CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)	Project Number
Juan A. Arellano	S0601

Project Title

How Water Density Affects Wave Height

Abstract

Objectives/Goals

To determine the height of waves between water of different densities caused by a simulated earthquake.

Methods/Materials

Built wave tank.Next,filled with distilled water.Pulled simulater to water surface and repeated motion for each trial. recorded with marked ruler and slow motion camera.Repeated process with the difference of adding salt that matched ocean concentration. Material:50-gallon tank, refractometer, weights, rope, wood, distilled water, table salt, camera, wheel, and tools.

Results

Average wave height was taller in fresh water than in salt water.Time for wave settling favored fresh water and all data was constant.

Conclusions/Discussion

The density of salt water made smaller waves because the plunger moved through the water slower than in fresh water.Showing that more force is needed to create larger waves in salt water than in fresh water. Hypothesis was correct.

Summary Statement

To test whether density plays a factor in creating waves.

Help Received

Used lab equipment at university UCI under supervision of Mrs.Mauzy-Melitz

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)	**Project Number**
Nathaly Chavez; Daniella Torres; Stacey Velazquez	**S0602**

Project Title

What Barrier to Wind Eriosion Is Most Effective?

Abstract

Objectives/Goals

The purpose of our project was to see which of the three diffrent plants we used as barriers would work the best against wind erosion. Since over 2.6 million acres used as crop fields are damaged by wind erosion in the United States alone, our goal was to successfully determine the best barrier that could possibly be used by crop growers to aid in protecting their crops from loss in soil productivity because of wind erosion.

Methods/Materials

We created a scene representing a crop field being affected by wind erosion. In half of the box we placed soil and the other half we placed coarse sand. To seperate the two types of sand and soil we placed the three barriers. The plant barriers were Foxtail Fern, Leatherleaf Sage, and Boxwood Shrubs. We placed a fan at the end of where the coarse was located to simmulate the wind and compared the results of each plant barrier, by weighing in grams the amount of coarse sand that pass throught the barrier to the opposite side containing the soil.

Results

Boxwood Shrub, avergae weight(in grams):29.2
Leatherleaf Sage, avergae weight(in grams):48.8
Foxtail Fern, average weight(in grams):12

Conclusions/Discussion

As a conclusion our hypothesis was partially correct. The Foxtail Fern plant was the best plant barrier; however, the Boxwood Shrub worked better than the Leatherleaf Sage plant. We live in the Southern San Joaquin Valley, the richest agricultural area in the United States, and by conducting this experiment, we were able to provide local farmers with knowledge about how they can protect their crops and increase crop and soil productivity.

Summary Statement

The purpose of our project is to determine which plant barrier to wind erosion is most effective.

Help Received

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Julie Cline; Munira Rahman

Project Number
S0603

Project Title

Why Is Sand the Best Material to Use as a Barrier Against Floodwaters?

Abstract

Objectives/Goals

My project was to determine why sand was the best material to be used as a barrier against floodwaters. Sand is the best material that can be used as a barrier against floods becauseof: its ability to mold around objects (especially other sandbags), has more volume of air trapped in spaces, and sand creates a maze of air. Sand will have the least amount of percolation when compared to gravel, fine gravel, and plant soil, because sand particles mold around each other so well due to its properties. The air space in sand will be the least compared to the other materials used since it is the most compact and can hold back more water due to its property of percolation.

Methods/Materials

We used wood to create a flood table on which we tested the burlap sandbags, which were filled with sand, gravel, fine gravel, and plant soil. Each material was tested separately for five trials for a time period of twenty five seconds in a flood table simulation. Percolation was tested by pouring water through each of the materials separately in an empty bottomless water bottle. Air space was tested by measuring the displacement of water in the different materials by using a graduated cylinder.

Results

According to our flood table experiments, the soil was the best material to use. For the air space experiment, soil had the largest amount of air space, following it was gravel, then sand, and fine gravel had the least amount. For our percolation experiments soil had the least amount in both dry and wet scenarios, while sand had the next lowest percolation rate, followed by fine gravel, and gravel had the largest percolation in both scenarios.

