CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Breanne D. Anderson

Project Number

J0701

Project Title

How Different Types of Soil Affect Landslides

Abstract

Objectives/Goals

My goal for this project was to undertsand how different types of soil react to rain and potential for landslides they create.

Methods/Materials

The method I used to collect my data was I selected dirt, sand, and topsoil. I created a slide board that I divided into three different sections(dirt, sand, and topsoil). The main components of the project was to sprinkle each soil from lightest rain to heavy rain. Each soil responded to the water differently, but initially the dirt flowed more freely than the others.

Results

Sand effects landslides. It proved that all hillside land is potentially landslide land, if enough rain or water falls on it. The value is that people who live on hillsides need to be aware of the potential of slides on hillsides. My results indicate that by applying different amounts of rain to soils, that over time the soils will start to slide. Sand provided the largest landslides. The sand responded to the water more quickly then the other soils. Dirt was next because it initially began to absorb water and once it became completely absorbed with water it began to slide. Topsoil was least responded to water, for it kept hardening and instead of sliding down it would flow down in larger clumps. The water had the greatest slide impact on the sand.

Conclusions/Discussion

After I reviewed the results with simulated light rain, medium rain, and heavy rain, what I determined by looking at the soil movements was that sand is really loose and grainy and would be more affected by water because nothing is bonding the sand together. Once water touches the sand, the sand quickly flows as compared to dirt. Dirt will absorb water, but after strong rains or water contact it begins to run more freely. Topsoil would do the exact same thing, but topsoil hardens when it comes into contact with water. It was my belief that topsoil would be more susceptible to landslides than sand and dirt. Initially in the light rain experiment, it appeared that dirt would provide the heaviest landslide capability, but when we tested the medium rain the dirt absorbed the water and did not flow as freely as initially. results are accurate

Summary Statement

How different types of soils react to rainfall.

Help Received

Dad helped build the display; Mom and Dad helped get the 3 different types of soils;

Name(s)

Matthew J. Chaffee

Project Number

J0702

Project Title

Me and My Oil: Finding the Most Ideal Reservoir by Measuring Sedimentary Rock's Permeability and Porosity

Abstract

Objectives/Goals

The goal of my project is to determine which of the most common sedimentary rock type (Sandstone, Shale or Limestone) provides the most ideal reservoir to store oil. The composition of the rock (especially its grain size and pore space) will affect its permeability and porosity. I believe Sandstone with the largest grain size and loose bonding between the grains will allow quick absorption and have the pore space to store the most oil.

Methods/Materials

Instead of extracting oil, the design is to pour oil into the rock samples. The experiment ran six trials for each rock type utilizing two different oils. To measure the rate of absorption (permeability), five drops of oil were placed on the sample and timed to see how long it took to soak into the sample. To measure the rate of saturation (porosity), additional drops of oil were added one drop at a time until the oil pooled underneath the sample. Visual inspection was achieved by splitting or splintering the rock and measuring grain size to the Udden-Wentworth scale.

Results

The Limestone rock samples absorbed the oil the fastest(14.97 seconds with organic oil and 6.97 seconds using inorganic oil) among the three rock types.
Sandstone had the slowest absorption rate (25.20 seconds)when organic oil was used and had roughly the saturation rate as Limestone (17 drops of oil compared to 16 drops of oil held).

Conclusions/Discussion

The three sedimentary rock types all had different permeability and porosity rates due to their composition and the visual inspection verified the oil's absorption and saturation as well as confirming grain size. My assumption that Sandstone would provide the best reservoir was incorrect, apparently, the silica bonding and size of its grains inhibited absorption and space for the oil. Limestone had the most effective permeability and adequate reservoir due to its skeletal fossil composition featuring interconnected pore space. My project information validated that exploration and drilling need to consider the type of sedimentary rock where oil is located.

Summary Statement

How measuring the rate of permeability and porosity along with visual inspection can provide the most ideal reservoir for oil in sedimentary rock.

Help Received

My parents assisted me in using Mircosoft Word and Excel and purchasing the rock samples from MineMe Geology.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Tristan J. Chester

Project Number

J0703

Project Title

Which Type of Sedimentary Rock Is the Best Storage Rock for Petroleum Oil?

Abstract

Objectives/Goals

The purpose of my project is to determine which type of sedimentary rock makes the best storage rock for petroleum oil. The reason I am doing this project is because oil reserves are scarce and it becomes more and more difficult each year to find new reserves.

