CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Gregory C. Arena

Project Number
J0701

Project Title
Sky Watch: To Determine if the Aerosol Optical Thickness (AOT) Changes Rapidly or Gradually from Day to Day

Abstract

Objectives/Goals
Aerosol Optical Thickness (AOT) is caused by tiny particles and vapors suspended in midair, created by salt, pollen, soot, smoke, water and even ice. The more concentrated the aerosols the less light can pass through. The sun photometer has to be calibrated to the Extra Terrestrial Constant (ET) or suns radiation outside of the atmosphere. From this can be calculated the AOT. Finding the AOT interested me because it has an affect on the growing problem on global warming and the amount of sunlight reaching the earth. Knowing the AOT is also useful in measuring distant objects. I believe that the AOT would vary greatly from day to day because from my extensive research, I learned that weather can have a strong effect on the percentage of AOT.

Methods/Materials
To measure the AOT I had to first find the proper gain resistor so that the measurements would fall in the center range of the sun photometer. Then I had to determine the Extra Terrestrial Constant (ET), which is the sun#s radiation at the top of the atmosphere, unobstructed by aerosols. The sun photometer is then calibrated to the ET. Knowing the ET allows for correlation between sun photometers. I used this in my experiment to measure the sun#s radiation most susceptible to aerosols, to determine the AOT.

Results
The period of data gathering spanned sixteen days. During that time the weather was especially mild for winter. In addition, if the sun was blocked by clouds I could not take my measurements. This resulted in nine days of data. The AOT results ranged from a low of 75% to a high of 92% with a range of 17 %.

Conclusions/Discussion
The results did not support my hypothesis. Instead of varying greatly the percentage of AOT was about the same. This could be from living in a low industrialized coastal region. It could also be due to the unusually mild winter. I expected there to be a greater range of AOT in my results than 17%.
Atmospheric science is now in great demand. Aerosols have a strong effect in global warming. Aerosols reduce sunlight entering the atmosphere, which makes for smaller clouds. This, in a roundabout way, allows for more sunlight to reach the earth#s surface.
Knowing the AOT also can help in measuring objects at sea, from space and on land. On a clear day objects seem closer than on a hazy day. Knowing the difference one can obtain the proper distance of an object.

Summary Statement
My project was to determine how Aerosol Optical Thickness (AOT) varies over a period of time.

Help Received
My father helped me understand concepts and workings of the sun photometer. My mother helped with the backboard. Ron Sabourin introduced me to the sun photometer. The Eureka (Humboldt County Main) Library Reference Department, helped me find needed research materials. Ms. Nickols my teacher,

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Sarah K. Beard

Project Number
J0702

Project Title
Scoping the Waves

Abstract

Objectives/Goals
To discover whether ground vibration waves travel faster uphill or downhil.

Methods/Materials
Materials: Oscilloscope, laptop computer, log, vibration sensors, cables, tape-measure, hill

Methods:
Control: Place sensors side by side and connect oscilloscope . Drop the log 14 feet and 4 inches away from the sensor. Look at the graph of the vibrations to see that the output is the same from both sensors. If they are the same, then continue to downhill procedure. (If they are not the same, you may need to look at the sensors to see if something is wrong with one of them.)
Set-up: Pick a steep slope and place sensors at top and bottom of hill. Measure the distance between vibration sensors, 45 feet 4 inches, with tape measure. Set up oscilloscope and connect the two vibration sensors to a laptop computer.
Downhill: Leave vibration sensors with one positioned at the top of the hill and one at the bottom of the hill, 45 feet 4 inches apart. Drop log five feet behind the sensor, so that the vibration passes past the first sensor and continues downhill to the second sensor. Save data recorded in computer. Determine time from sensor to sensor using oscilloscope cursors. Record data. Analyze speed using formula: speed (ft./sec) = distance(ft.)/time(sec). Repeat steps 2-6, ten times and find average speed from the 10 test results.
Uphill: Repeat downhill procedure but from the bottom of the hill.

Results
The mean travel time for the ground vibration to pass between the two sensors going uphill was 22.64 milliseconds, from ten trials. The mean travel time from ten trials going downhill was 22.64 milliseconds. I observed that the wave gets smaller as it moves away from the point of impact. When the wave travels uphill it gets signifcantly smaller than the wave traveling downhill over the same path.

Conclusions/Discussion
In conclusion ground vibrations do not travel significantly faster uphill or downhill the speed is about the same for this type of soil. If I were to do this experiment again, I would try different soil types (sand,clay,and rocky soils.) The most fun part about this experiment was learning how to use an oscilloscope and using it. Now I am also using it to see different things like the difference between my cockiel's chirps and my two parakeet's chirps.

Summary Statement
This project investigates and compares ground vibration speeds travelling uphill and downhill using vibration sensors and an oscilloscope.

Help Received
My dad used the log to hit the ground to cause vibration waves, and explained to me how the ocilloscope worked.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Evelyn Chang

Project Number
J0703

Project Title
The Investigation of Different Earth Materials on the Seismic Response of a Building Structure

Abstract

Objectives/Goals
The main objectives of this project were to study 1) the structural response of a building when founded on different soil types under similar seismic loading and 2) the seismic performance of different soils when supporting similar building under similar seismic loading. My hypotheses are as follows:
a) Buildings, in general, would show larger displacements when founded on medium dense sand and smaller displacements when put on rock, with the building on stiff clay showing displacements being somewhere in between the other two.
b)The taller building will show larger displacements on soft soils than on rock, and the shorter building will show larger displacements on rock than on soft soils.