Conclusions/Discussion

Our experiments were only conducted for a mere 25 seconds, while in real conditions floods will last for hours, days, and sometimes even weeks. The fact of the matter is that sand is the better contestant. Sand will harden up in the sun but it can be reshaped. It can hold its form much better than soil. The problem with our experiment would be that the trials were not long enough, and because of this reason the soil held back water well in short conditions.

Summary Statement

This project was conducted to find out why sand is the best and most widely used material in sandbags to protect against floodwaters.

Help Received

Tariq Ahmed and Shams Rahman provided sandbag materials. Dennis Cline helped build the flood table. Milly Cline assisted in timing the experiment and bought the burlap. Mr. Lusardi provided the stopwatch. Ralph Murphy, Rich Reeves, Rick Jirsa, and Mike Reason provided their expert opinions as geologists.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Terik Daly

Project Number
S0604

Project Title

The Derivation and Interpretation of Geochemical Ratios Generated by Meteoritic Impact

Abstract

Objectives/Goals

Much has been done to determine the effects of shock metamorphism on the mineralogical structure of target material, but little has been done to document the effects of shock metamorphism on the chemical composition of the target material. This research quantifies the trace chemical changes induced by ultrahigh temperatures and pressure in granite samples due to meteoritic impact.

Methods/Materials

In this study, granite from the Silver Plume batholith was subjected to hypervelocity impact, which was induced by a two-stage light gas gun, using an aluminum projectile. X-Ray Fluorescence and Inductive Coupled Plasma Mass Spectrometry analyses were used to document the chemical composition of the target material before and after the exposure of target material to impact.

Results

Depletion and enrichment were noted as occurring on an elemental basis, as well as determining enrichment and depletion trends throughout entire affinities and groupings of elements as defined by V.M. Goldschmidt. Statistical analysis of the data shows relative homogeneity of the sample material and is useful in determining trends in enrichment and depletion.

Data shows that enrichment is characteristic of the chalcophile elements (according to terrestrial affinity) and siderophile elements (as defined by meteoritic affinity). Ni, Cu, Ga, Pb, and Zn were each enriched in a consistent, significantly significant manner. Other elements were affected significantly, but in an inconsistent manner. Thin section analysis shows that a high silica polymorph formed, meaning that pressures of at least 170 GPa were reached, with temperatures near 1000 degrees C.

Conclusions/Discussion

Impact-induced shock metamorphism has a distinct and significant effect on the trace chemical composition of granite specimens. Trends of enrichment were seen in the chalcophile/siderophile affinity.

Summary Statement

This experiment quantifies the effect of shock metamorphism, induced by meteoritic impact, on the trace chemical composition of granite by using XRF and ICP-MS analyses to determine depletion and/or enrichment of individual elements

Help Received

The WSU GeoAnalytical Lab aided in performing chemical analyses; the UOH Petrology lab aided in the creation of thin sections; I used equipment at the NASA Ames Research Center under the supervision of Dr. Peter Schultz

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Allyson Drinkert; Ellen George; Michael Kreider

Project Number

S0605

Project Title

What's Down There? Ocean Topography at the Ventura Pier

Abstract

Objectives/Goals

The bottom composition of the ocean varies greatly around the world. This experiment tests the effect of depth on bottom composition at the Ventura Pier. It is hypothesized that as depth increases, the material found will become coarser and/or larger.

Methods/Materials

This experiment used a can and weight, fishing line, Tanglefoot wax, plastic bags, and colored electrical tape. First the height of the pier was found by lowering the weight in the can down to the ocean#s surface, and then the total height of the ocean depth and the pier height were tested at eleven evenly spaced intervals along the pier. The material on the bottom at each particular measuring site was collected by spreading Tanglefoot wax on the bottom of the can, which was covered in a plastic bag.

Conclusions/Discussion

After graphing, it was found that the hypothesis was correct, for as the depth increased, the bottom composition became coarser and larger.

