to recover the equipment.

CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)
Aidan L. Brem

Project Number
J0899

Project Title
Testing the Accuracy of a Homemade Magnetometer in Tracking Solar Flares

Abstract

Objectives/Goals

Abstract
I was led to this project because I have always loved heliophysics, and I have always loved researching the sun in general: I have always wondered about the solar wind, solar flares, Coronal Mass Ejections, and other phenomenon on the Sun. I began working on a magnetometer to see if I can record these phenomenon. My hypothesis was that my magnetometer could detect differences in the solar wind as fine as 0.1 keV, and detect 90% spikes that went over 25 keV.

Methods/Materials

I used two neodymium magnets, two mirrors, and a laser pointer for the basic components for my magnetometer. I wrote a program to track the laser and make a graph of how much it moved. I then let my magnetometer run for 12 hours every night, and have accumulated over 240 hours of results.

Results

My results were very surprising. When compared to NASA's data, my magnetometer could detect differences in the solar wind as fine as 0.5 keV, and it could detect 85% of the spikes in the solar wind that went over 25 keV, and also detected 65% of all spikes that went over 15 keV.

Conclusions/Discussion

I had a lot of fun doing this project. While my results show that my magnetometer should detect all differences over 15 keV, it couldn't detect a spike that went over 18 keV. If I were to do this project again, I might try using different magnets as the core, different types of coins as the control, and try to eliminate all different magnetic disturbances nearby.

Summary Statement

The goal of my project was to construct a magnetometer that could detect and record differences in the solar wind as fine as 0.5 keV and track solar flares.

Help Received

Father helped me gather materials, Grandpa was my safety advisor, Mother lent me computer for testing and Grandma took pictures of my project.