Methods/Materials
The model set-up consists of the model buildings, made of bamboo sticks tied with steel wire with bolts assigned to the joints in simulation of building mass; the three soil box each containing a different type of earth material(sand, clay, rock); and the shaking table.
For each experiment, after affixing the soil box with the model building on the shaking table, a rotational speed ranging from 120 rpm to 150 rpm was applied to the shaking table for a period of five seconds. The movement of the soil box with model building was captured by digital camcorder positioned 500 mm away from the edge of the building. A cardboard with gridlines spaced at 12.7mm was placed 155 mm behind the building for the purpose of measuring displacement against its original position. The video clips of each experiment were analyzed to provide the basis of pinpointing the sequence, magnitude, and pattern of the building displacement.

Results
The buildings atop medium dense sand showed larger displacements, with the three-story building displaced and rotated more than the single-story one. The displacements were less when both the single-story building and the three-story building were founded on stiff clay. When placed upon rock, the buildings showed minimum or no displacement.

Conclusions/Discussion
In conclusion, buildings, especially high-rise buildings, built on sand site, will require special foundation design due to the relatively low rotational resistance and potentially large compaction of sand when subject to seismic shaking. The study of the effect of soil type and depth on ground shaking was inconclusive due to the design constraint of the shaking table and model set-up.

Summary Statement
The main objectives were to study 1) the structural response of a building on various soils under similar seismic shaking and 2) the seismic performance of different soils when supporting similar building under similar seimic loading.

Help Received
Father helped with the sawing and drilling of wood for the shake table; Used lab equipment at Associated Soils Engineering, Inc. under the supervision of the Senior Project Engineer, who is my father.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Jennifer I. Chute

Project Number
J0704

Project Title
Earthquake Intensity

Abstract

Objectives/Goals
The goal of my experiment was to measure the damage that a simulated earthquake causes on different land types and varying forces using a scale loosley based on the Mercalli Intensity Scale.

Methods/Materials
The foremost material used in the experiment was the earthquake simulator. This, I designed and built myself.

Results
As the intensity of the earthquakes increased, the amount of damage increased as well. Therefore, the overall data shows a positive correlation. Also, each of the trials for both land types had very similar damage ratings. Landfill had a significantly higher overall damage rating than bedrock at every level of earthquake intensity. The amount of damage to the sugar cube structure increased more rapidly with increases in earthquake intensity on landfill than on bedrock. The largest differences of the damage rating were on the second trial with a force (inches the ram was pulled back) of four, and the second trial with a force of five. Both of these had a difference of 4.5. The larger earthquakes that took place on landfill caused the sugar cube structures to suffer severe to complete damage, while the smaller earthquakes that took place on bedrock had barely any effect on the structure. Once the ram had made contact with the platform, there was an initial hit, but the platform did not continue to move after the initial impact. After the ram made contact with landfill, the platform continued to shake, causing more damage to the sugar cube structure each time

Conclusions/Discussion
This experiment proved that increasingly larger earthquakes create more damage to a structure on certain land types. This prediction was based on thoughts that land with no support would shake more than land with more support, and the excess movement would create more chances for the sugar cube structure to raze. In this case, landfill was the land with no support, and bedrock was the land with it. The movements of the landfill proved to be most damaging. This experiment was well controlled and the data was very consistent. If some of the cubes were chipped at the bottom, that could make the structure unstable before it even became subject to an earthquake. This may have occurred several times during the testing, because if the brittle sugar cubes were hit with a strong force, they could have become weaker for the next earthquake.

Summary Statement
This project is a unique way of demonstrating the contributing effects or the bi-products of earthquakes and what harm they encompass.

Help Received
My father supervised the construction of the earthquake simulator and helped me a few times when I was having trouble with negligible tasks involved, liked putting in a nail or screw, attactching eyelets, etc. He also drove me to the store to buy the materials and edited my final report,

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Kristina Davis; Jenny Delucchi

Project Number
J0705

Project Title
Soil Science

Abstract

Objectives/Goals
We want to know if the soil on our property has the right amount of nutrients in it for our new lilac tree to grow healthy and strong. Our goal is to find the best spot by testing for nutrients.

Methods/Materials
Step 1&2.Dig up soil 4"deep,put on paper plate to dry naturally. Step 3.Sift soil until fine. pH test only: Step 4&5.After removing cap from pH tester, fill with soil to soil mark. Step 6.Holding pH capsule over test chamber,break in half releasing powder into chamber.Step 7&8.Fill the test chamber with distilled water to the mark. Replace cap tightly on the tester and shake well.Step 9&10.Wait 1 minute, compare the color of the mixture to the pH color chart on the tester. Step 11. Record the results in notebook. N,P,&K tests only: Step 4.Fill a clear plastic container with 1 part soil and 5 parts distilled water.(1/4 cup soil and 1 1/4 cup distilled water). Step 5&6.
Shake well, allow soil to settle for 1-24 hours, until the water is mostly clear. Step 7. Select your tester,N=nitrogen(purple), P=phosphorous(blue),K=potash (orange) Step 8.Fill the dropper from the settled plastic container with water from the top. Step 9.Break the matching colored capsule in half over the tester pouring all the powder in.Step 10&11. Put the cap tightly on the tester and shake well, wait 10 minutes for the color to appear. Step 12. Match the color of the mixture to the color chart on the tester. Step 13. Record your results in notebook. Materials used:small hand shovel, distilled water, measuring tape, plastic spoons, Rapitest soil test kit, paper plates, sifter, newspapers, clear plastic containers. soil and measuring cups.