Summary Statement

Our project investigates the change in bottom composition as ocean depth increases along the Ventura Pier.

Help Received

Our advisor reviewed our completed project, however, the entirety of the project was executed and completed by the student members.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Allison Dudzik; Cora Hubbert

Project Number

S0606

Project Title

Dirt Domination

Abstract

Objectives/Goals

The objective was to determine the dominant soil type in Anderson Valley.

Methods/Materials

Our method was that we took soil samples from conveniently located mile markers from Yorkville to Navarro. Then we brought those samples back to the classroom. We put forty milliliters of each soil sample into a graduated cylinder along with thirty milliliters of water. After five days the soils separated. Next, we took a percentage of each layer of soil (sand, silt, clay) using the soil triangle to classify the soil type. Then we compared our results to find which type of soil is dominant in Anderson Valley. Our materials were graduated cylinders, soil extractor, ziploc bags, tap water, soil triangle, physical map of Anderson Valley, and paraflim.

Results

We collected twenty-one soil samples from Yorkville to Navarro trying to find the dominant soil type in Anderson Valley. We found that clay was the most common by an obvious amount. Sandy loam was the runner up, with four occurrences. Sandy clay loam and loamy sand both showed up two times. Silt loam and silty clay showed up only once each in our data.

Conclusions/Discussion

Our hypothesis was correct. We thought that the dominant soil type would be clay because we live in a humid region, with many creeks and rivers.

Our experiment went well. We spent a month, and a half taking notes and learning about our subject. We learned about the different soil types and how to use the soil classification triangle. After we took notes, we looked for a topographic map of the Anderson Valley. We looked for a week and a half to find a map, but we were unsuccessful. Finally, we settled on physical maps from Mr. Grist.

If we could do our project over again, we would do things differently. We would manage our time better. We wouldn?t take a whole month to research our project; we would take three weeks. We also would put more effort into trying to find a topographic map. Another thing we would do differently is take soil samples from equally spaced locations.

Summary Statement

Using sedimentation layers in soil samples to determine a dominant soil type over an entire Northern California valley.

Help Received

Mother and Father drove us around; Mother and two english teachers corrected spelling and grammar.

Name(s)

Daniel P. Ferons

Project Number

S0607

Project Title

The Effect of Jetties on Sand Deposition

Abstract

Objectives/Goals

The purpose of this project was to find the best jetty design that would keep sand on the ever-disappearing beaches. The hypothesis was that the Y-shpaed jetty would be most effective at keeping the sand on the beach. The background research emphasized the need to understand ocean currents and sediment transportation since this is what the project is based on. The currents and the effects of jetties interrupting the current are the key components, this project models the typical currents in Newport Beach and compares the erosion with different jetty configurations.

Methods/Materials

In order to proceed through this project there are two different sets of procedures. The first set was to collect the data needed to determine the currents along the Newport Coast. The second set of procedures was used to set up the model to test the different jetty layouts. Additionally, each jetty design was tested twice, once with only a longshore current and once with the longshore current and additional waves. The second test was more realistic, but harder to control since the waves were produced by hand.

Results

The most important findings were, even though the Y-shaped jetty was the most effective jetty for beach protection, it siginificantly reduced the amount of waves that would make it into that area. The results showed that the Y-shaped jetty and the jetty angled off at 80 degrees were almost equal in loss of sand. The jetty angled off at 80 degrees did not have as high of a percentage of erosion protection but the amount of waves that will come is greater.

Conclusions/Discussion

Design of the jetty will need to be determined not only on beach erosion, but on usage of the beach. If waves are not a concern, then the Y-shaped jetty provides the most protection. If wave activity is a concern, then a different configuration should be considered.

Summary Statement

The project examines four jetty configurations to determine which one provides the most protection from beach erosion.