Methods/Materials

I used limestone, sandstone and shale as my sedimentary rock samples. Ten samples of each rock were used. I weighed each rock on a triple-beam balance to record beginning weight. I then placed each rock into separate clear plastic cups. I measured a quarter-cup of mineral oil and drew five drops from it and then placed those drops onto the rock. Using a stopwatch I then recorded the time the rock took to absorb the oil. I poured the remaining quarter-cup of oil onto rock in cup to soak overnight. This process was done individually to ten samples of each rock for a total of thirty rocks. The next morning I used tongs to remove each rock from each cup and weighed each rock again on the triple-beam balance. After recording the end weight of each rock I then subtracted the beginning weight from the end weight of each rock to see how much oil each rock absorbed. I recorded all data and observations during my testing.

Results

The results of my testing showed that limestone proved to be the best storage rock by time and amount of oil held. Limestone took an average of 25 seconds to absorb 5 drops of oil and held an average of 3.6 grams of oil after an overnight soak in oil. Sandstone took an average of 51 seconds to absorb 5 drops of oil and held an average of 2.3 grams of oil after an overnight soak in oil making sandstone the second best storage rock by time and amount of oil held. Shale took an average of 86 seconds to absorb 5 drops of oil and held an average of 1.5 grams of oil after an overnight soak in oil making shale the worst storage rock by time and amount of oil held.

Conclusions/Discussion

After completing my investigation on which type of sedimentary rock is the best storage rock for petroleum oil, I found that my hypotheses were incorrect because I believed that sandstone would be the best storage rock by time and amount of oil held. In conclusion, my findings indicate that petroleum engineers and geologists should consider using the latest technology to specifically locate limestone rock underground when searching for oil to aid in reducing drilling "footprints".

Summary Statement

This project is to determine which sedimentary rock makes the best storage rock for petroleum oil.

Help Received

Science teacher let me borrow triple-beam balance. My mom helped to type some of my written work and photograph the experiment.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Marcus O. Eriksson

Project Number

J0704

Project Title

Crater Impacts

Abstract

Methods/Materials

Materials1) 5 pennies: to drop into materials/to resemble a meteor 2) 1 roll of tape: to tape pennies together3) meter stick: to measure the height of drop4) vernier caliper: to measure the diameter and depth of the craters5) fine sand: to drop pennies into6) coarse salt: to drop pennies into7) flour: to drop pennies into8) ladder: to drop pennies from 2 meters9) straight edge: to flatten the material before and after drop

Results

Each material's data is an average from 50 drops at each height.

Results from 1m

Material	Crater diameter mm	Crater depth mm
coarse salt	50.43	15.67
flour	26.26	35.07
fine sand	23.60	13.57

Results from 2m

Material	Crater diameter mm	Crater depth mm
coarse salt	63.09	22.33
flour	29.43	46.62
fine sand	25.15	19.60

Conclusions/Discussion

Conclusion When I tested my problem I found that the pennies left the widest craters in the coarse salt. I think the reason for this is that since coarse salt isn't fine at all it couldn't absorb the hit well and instead the course salt was scattered .When the fine sand was tested though the results were very different from the course salt because the craters were significantly smaller in the fine sand . When I tested the flour the pennies made craters that had a smaller diameter than the coarse salt but not the fine sand, but the depth of the craters in the flour were the deepest. There may have been some error involved though ,for example when I was measuring the diameter with the vernier caliper some of the material could have fallen into the crater, making it less deep. The pennies wouldn't always land flat, they would land at an angle causing the penny to leave a deeper crater than when it lands flat. When the pennies landed flat the crater would have a greater diameter since it had a more solid impact. I think that my hypothesis is mainly correct because there is a relatively distinct relationship between mass and the size of the crater. I thought that the flour would absorb the impact very well, but since the flour was so dense there were very deep craters in it. So if a meteor were to hit the Earth it would probably make the largest crater if it hit a rocky area and it would cause the least damage if it hit in a sandy area such as a desert.

Summary Statement

My project is about how different factors affect a crater's size, such as mass, height of drop, and the impact material.