Results
Our results showed that all 6 testing areas had the same level of pH, 6.0, just adequate for our lilac tree. In testing for potash we found that all 6 areas were sufficient to surplus, phosphorus was only adequate in 1 area and depleted or deficient in the other 5 areas. Nitrogen only showed up in 1 area and that was deficient.

Conclusions/Discussion
We found our area #4 to be the best suited for planting our lilac tree. This area has the highest amount of nutrients.Also good drainage & exposure to extreme temperature changes, two additional things we learned in our research that are good for lilacs. We will be adding some organic fertilizer to bring up the pH a little and increase the nitrogen and phosphorus before planting. Our tree is in the ground and is already showing new growth.

Summary Statement
To find the area on our property with the best nutrient value for our new lilac tree to be planted..

Help Received
Mothers helped with editing report(no spell check) and learning to make graphs.John Murrah(San Lorenzo Lumber Garden Center) answering questions.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Julia Dressel; Maya Norman

Project Number
J0706

Project Title
Is Your House Sitting on the Right Soil?

Abstract

Objectives/Goals
The objective of this project was to find out what type of soil houses should be built on. The project demonstrates how well a sand/soil can withstand a certain amount of weight for a short period of time. Our school is going through a drastic remodel, building over five new structures. As the foundations were being built, we wondered what soil/sand would be the best for supporting these new structures.

Methods/Materials
This experiment was tested by first, pouring the testing sand/soil (Top Soil, Essential Soil, Mason#s Sand, or Olympia Sand) into the testing bucket. Then the dowel was inserted through a jig and onto the soil/sand. The dowel, supporting the weight, created pressure, therefore; the dowel penetrated through the sand/soil. The farther the dowel penetrated, the less able the sand/soil was to withstand pressure. The amount of weight put on the dowel and the dimensions of the dowels were changed for different tests, but there was a standard weight and a standard dowel for the tests. The materials used for this test were Top Soil, Essential Soil, Mason#s Sand, Olympia Sand, ½ inch dowel, # inch dowel, 1 inch dowel, 1 ¼ inch dowel, large bucket, and a small plastic measuring tool.

Results
Even though the Mason#s Sand withstood more pressure than the Top Soil in some of the tests, Top Soil withstood the most overall

Conclusions/Discussion
The testing concluded that the Top Soil in a dry state was the best at withstanding weight. It also concluded that the more varied particle sizes make it harder for the dowel to penetrate. Clay matter helps the particles stick together, which makes it harder for the dowel to penetrate the soil. Top Soil contains clay and varied particle size, making it the best soil to withstand pressure

Summary Statement
This project was thought up to discover the sand/soil that could withstand the most pressure, making it the best to support a heavy structure.

Help Received
Dad helped build and supervise the building of the jig; Teacher and Mom helped look over grammar in writing.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Ken Farris

Project Number
J0707

Project Title
Soil Superman

Abstract

Objectives/Goals
The purpose of my study is to investigate which soil type is the stiffest and supports the most compressive stress. I hypothesized soils with larger size of particles will support more stress.

Methods/Materials
In my experiment, the compressibility of five different soils was measured. I put a known amount of weight on the top of a dowel to insert into holes filled with soil.

Results
Top soil was compressed most, followed by soils with larger size of particles (vermiculite and silt). Pumice, whose particles were largest among the five, was unpredictable, and sand, whose particles were smaller, was completely uncompressible in one condition.

Conclusions/Discussion
Not only soils with larger particles were stiffer and supported stress well as I hypothesized, but so did sand due to its density.

Summary Statement
Tested stiffness of soils with different sized particles.

Help Received
Mr. James Neilson, a Ph.D. candidate in Biomolecular Science and Engineering at UCSB, guided me through experimental preparations and analyses.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Daniel R. Freeman, Jr.

Project Number
J0708

Project Title
Surfs Up: Will Different Ocean Bottoms Affect the Height of a Breaking Wave?

Abstract

Objectives/Goals
The purpose of my project was to find out if different ocean bottoms affect the height of a breaking wave. Out of my three bottoms sand,rocks,and gravel (which mimicks a reef) I think gravel will produce the highest wave. I chose this project to help surfers choose a safe and fun break to ride.

Methods/Materials
I made three oceanscapes by pouring my three materials into three clear plastic tubs and forming them to an even slope. I then added water into my tubs. I used a plastic paddle to gently push and form a wave. I practiced on a scale to make sure all my pushes were the same strength. I then recorded my results in cetimeters as the wave passed by a ruler.

Results
The results showed that the best bottom was gravel at 4.5cm. In second was rocks at 3.5cm. In dead last was sand at 3cm.

Conclusions/Discussion
My results supported my hypothesis that the gravel produced the highest wave. Since rocks displaced the water the wave was destroyed before it broke. The sand was shifted so much that the wave had a hard time forming. The gravel had a solid bottom and was not as bumpy as the rocks. I met my objective by proving that surfers can now search for new breaks in areas that can be safe and fun.

Summary Statement
My project shows which ocean bottom will produce the highest wave.

Help Received
Mom helped supervise the construction of my board and guided me; Dad helped with the heavy lifting; Mrs. Cloud helped me with the interviewing process.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Jenna J. Graves

Project Number
J0709

Project Title
Cloud Creation

Abstract

Objectives/Goals
The objective is to determine how the following weather conditions affect cloud formation: variations of humidity, temperature, air pressure and nucleation.
My hypothesis is that cloud formation is related to increased humidity, decreased temperature, decreased air pressure, increased nucleation and a mixture of hot and cold temperatures.