Help Received

My father helped by driving me to the beach and help construct the model in the garage and my sister helped with setting up the model for each expriment.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Ian B. Gindelberger

Project Number

S0608

Project Title

The Effects of Acid Rain on Different Materials

Abstract

Objectives/Goals

The purpose of this experiment is to:
1) Measure the pH of rain samples falling in different parts of Southern California to see if it is acid rain.
2) To measure the effect of a standard acid rain solution on different metals and rocks.
3) To measure the effect of acid rain that has dissolved chemicals on plant germination and growth.

Methods/Materials

Materials: 1) 1 aluminum rod; 2) 1 brass rod; 3) 1 iron rod; 4) 1 zinc rod; 5) 2 limestone rock pieces; 6) 2 granite pieces; 7) 2 cement pieces; 8) 2 copper pennies; 9) 20 100ml glass bottles; 10) 20 plastic disposable cups; 11) 2 packages of Corn, Sweet Silver Queen (hybrid); 12) Perlite for growing plants; 13) 8 ounce plastic cups for growing seeds; 14) Plastic film; 15) Spray fungicide for preventing mold.
Equipment: 1) Micro gram scale; 2) pH meter with buffers at pH 4.0, 7.0 and 10.0; 3) Drying oven at 200ºF.

Results

not enough room to fit

Conclusions/Discussion

The six samples of rainwater collected in Oak View and San Diego CA have an average pH of 5.79 and are not acid rain.

The artificially made acid rain water was most effective in dissolving limestone and had almost no effect on aluminum. The pH of the acid rain was changed the most by the cement samples and the least by aluminum. A significant amount of iron, zinc, copper, and brass were dissolved in the acid water after 1 month.

The plant germination was slightly less than standard with the zinc, copper, and cement soak water. The effect on growth was different depending on the material used. Copper soak water had the most severe effect, killing all of the seeds after they germinated and brass soak water had the shortest growth after 30 days. The control rain water had the highest rate of growth.

My final conclusion is that acid rain can affect the germination and growth of corn seeds, especially when it comes in contact with metals like copper and brass.

Summary Statement

I am testing what acid rain does to different materials then taking the end result of that and seeing what it does to plant growth

Help Received

my dad helped me by letting me use the equiptment i needed in his lab

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Ashley S. Hall

Project Number
S0609

Project Title
Mars Global Surveyor Image Analysis

Abstract

Objectives/Goals

The purpose of this project was to measure the ratio of dune spacing to dune height of sand dunes on Mars. I expected this number would be different than ratios from other areas on Mars. I analyzed a photo taken by the Mars Global Surveyor of an area of Mars called Ophir Chasma, containing sand dunes near the rim of a crater. I used geometry and trigonometry to determine that the average height of the dunes is 15.8 ± 4.54 meters and the average spacing is 36 ± 8.28 meters. The ripple wavelength to height ratio is ~2.3:1. Due to the standard deviation, the ripple wavelength to height ratio could be as high as 3.9:1 and as low as 1.4:1. This is smaller than the ratio found by other researchers. I have yet to conclude what affects this difference, whether it is the air on Mars, the wind, or the grain size and material. Other possibilities include the crater's affect on the dunes or the chance that there may be frozen water underneath the dunes that may have slightly melted causing the sand to stick together and increase the angle of repose, which would increase the height, which would decrease the ripple wavelength to height ratio.

Summary Statement

The purpose of this project was to measure the ratio of dune spacing to dune height of sand dunes on Mars and compare my results to those of other researchers.

Help Received

My astronomy teacher Mr. Jeff Adkins assisted me with some math techniques and some grammatical and organizational issues in the paper. Malin Space Science Systems and the Mars Global Surveyor Orbiter Camera-Narrow Angle provided the photo of the dunes on Mars. NASA provided the observations.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Elijah Hanes; Ras Smith

Project Number

S0610

Project Title

Sunspot Temperature Correlation using Sunspot and Northern Hemisphere

Abstract

Objectives/Goals

Can we predict future temperatures using the number of sunspots from 1856-2002, and the temperatures in the Northern Hemisphere during the same period?