Methods/Materials
I simulated the weather conditions inside of a one gallon glass jar and measured the cloud formation using a rubric to gauge the results of the translucency or transparency of the jar.
I poured different amounts of water into the jar for each test to simulate increased or decreased humidity and placed a certain number of lit matches to simulate increased or decreased nucleation. I sealed the jar with the open end of a latex glove. The glove started inside the jar and was pulled outward, or started outside of the jar and pushed inward to show increased or decreased air pressure. I placed the jar into a container of hot water or ice water to simulate increased or decreased temperature.

Results
My data shows that translucent and semitransparent clouds were caused by increased humidity, an average quality of clouds resulted from decreased air pressure. Clouds made from increased nucleation were rated as almost very cloudy. Extreme temperatures (hot and cold) both caused the greatest cloud formation (very translucent).

Conclusions/Discussion
I concluded that humidity, temperature, air pressure and nucleation would affect cloud formation. Most of my tests had a different reaction except for tests 6 and 8 because the results were both cloudy as seen on the graph.
I learned that ideal conditions for cloud formation include a combination of increased humidity, extreme temperatures, decreased air pressure and increased nucleation. A mixture of hot and cold temperatures created the best cloud formation.

Summary Statement
Testing different conditions of temperature, humidity, air pressure and nucleation essential for cloud formation.

Help Received
Dad helped with computer graphics; Mom helped with suppplies: Miss Spencer helped with material organization; Dr. Allison helped with improvement suggestions.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Andrea J. Grimbergen

Project Number
J0710

Project Title
Will Your House Sink?

Abstract

Objectives/Goals
My objective was to study soil liquefaction during an earthquake. I wanted to understand what liquefaction is and how it is affected by soil density and different water saturation levels. I also wanted to simulate how liquefaction occurs during an earthquake.

Methods/Materials
I filled a tub with sand, and added different amounts of water. For each amount of water, I followed the same steps. First, I placed a brick on the surface of the sand. Next, I dropped the tub from three inches off the ground eight times. Then I measured the amount the brick sank into the sand at each corner of the brick and averaged those four measurements.
I repeated the above experiments for both loose and compacted sand. I also measured how much water could be poured into the sand before it became 100% saturated.

Results
I found that when simulating an earthquake the brick will sink deeper into loose sand than into packed sand, and will sink the most at 100% saturation. I also measured how much loose sand can compact and how much water sand can hold. These are important factors in determing how much liquefaction occurs.

Conclusions/Discussion
I concluded that the amount of water in the sand and the packing density of the sand affect liquefaction. My simulation showed that the effects of liquefaction were most dramatic at 100% saturation. To lessen the effects of liquefaction, the soil should be packed and it should be dry or partially dry.

Summary Statement
The objective of my project was to understand what liquefaction is and how it is affected by soil density and different water saturation levels.

Help Received
I learned about liquefaction at the US Geological Survey Open House. I received advice from my father on some experiments.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Christine E. Herrmann

Project Number
J0711

Project Title
Which Weather Forecaster?

Abstract

Objectives/Goals
Weather is an important part of our everyday lives. My science fair project analyzes the accuracy of seven different San Francisco Bay Area weather forecasters: weather.com, ktvu.com, kron.com, abclocal.com, nbc11.com, cbs5.com, and sfgate.com.

Methods/Materials
I collected sky formation, precipitation, and high and low temperature forecasts (one day and two day out forecasts) and actual occurrences for 47 consecutive days in the fall of 2006. In the middle of my data collection, I dropped cbs5.com for lack of detailed forecasts. To analyze the data, I entered the data points into an Excel database to compare the forecasts with the actual occurrences. Forecasts are given using qualitative descriptions, but I needed quantitative measures which would be meaningful to weather consumers. For each weather metric, I created conversion charts using embedded IF statements in my Excel database to automate the data translation to a 100% accuracy scale.

Results
For combined forecast accuracy, nbc11.com was the most accurate (87.7 %) followed closely by ktvu.com (86.2%). Forecasters were most accurate when forecasting precipitation (92 % accurate), followed by temperature (86% accurate and about 2 degrees off), and lastly sky (73% accurate).

Conclusions/Discussion
Although forecasting the weather is a challenging task, there is neither a significant difference between the accuracy of each forecaster nor the difference between one day and two day out forecasts.

Summary Statement
This project analyzes the accuracy of seven different weather forecasters by comparing their forecasts to what actually happened.

Help Received
Mother helped review Excel database; Stephen Kemper (with PRTM) showed me how to use an Embedded IF Statement.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Jordan W. Houze

Project Number
J0712

Project Title
The Shake, Rock, and Roll of a Desert Wash

Abstract

Objectives/Goals
My project was to determine the profile of a desert wash from top to bottom.I hypothesized the profile of a desert wash would change down the length of the wash.I predicted the particle sizes would be larger and more abundant at the top of the wash and decrease in size as I traveled down the wash due to deposition.

Methods/Materials
For my project I used baggies to carry my soil samples. I used a small hand shovel to dig, permanment marker to label baggies, pencil, and tape measure to measure the circumference of rocks. I also carried gloves, rulers, buckets, notebook, map of area, backpack, 5 layered soil sieve, label paper, spring scale, data sheets, calculator, Dixie cups, paper clips, spoon and a timer. I went to the Coachella Valley Preserve, mapped off area, and collected samples. At home I weighed the samples 3 times each.

Results
The profile of the desert wash did change down the length of the wash. I found that the larger particle sizes were more abundant at the top and the fine sand and silt and clay increased as I made my way down the length of the wash.

Conclusions/Discussion
I conclude the location where soil samples are taken from a desert wash does affect the soil structure size. I also know that if I had gone higher up the wash the terrain would have been very rocky.

Summary Statement
My project is about the profile of a desert wash and how a desert wash sorts soil, particle sizes from the top to the bottom of the wash.

Help Received
My science teacher lent me the sieve and spring scale. My mom drove me to the wash, to get supplies and helped carry samples in the wash and mark baggies. School science coordinator reviewed my project after state qualification.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Irene Hsu

Project Number
J0713

Project Title
Relationship between Sunspot Number and the Geomagnetic Field: A Two Year Study

Abstract

Objectives/Goals
This study examined the possible correlation between sunspot number and the deflection component of the Earth's magnetic field. In the first year, sunspot measurements were taken with a Sunspotter daily, and magnetometer measurements were taken with a simple bar magnet (soda bottle) magnetometer at 10:00pm nightly for two months. In the second year, sunspot measurements were obtained online, and magnetometer measurements were taken first with a soda bottle magnetometer, and then a compass detector magnetometer for two months. After comparison of the final data, it was found that the higher the sunspot number, the stronger the perturbation in the Earth's magnetic field, and vice versa. This suggests that there is a positive association between sunspot number and the deflection component of the geomagnetic field.

Summary Statement
This study examined the possible correlation between sunspot number and the deflection component of the Earth's magnetic field.

Help Received
Used lab equipment at the UCLA Space Physics Lab; Kathryn Rowe helped build compass detector magnetometer; father helped build soda bottle magnetometer; Sunspotter was borrowed from Dr. Mark Moldwin

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Oren A. Klein

Project Number
J0714

Project Title
Slip Slidin' Again

Abstract

Objectives/Goals
The goal of my project was to determine the effect that slope and vegetation have on soil erosion caused by rain. I believe that there will be more erosion in areas with the steepest slope the least vegetation

Methods/Materials
Ten areas of various slopes and vegetation were identified as test sites. Three methods of testing erosion were chosen. Catch-pits were used to estimate how much soil had been accumulated at a site. Erosion Pins were used to estimate how much soil had been lost from a site. Turbidity readings were used to measure the suspended matter in the water collected. Samples were collected after each one inch of rainfall from each of the ten areas. Nine inches of rain fell during the two months of observation.

Results
The steepest areas and the loose, non-vegetated areas were the most eroded.

Conclusions/Discussion
My conclusion is that slope and vegetation play an important role in the way that particular areas erode.

Summary Statement
Does slope and vegetation have an effect on soil erosion caused by rain?

Help Received
Teachers and mentors helped edit report. Parents helped with board display.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
William C. Mebane

Project Number
J0715

Project Title
Which Erosion Prevention Method Is Most Effective for Earthen Levees?

Abstract

Objectives/Goals
The problem hoped to be solved is to find the best way to prevent surface erosion of earthen levees, by testing four different erosion prevention methods. Improved levees are very important to prevent flooding, which is a major risk in many areas including New Orleans and the Sacramento Delta in California.

Methods/Materials
Model levees of five different types were constructed using sand. These included five samples of control levees with no erosion protection measure and two samples each of levees with four different variables: rip-rap, grass, simulated deep roots, and reinforcement of weak points using concrete chunks. The protected side of each levee was flooded by pumping in water, and the amount of time it took for eight liters of water to cross the levee was used as the measure of erosion. This time changes depending on the amount of erosion that occurs.

Results
The rip-rap covered levee had a 29% improvement over the control levee. The grass covered levee had a 44% improvement which was the best of all types. The levee with reinforcement of weak points did slightly worse than the control levee, and the simulated deep roots levee was similar to the control levee with only a 2% improvement.

Conclusions/Discussion
It was demonstrated that grass is most effective for short term flood control. It was noted that the height of the grass and depth of the roots were greater relative to the levee height than they would be on a real levee, which contributed to the strong results of the grass in this test. Rip-rap performed well and is believed to be best for long term periods of exposure to water or where a more low-maintenance method is needed.

Summary Statement
Models of earthen levees with four different erosion protection measures were tested to determine which technique is most effective for making levees more reliable to prevent major flooding.

Help Received
Mother proofread work. Father helped with technique for building levees and recommended a pump. Parents supplied materials. Science teacher Elaine Gillum suggested studying levees and provided advice.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Nathaniel J. Mooi

Project Number
J0716

Project Title
Got Salt? Measuring Salinity in San Francisco Bay Before and After Rainfalls

Abstract

Objectives/Goals
The primary goal was to determine salinity around San Francisco Bay estuary according to location and before and after rainfalls. Secondary goals were to see if relative salinities can be measured by evaporation and weighing of the remaining salt, to test the effects of temperature on a store-bought hydrometer, and to observe physical factors and organisms at each collection site.

Methods/Materials
In November 2006, I collected water samples from 6 places around the Bay and measured their salinity by weight of salt in a certain weight of water. This was done by evaporating the water from sample until only the salt was left. I also tested the salinity of each sample using a hydrometer. I repeated the sampling in December, after several rainfalls. I went to websites to find out how much rain fell during November and December. I also made observations about weather, water temperature, and organisms at each site.

Results
Salinities are highest near the ocean. After the rains, salinities went down, especially near the Sacramento River. The hydrometer gave different readings at different temperatures. I tested the weight method by evaporating a known salinity and found that I got all the salt back. Surprisingly, the dried salt weighed more than the amount I put in, probably because it still had some water in it.

Conclusions/Discussion
My evaporation method for determining salinity worked well. Rain is fresh water that can lower salinity. It lowers salinity more along the rivers that flow into an estuary because the volume of fresh water is high compared to the water in the Bay. The volume of the ocean is huge, hence the rainfall has little or no effect. Salinity changes are very important for determining what kinds of organisms live in the Bay at certain times of the year.