Methods/Materials

computer

Results

We have correctly compiled a large amount of data with which to use as raw information to feed into the time series prediction program. We have used the data to create graphs that draw correlations between sunspot activity and temperatures in the Northern Hemisphere. We know that sunspots are on a cycle. The graphs show that the temperature in the Northern Hemisphere is increasing, especially in the last twenty-five years. In the same time period the graphs also show increased sunspot activity.

Conclusions/Discussion

The data from both the sunspots and the northern hemisphere temperature have been entered into the excel program and "checked, checked, and re-checked". The data in both categories range from 1856 to 2004. From that data and the graphs of that data, we have found out that not only is the temperature increasing, but the sunspots are becoming more active as well. That is a positive correlation. The average of the cycles of sunspots is nearly parallel to the average of the temperature data.

A correlation is when two or more different sets of data are nearly the same, or close to being the opposite. In other words, they vary in the same way. Correlation is measured on a scale of negative one to positive one. A positive one correlation means that there is an exact (or super close to it) relationship between the different sets of data. A negative one correlation means that the data is close to the opposite of the other data. This data is just as useful as positive one correlation data.

The work we have done so far has been disappointingly inconclusive. However, our next step is to complete studying the time prediction program and see if it will not only make a correlation between our sets of data, but also use the data to predict temperatures in the Northern Hemisphere. This program should tell us whether or not our hypothesis is correct.

Summary Statement

We are trying to predict future temperatures from sunspot data.

Help Received

Name(s)
Travis J. Killmer

Project Number
S0611

Project Title
Characteristics of Water Flow in Sherwood Valley Soils

Abstract

Objectives/Goals
The goals of my project are to determine the composition, diffusion, permeability and porosity of the soils located around the Sherwood Valley. My project is also designed to determine which soil types are most likely to erode under severe weather conditions and which soils are prone to flooding.

Methods/Materials
Eight different soil samples (2 fields, 2 forests, 2 hills and 2 streams) were collected. The composition of the samples was determined by conducting sedimentation tests. To conduct the sedimentation test ½ cup of soil, 3 ½ cups of water and 5 tablespoons of Calgon solution were placed in a jar, shaken for five minutes and the settled soil was measured after 40 seconds, 30 minutes and 24 hours. The soil depth after each time interval was divided by the total depth to determine the percentage of clay, sand and silt in each soil sample. The diffusion of the soil was calculated by filling a beaker with 350 ml of soil, adding 5 ml of food coloring and water and measuring its spread in centimeters. The permeability of the soil was determined by filling a gallon bucket with soil, pouring 500 ml of water into it, timing how long it took to permeate and dividing 500 by the time it took for the water to permeate. The porosity of the soil was determined by filling a beaker with 350 ml of soil, pouring water into the soil until it reaches the top of the soil and dividing the amount of water used by 350 to calculate the percent pore space.

Results
The soils with the highest porosities in descending order are field 2, forest 1, field 1, hill 1, forest 2, stream 2, hill 2 and stream 1. The soils with the highest permeabilities in descending order are hill 1, forest 1, hill 2, stream 2, forest 2, stream 1, field 2 and field 1. The soils with the highest diffusion in descending order are forest 1, forest 2, hill 2, stream 1, field 2, stream 2, field 1 and hill 1.

Conclusions/Discussion
My conclusion is that the soils of the Sherwood Valley are, for the most part, very high in sand. The high proportion of sand in the soils means that nutrients need to be added to the soil so that croplands can be more productive. In addition, high proportions of sand mean the soil is easier to work and flooding is not a problem in the Sherwood area. The erosion factor in the Sherwood Valley has the potential to be a problem if local road crews and engineers don#t cut slopes and grades at appropriate angles.

Summary Statement
The goal of my project is to determine the characteristics of water flow in Sherwood Valley soils by testing for soil composition, diffusion rates, permeability and porosity.

Help Received
Father took pictures; Sister sewed project header; school loaned triple beam balance; Clint Smith helped with data analysis.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Lauren E. Markgraf

Project Number

S0612

Project Title

What Petroleum Waste Products Affect the Formation of Clouds?

Abstract

Objectives/Goals

The objective of this project was to determine which petroleum waste products commonly introduced into our environment by means of combustion, container leakage and improper disposal had the greatest impact on cloud formation.

Methods/Materials

A cloud chamber was created by taking a 32 oz. glass container and filling it with 1 cup of water heated to 120 degrees F. This heated water acted as a warm front. The opening of the container was covered by a stainless steel bowl containing ice cubes with a temperature of 8 degrees F. The chilled bowl acted as a cold front. The temperature of the room in which the experiment was conducted was 73 degrees F. The reaction was created in a control state with outcomes recorded for comparison. The reaction was recreated with five different petroleum waste products injected into the heated water of five separate cloud chambers. The petroleum waste products used were unused motor oil, unused diesel oil, gasoline, used motor oil and used brake fluid. Each waste product was tested using three different ratios; 5 drops: 1cup, 15 drops: 1cup and 30 drops: 1cup. During each trial the reaction was timed and the cloud size measured after 45 seconds with a standard inch ruler. Each group was recreated three times for a total of 45 repetitions.

Results

Based on the data collected from these trials I found that the cloud that formed the fastest compared to the control group, which formed at an average speed of 2.7 seconds was the unused motor oil timed at 1.5 seconds using a ratio of 30 drops: 1 cup. The variable that produced the slowest time to form a cloud was used motor oil timed at 6.3 seconds with a ratio of 30 drops: 1 cup. The pollutant that created the smallest cloud was used brake fluid, which measured 1.8# and used a ratio of 30 drops: 1 cup. As expected, it was the control group that created the largest cloud measuring 5.5# with the used motor oil following closely behind with a cloud of 5.2# high and a variable ratio of 5 drops: 1 cup.

Conclusions/Discussion

I have concluded from the results of this experiment that the unused motor oil (30drps/1c), generated a cloud in the least amount of time. Therefore, the unused motor oil in large quantities acts as an accelerant in the formation of clouds. Also, I have concluded that used motor oil in small concentrations (5drps/1c) creates a measurably larger cloud than the other pollutants used in these trials.

Summary Statement

I have determined that the petroleum pollutants that had the greatest impact on cloud formation were unused motor oil, used motor oil and used brake fluid.

Help Received

All hazardous materials used for this experiment were provided and disposed of by Mr. Warren Valenson, owner and operator of Top Dawg Auto Repair, Riverside, CA. Additionally, the transport and handling of hazardous materials was conducted under the direct supervision of Lauretta Logue.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Maia Singhal

Project Number
S0613

Project Title
Ripped Away: How Does Dredging Affect Rip Currents?

Abstract

Objectives/Goals
Each year, people drown by getting caught in rip currents along coastal areas. Often this happens in places where sand dredged from the ocean has been added to the beach. My experiment tests to see if extending the beach by adding sand to it affects rip currents. I hypothesize that if a beach is built out, then the frequency and speed of rip currents will increase.

Methods/Materials
I built a model beach using a plastic tank and a tray of sand. Waves were created in the tank using a wave-maker built from a Lego set. I used plaster-of-paris molds to shape the sand into beaches with sandbars at different distances.
I measured rip currents by turning on the wave-maker and videotaping Styrofoam pieces as they were pulled into the currents near the beach. A total of 54 trials were run using three different sandbar depths (0, 0.5, 1cm) and three different distances between the beach and the sandbar (4, 6, 8cm). The video was analyzed on a computer to calculate the frequency and speed of rip currents.

Results
The data showed that rip currents occurred in 16 out of 18 trials with the most built out beach, but in only 11 of 18 trials with the least built out beach. However, I did not find a statistically significant difference in the speeds of the rip currents when the beach was built out.

Conclusions/Discussion
My hypothesis was partially correct. When the beach was built out, the number of rip currents increased by 45%. Although there were small changes in the speed of the rip currrents when the beach was built out, they were not statistically significant.
This experiment shows that changing a beach can have an impact on the behavior of the ocean. By understanding this impact, we can try to change our beaches in ways that will affect the currents less.