Summary Statement
It is possible to detect salinity changes in San Francisco Bay before and after rainfalls by collecting water samples and evaporating them to weigh the salt.

Help Received
Mom and Dad drove me to localities and helped print the material for the display.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Seamus M. O'Connor

Project Number
J0717

Project Title
Do Erosion Control Blankets Change the pH of Soil?

Abstract

Objectives/Goals
My science fair project is to see which erosion control blanket changes the pH of soil the most.

Methods/Materials
For my experiment I went around my yard gathering dirt. Then my mom gave me some erosion control blankets from work. I measured the pH of the soil from my back yard to determine the baseline pH level. I cut the erosion control blankets in circles and placed them in the cups. Then I watered my samples and checked the pH of the soil and recorded it in my journal.

Summary Statement
The change of the pH in soil through erosion control blankets.

Help Received
Would like to thank Mr. Kuhn my science teacher for helping me set up my project. I would also like to thank my Mom, Sarah O#Connor, for buying my supplies. Thomas O#Connor my dad for taking the pictures. And I would lastly like to thank my sister Taramarie O#Connor for letting me use her old science

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Dennis Ojogo

Project Number
J0718

Project Title
How Does Carbon Dioxide Affect Air's Rate of Temperature Change?

Abstract

Objectives/Goals
The purpose of my experiment was to observe carbon dioxide as an essential contributor to global warming, and to accurately model how in the near future, the amount of carbon dioxide in the atmosphere will correlate to an abrupt spike in atmospheric temperature. Once I began my experiment, I expected to see a sudden increase in temperature in the environments containing the highest amounts of carbon dioxide.

Methods/Materials
Materials:
- Four jars with lids
- Four Temperature Probes
- Laptop with Data Studio Program
- Drill
- Dry Ice

Methods

I decided to set up a series of four jars, each containing a progressively larger amount of carbon dioxide in the form of dry ice. The amount in each jar corresponded to research I had done. I used heating lamps as a light source in substitution for the Sun, as it provided a constant and non-varied amount of heat. Over time, I analyzed the temperature change each atmosphere experienced over the coarse of 11,000 seconds.

Results
Each jar had an initial temperature of 5 degrees Celsius, and each resulting temperature told a story. Group A, my control group, in which no dry ice was used, had actually decreased in temperature over time. Group B, the jar representing the year 1900, slightly increased over time. Group C, the jar representing the year 2006, significantly increased over time. Finally, Group D, the jar representing the hypothesized atmospheric concentration of carbon dioxide in the year 2100, experienced a pronounced spike in temperature. This group had a final temperature of 76 degrees Celsius. This concluded the results of my experiment.

Conclusions/Discussion
Based on my results, I can confidently say that carbon dioxide is certainly contributing to global warming, and that the more carbon dioxide that is present in the atmosphere, the more extreme the effects are.

Summary Statement
I used glass jars, dry ice, sun lamps and computer-controlled temperature probes to investigate how the amount of carbon dioxide in the atmosphere affects the speed and severity of atmospheric temperature increase.

Help Received
Mr. Simonsen taught me how to use the probes and software. Ms. Guerrero, my science teacher, taught me how to conduct a controlled experiment and helped edit my report.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Rae'an S. Olivares

Project Number
J0719

Project Title
Determining if the Sea Floor Affects Wave Height

Abstract

Objectives/Goals
The objective is to determine if common sea floor materials will decrease wave height.

Methods/Materials
Making a wave box with plastic cardboards and filling it up with water then sand, rocks, and shells. I used a ball to make waves, by applying pressure with a constant up and down motion. I did this about 10 to 30 times. I used a measuring stick to determine the height of each wave.

Results
After completing my science project I found out that with just water the height of the wave was about an average of 2.5 inches. Adding sand into the water it was an average of 3.5 inches. Then adding rocks onto the sand and into the water it was about an average of
4.5 inches. Finally after adding shells onto the rocks and sand it was an average of 5.5 inches. Each material was an inch difference from the previous test.

Conclusions/Discussion
When I finished my project I learned that after adding three materials it increased wave height. I then learned that my hypothesis about how these materials decreased wave height was wrong. I learned that the materials in the ocean have a huge impact on the size of a tsunami wave.

Summary Statement
Investigating the Affect of the Topography of the Ocean Floor on Wave Heighth

Help Received
Mom helped me type my report; my science teacher (Mr. Berry) helped with extra research and preparing my display board.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Alexander J. Payne

Project Number
J0720

Project Title
Eocene Fossil Environment

Abstract

Objectives/Goals
The goal of my research is to obtain a better understanding of the environment during the Eocene epoch through analysis of the plant and insect fossils I discovered during excavation of 45 million year old shale rock located at 9,000 foot Douglas Pass in Western Colorado in August 2006.

Methods/Materials
Fossils from shale rock including mosquito, bee, beetle, and several types of leaves and twigs
Rock hammer
Magnifying glass
Millimeter ruler
Pencil
Paper

Results
The fossils were carefully examined and measured. Their features such as their length, width, abdomen size, wing size and leg lengths were evaluated. Leaf length, width, and features were also noted. These results were compared to their modern-day counterparts' features and measurements. The large leaf fossil was most consistent with the Black Willow (Salicacaea), known to grow in this region of North America. The fossil mosquito, bee, and beetle bore remarkably similar features and size with their modern-day counterparts. These animals and plants are known to co-exist in a warm climate with access to water most of the year.

Conclusions/Discussion
My hypothesis that the Eocene epoch would be warm and wet was supported by my fossil findings. The coexistence of a leaf similar to the Black Willow with mosquito, bee, and beetle suggest there was access to fresh, standing water in this environment 45 million years ago.

Summary Statement
Eocene Epoch Fossils Discovered at Douglas Pass, Colorado Confirm a Warm, Wet Environment

Help Received
Teacher, Mr. Kuhn guided project. Father accompanied on excavation trip. Sister assisted with photography. John Foster, PhD, Chief Paleontologist of the Museum of Western Colorado led the expedition and provided information on the age of the rocks.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Maxime D. Rappaport

Project Number
J0721

Project Title
Predicting Earth's Long-Term Temperature Variations

Abstract

Objectives/Goals
The objective of this experiment was to find a mathematical equation to predict earth's long term temperature variations. With this information, I can find out if the earth's natural variations can help correct global warming.

Methods/Materials
Past earth temperature variations from ice core data were plotted. Changes in earth eccentricity and obliquity were also calculated and then plotted. I looked for a periodic function to model the cyclical variations of temperatures and used experimental data to determine the amplitude and period of the function. I then applied this equation to estimate the near future impact of these changes.

Results
Past temperatures correlated well to past eccentricity. By using the periodic function F(T)=A*SIN(2*Pi*T/P), it is possible to create a cyclical long-term temperature prediction. I found that the amplitude (A) of -7.2 degrees and period (P) of 92,500 years correlated well with eccentricity variations in past and future. With this data, it was possible to determine how fast the temperature decreases or increases on a normal basis. By comparing the rate at which the temperatures decrease from changes in eccentricity of the earth's orbit to the rate at which temperatures increase from global warming, it was possible to discover that variations based on these orbital dynamics are minimal and cannot overcome the rapid rate of global warming.

Conclusions/Discussion
I was able to derive a function that is useful to predict future long-term temperature cycles. I determined that the eccentricity changes of earth orbit around the sun would only affect the temperature by less than 1 degree Celsius over 1000 years. Global warming is heating earth at a much faster rate (around 1 degree Celsius per 100 years) than the long-term eccentricity variations can cool earth. This result demonstrates that it is truly up to humans to stop global warming and if they are successful, the temperature will continue in its natural periodic function as predicted.

Summary Statement
To predict the earth's long-term temperature variations based on changes in orbital dynamics and study their relation to current global warming.

Help Received
Father helped with formatting the data in Excel.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Jesse J. Redding

Project Number
J0722

Project Title
The Effect of the Moon's Gravity on Earthquakes

Abstract

Objectives/Goals
This study looks at whether the moon's gravitational pull affects the frequency, magnitude, and depths of earthquakes.

Methods/Materials
The location of the moon at the time of each earthquake was calculated. I then computed the moon angle made by the longitude under the moon and the longitude of the earthquake. This angle was compared to the depths, magnitudes, and numbers of earthquakes, and plotted using Microsoft Excel. On the charts, sixth order polynomial trend lines are shown, and also the r^2 expression which represents the fit of the trend line, the closer to 1.0 the better fit.

Results
The Moon Angle did affect the number of earthquakes. This is shown in the trend lines of the graphs. They fit better as curved lines than straight lines. If the distribution of earthquakes was random and not affected, the trend lines would be straight.

Conclusions/Discussion
One cause of these earthquakes could the tide in the earth. This earth tide could cause tectonic plates to buckle slightly, causing earthquakes. The increases in the number of earthquakes at 90 and 270 degrees could be caused by the moon pulling simultaneously with and against the rotation of the earth. The moon angle did not significantly affect magnitude, and did not affect depth as much as expected.

This research will lead to a better understanding of our earth. It will help us understand the pressure that the moon#s gravity places on it, and may eventually lead to a way to help predict earthquakes.

Summary Statement
This study looks at whether the moon's gravitational pull affects the frequency, magnitude, and depths of earthquakes.

Help Received
Mother helped with learning to use Excel.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Marci F. Rosenberg

Project Number
J0723

Project Title
The Effect of Compression on Granular Media

Abstract

Objectives/Goals
The objective of my project was to examine the effect of compression on granular media. Specifically, I was interested in the phenomenon of the compression of wet sand, compared to the compression of other granular media.

Methods/Materials
To accurately test my hypothesis, I used a simple contraption consisting of a balloon, straw, rubber band, and a ruler. I added approximately 1/8 cup (.0295 liters) of material to the balloon, and using a 2-inch C-clamp. I applied compression to the material inside, one revolution at a time, and tracked the results.

Results
My results indicated that water, clay, glass stones, dissolved salt water, and magic sand had similar gains in the water level as compression was applied, although water, dissolved salt water, and clay, had slightly steeper slopes than the other materials, as pointed out in my graph "Water Elevation vs. Compression." In complete contrast, the water level of sand decreased at a significant rate.

Conclusions/Discussion
My prediction of the results was mixed. Although I correctly predicted the increase in water level of the straw during experiments with dissolved salt water, magic sand, glass stones, clay, and water, I was deeply surprised by the decrease in the water level in the straw while compressing sand. The level of water in the straw lowered when sand was compressed possibly because there are air voids, letting more water rush into the balloon instead of going up the straw.

Summary Statement
I tested how the application of pressure on a balloon filled with a granular material, for example sand, saturated with water, would affect the material inside.

Help Received
Brother helped me understand some concepts; father supplied C-clamp.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Alec D. Simpson

Project Number
J0724

Project Title
Simulation of Ultraviolet Radiation Attenuation at the Earth's Surface

Abstract

Objectives/Goals
The project seeks to determine atmospheric conditions that affect the intensity of UVA and UVB at the earth's surface. Four test conditions are simulated: 1. unaffected atmosphere (control), 2. water vapor attenuation (Treatment 1), 3. carbon dioxide gas attenuation (Treatment 2), 4. dry aerosol (Treatment 3). The goal is to determine the relative attenuation of each treatment against the control.