Summary Statement
My experiment tests to see if building a beach out towards the ocean increases the frequency and speed of rip currents.

Help Received
My dad offered suggestions for building my apparatus and downloaded the video into the computer for me. He showed me statistical tests I could do in Microsoft Excel.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Chance C. Sorensen

Project Number

S0614

Project Title

Slope Stability

Abstract

Objectives/Goals

The objective was to investigate how soil type and the degree of saturation of the soil affects slope stability. I believe that under dry soil conditions, sand will be less stable at increasing slope angles. Under increasingly wet soil conditions, such as during a sequence of heavy winter rains, the clay soil will be less stable at increasing slope angles.

Methods/Materials

Five types of soils (clay, silt, sand, gravel, and loam) were tested to evaluate the stability of the soil on a slope under increasing degrees of saturation. Equal volumes of soil were placed in soil pans and shaped to represent a hillside slope. The angle of the slope was increased until failure occurred. The first test was conducted when the soil was dry. The test was then repeated at least five times with increasing volumes of water added to the soil, representing rainfall events on the soil and an increasing degree of soil saturation.

Results

Sand and gravel soils were the least stable under dry soil conditions. As soil moisture initially increased, sand and silt soils showed increasing strength and stability. Once the degree of saturation of the clay soil reached 30 percent, the clay showed a significant decrease in strength stability, and proved to be the least stable soil under wet conditions.

Conclusions/Discussion

Sand is the least stable soil material under dry conditions. With increasing saturation (such as extended heavy rains), clay became the least stable soil material. The project showed how important moisture content is to the stability of a slope. For sandy and gravelly slopes, a small amount of moisture actually increases the slope strength and makes the slope more stable. But if too much moisture is allowed to saturate the soil, all the slopes fail. And once the clay soil reaches a certain level of saturation, it becomes very unstable.

Summary Statement

Soil type and the degree of saturation of the soil affects slope stability, that is, the angle of the slope at which failure occurs.

Help Received

I would like to thank Fugro West for letting me use their soils lab. Thank you, Dad, for driving me, guiding me, and helping me with writing results and data. I also thank God for all He created, because without anything He created, we would not have a science project to work on.

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Samuel C. Spevack

Project Number

S0615

Project Title

Analysis of a Potential Impact Crater in the Sacramento Basin

Abstract

Objectives/Goals

In 2004, ABA Energy noted a circular feature in their analysis of a 3-D seismic dataset in the Sacramento basin. The analyst's objective was to determine whether this feature is a meteor impact crater by mapping it with seismic and well data and possibly determines the age, type of impact crater and the nature of the impact.

Methods/Materials

The analyst used a seismic workstation to map four horizons or seismic events. Several hundred two-dimensional seismic profiles were interpreted for each horizon in this process. Depth maps and then isopach maps were than made between the top horizon and all the other horizons. From these the analyst was able to measure the dimensions of the potential impact crater. The analyst also used a cross section of well logs in the potential crater area to help confirm some of these dimensions.

Results

The maps showed a feature with a lot of similarity to an impact crater - a broad shallow circular depression with associated circular structures and a central high or uplift. It is a slightly elliptical circular feature with a diameter of approximately 5,100 meters (northeast - southwest) to 5,800 meters (northwest - southeast). The circularity of this feature matches well with the circularity of known lunar and terrestrial impact craters. The maximum thickness of the potential crater fill is 80 meters. This feature is buried at depths between 1,600 and 1,490 meters below sea level and appears to be middle to late Eocene in age.

Conclusions/Discussion

The analyst compared the characteristics of this feature to geologic features other than impacts that could cause the creation of circular patterns and was able to eliminate all of these as possible alternatives to this feature being an impact crater. The size of the likely crater, complex structure of beds under the feature (including a central high) makes this a complex rather than a simple crater. The analyst recommends a future project be conducted, studying samples from any wells in the area for physical or chemical evidence of the impact.