Methods/Materials
A custom-built simulation chamber utilized. The chamber was instrumented using the following instrumentation and software: Vernier UVA probe, UVB probe, light sensor, carbon dioxide gas sensor, barometer, relative humidity sensor, temperature probe, Lab-Pro USB interface, Logger-Pro 3 software, and laptop computer. Three custom treatment sources utilized to dispense carbon dioxide, water vapor, and a dry aerosol (talc). For each test condition a fully instrumented chamber was used. For the given test conditions, the sensor data was recorded and computer files developed for detailed analysis. After each experimental trial, the chamber was shut down and data was evaluated. Each trial was replicated five times. After all experimental trials were completed, detailed comparisons were made to determine the relative effects. Using these results, an attempt was made to relate the findings to the earth's naturally occurring atmospheric attenuation.

Results
The UVA was attenuated by water vapor an average of 48.94% less than the control. The range for the UVA attenuated by water vapor was 46.75% to 53.99%. The UVB attenuated by water vapor on average 22.33% and had a range of 18.30% to 25.81%. The UVA was attenuated by carbon dioxide on average of 30.45% and had a range 23.43% to 34.81% The UVB when attenuated by carbon dioxide an average of 30.12% and had a range of 19.25% to 40.19%. The dry aerosol (talc) attenuated the UVA an average 7 % and had a range of 3.25% to 11.04%. The UVB was attenuated by dry aerosol an average of 12.53% to 0%.

Conclusions/Discussion
The experimental results show that water vapor had the largest attenuation effect on UVA. Carbon dioxide gas had the next greatest effect on UVA and the largest effect on UVB. The dry aerosol (talc) had the least effect on UVA and UVB. An attempt was made to relate these findings to the known earth's atmospheric attenuation.

Summary Statement
I sought to determine how UVA and UVB radiation is attenuated in the earth's atmosphere through experimental simulation.

Help Received
Dr. John C. Howe provided the motivation for my looking at a problem in atmospheric physics as well as on-going mentoring. My parents provided on-going encouragement and support.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Aradhana Sinha

Project Number
J0725

Project Title
The Absorption of Pollutants in Different Soil Types

Abstract

Objectives/Goals
The purpose of this experiment was to determine which type of soil is the most absorbant of which kind of pollutants. The information gained from this experiment will benefit farmers, garderers and botanists who deal with soil pollution problems, to better understand the effects of absorbancy with different porosities of soil and with different viscosities of pollutants.

Methods/Materials
I placed 200g of each type of soil and 100ml of each type of pollutant in separate cups.I waited till the soil was completely wet and then I put it on a filter for 15 minutes. I measured the remaining pollutant for understanding how much was unaborbed. Material :Plastic filter, 500ml graduated cylinder, triple-beam balance, notebook, organized working area, stop watch, writing material (pen/pencil), 54 clear plastic cups, 900ml of soap oil, 900ml of olive oil, 900ml of gasoline, 1800g of sand, 1800g of clay,1800g of silt-clay loam.

Results
Sand, the most porous soil, had absorbed the greatest amount of pollutants. Silt Clay Loam, the 2nd most porous soil, had absorbed the 2nd greatest amount of pollutants. Clay, the least porous soil, had absorbed the least amount of pollutant.Sand absorbed gasoline (the least viscous)the most. It absorbed olive oil (the second least viscous)the 2nd-most.It absorbed oil soap (the most viscous) the least.Silt Clay Loam and Clay absorbed oil soap the most, followed by olive oil and gasoline.

Conclusions/Discussion
The most porous soil absorbs the greatest amount of pollutants. More viscous pollutants get absorbed more than less viscous pollutants.In the future, I would refrain from using volatile fluids like gasoline, beacuse it evaporates and hence may create erroneous results.I would also increase the time that I allowed for absorption.

Summary Statement
My project determines which type of soil is most absorbant for which kind of pollutant.

Help Received
Used lab equipment in school.

CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Stephanie M. Vistnes

Project Number
J0726

Project Title
Air Pressure and Elevation Effects on Boiling Point

Abstract

Objectives/Goals
I wanted to see whether it is the air pressure or the elevation that decreases the boiling point of water as elevation increases. My hypothesis was that it is the air pressure.

Methods/Materials
I conducted an experiment in two parts. In the first part of the experiment, I drove up the hill from about 2000ft to about 7000ft, boiled water, and recorded the elevation, air pressure, and boiling point at every elevation marker along the way. I repeated this part of the experiment about two weeks later to get multiple results. In the second part of the experiment, I stayed at home (where the elevation was constant), boiled water, and recorded the air pressure and boiling point for about two weeks. I hoped that as the weather changed, the air pressure would change also.

Results
The first part of the experiment showed that as the elevation increased, the boiling point decreased linearly; as the air pressure increased, the boiling point increased linearly; and as the elevation increased, the air pressure decreased linearly. During the second part of the experiment, however, although the weather varied, the air pressure changed very little, so the change in boiling points was too small to measure.

Conclusions/Discussion
I found that increased elevation and decreased air pressure decreased the boiling point. The second part of the experiment was inconclusive because of the small changes in barometric pressure.

Summary Statement
We boiled water at different elevations and air pressures to measure the effect of elevation and pressure on boiling point.

Help Received
Dad helped me structure the experiment, drove me around, taught me about Excel and statistics, and revised the writeup.