Summary Statement

This project was an analysis of a potential meteor impact crater using 3D seismic and well log data.

Help Received

ABA Energy provided computer equipment,software and access to seismic and well data. Members of ABA Energy and Dr. Raymond Sullivan provided help in the correlation of well logs to the seismic data

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Swati Yanamadala

Project Number

S0616

Project Title

Changes in Densities of Fecal Indicator Bacteria (FIB) over Differing Tidal Flows in the Ballona Wetlands, Los Angeles

Abstract

Objectives/Goals

There are two main objectives of this experiment: to create a mathematical model showing the relationship between turbidity, dissolved oxygen, pH, salinity, time from high tide, and levels of indicator bacteria for fecal contamination, which are E. Coli, Enterococci, and Total Coliform bacteria, and to assess the impact of the Ballona Wetlands on coastal ocean waters.

Methods/Materials

In the field samples were collected on three different days over twelve hour periods every half an hour for temperature, dissolved oxygen, salinity, and pH levels using the YSI 600R Sonde Electronic Probe. Further testing was done in the lab using the HACH 2100N Turbidimeter for turbidity levels and the IDEXX Quantitray 2000 System with the MPN method for levels of indicator bacteria. Finally, on a fourth sampling day, three sets of ten samples were collected. The first two were taken normally, and then the sediments were stirred to increase turbidity levels. The following eight samples were taken with the increased turbidity.

Results

Results indicated that bacterial levels were higher with decreased dissolved oxygen, decreased salinity, increased turbidity, and a neutral pH. Bacterial levels were also higher at and around high tide. Based on these results, a mathematical model was created for bacterial contaminant determination.

Conclusions/Discussion

Coastal pollution and beach water quality are a result of the interaction of a myriad of human and naturally ocurring factors. This study clearly demonstrates that there is contamination in the Ballona Wetlands, which is carried into the ocean by tidal flows. The two possible explanations for this are primary contamination from wildlife in the Ballona Wetlands or secondary contamination from the Ballona Watershed. As bacterial levels increase, they deplete dissolved oxygen and salinity reserves in the wetlands. The bacteria also thrive at a neutral pH of 7. Turbidity levels increase as sediments are drawn off of the banks of the water column and resuspended from the bed of the creek, and Enterobacteriaceae are able to attach to these sediment particles. Thus, they are drawn into the water as well. This study also shows that sophisticated mathematical models can be constructed to greatly simplify the current testing procedures and be more cost effective. These types of models are critical from an economic point of view and for beach safety considerations.

Summary Statement

The purpose of this project is to understand the role of the Ballona Wetlands on coastal water quality and to construct a mathematical model for bacterial contaminant determination.

Help Received

Used lab equipment at Loyola Marymount University under the supervision of Dr. John Dorsey

CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)

Rachel M. Yuengert

Project Number

S0617

Project Title

The Low-Down on Landslides

Abstract

Objectives/Goals

The objective of this project is to test several methods of landslide prevention to determine which is the most effective.

Methods/Materials

Six identical 90 degree slopes were created from a 2:1 mixture of topsoil and sand. The first was the control slope and used no landslide prevention. The second had a piece of plywood in front of it to represent a barrier wall. The third had netting stretched across it representing erosion control netting, and the fourth had dowels inserted into the top of the cliff representing soil nails. The fifth and sixth slopes were adjusted, without changing the volume of soil, into 60° and 30° slopes, respectively. 30 oz of water was sprayed on each slope.

Results

The control slope collapsed, but none of the other slopes collapsed.

Conclusions/Discussion

The results were inconclusive and did not show the most effective method. Also, there were some problems with the models. For example, the model did not accurately represent a landslide prone hill because it lacked a discrete sliding surface. The barrier wall and erosion control netting representations were also not to scale. There was a large range of times for the spraying of the water on the slopes which could have also skewed the results.

Summary Statement

This project tests different methods of landslide prevention to find the most effective one.

Help Received

Father helped spray models