Help Received

Mother took pictures; Father showed me how to use a vernier caliper.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Kent R. Gleim

Project Number

J0705

Project Title

The Effect of Soil Moisture on the Percolation Rate of Volatile Fluids

Abstract

Objectives/Goals

My goal is to determine what effects soil moisture has on the percolation of volatile fluids. This is because there are people spilling loads of volatile fluids around the world and are not realizing the affects the aftermath has on the plant; example poisoning ground water or reaching inhabited areas.

Methods/Materials

I will do this by First placing a tray on a weight scale. Pour my earthly material into a tray. Than Pour 1% water in the tray. Next mix the compound evenly. Place the moist material in the clear casing. Pour 2 ounces of the volatile fluid on the material. Let it percolate for 45 seconds. Place it horizontally on a nonflammable flooring. Open the casing and place the material on the leveled area. Use a lighter to ignite the liquid, wait till the flame has died out. Measure how far the volatile fluid percolated by measuring how far the remains of the flame traveled by inches. Finally, repeat test nine more times, then do the same with the second material; do the entire process again using 2% moisture instead of 1%, and again using no water to act as a control group. I will use several bags of play sand to act as the very fine material. Several bags of all-purpose sand as the coarse material. One sturdy aluminum tray. One ruler. One butane lighter. One clear plastic casing. A plentiful source of water. One timer or stopwatch. A large supply of lighter fluid. One measuring cup that has ounce marks. One weight scale. Lastly a gardening shovel.

Results

My results were that the control group percolated the least while the 2% moisture test percolates the farthest. My theory was that the water opened up the pour of the grains causing air ways to open up, and that the less water it had caused less air to get through. My theory is also that the more coarse the material, is the less grains will fit in the casing meaning more oxygen to enter, causing the fire to last longer and let it burn more of the material.

Conclusions/Discussion

Once I have gained my results I have found my hypothesis to be correct. Stating that the material with 2% moisture level would percolate the farthest. I also discovered compacting the material will cause it to prevent the fire from igniting since fire needs oxygen to ignite and compacting it would block off the air ways meaning no fire. I have also learned that most of the liquid sank to the center, which possibly due to either depressions or the grains shifting.

Summary Statement

I am determining the effect of soil moisture has one the percolation rate of volatile fluids, by using two different levels of moisture (1% and 2%) and a control, each had two materials with differant density levels (coarse and very fine).

Help Received

Mother helped with the expiement and placing the board together. Mr. (Carl) Gong gave advice and tecnical support. Mrs. (Diane) Loflin helped with preperation. Father helped with clean up.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Sawyer L. Judge

Project Number

J0706

Project Title

Stalactites and Stalagmites: Mother Nature's Teeth

Abstract

Objectives/Goals

After seeing pictures and articles referring to stalactites and stalagmites, I wondered how they formed. Because stalactites and stalagmites usually grow in hard to reach caves, I thought it would be an interesting subject to explore. The objective of my experiment was to examine a variety of mineral solutions and see which would grow the longest, single formation.

Methods/Materials

To begin my experiment, I compared the compsition of my minerals with calcite that is commonly found in caves. I predicted the Washing Soda solution would grow longer growths than the Baking Soda and Epsom Salt solutions. I tested this by placing six jars (two jars per solution) on a windowsill with solutions inside them. Each set of jars represented one of the three solutions at saturation point. The sets were connected by a yarn measuring 60 centimeters. I observed these jars for two weeks, collecting my data measurements and photos at approximately 6 p.m. at night. A control group was also observed. I repeated this three times.

Results

After placing my daily data in charts and tables, I found that my Washing Soda solution grew the longest stalagmite and had the greatest total growth. It even formed columns. Washing Soda's composition most likely resulted in its massive growth success. In two out of the three trials I performed, its formations were the longest.

Conclusions/Discussion

The Washing Soda solution's mineral composition grew longer stalagmites and had greater total growth than the two other solutions. By finding minerals more commonly found in caves, that have a similar composition to Washing Soda, scientists can collect data and further understand cave formation growth. Laboratory experiments can also be done using the minerals I have researched.

Summary Statement

My project focused on discovering which of three solutions would grow speleothems the fastest and largest.

Help Received

None

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Rachel L. Kanonchoff

Project Number

J0707

Project Title

Slip, Slidin' Away

Abstract

Objectives/Goals

To determine what additive(s) will most effectively stabilize and add to the shear strength of soil.

Methods/Materials

I used 40 lbs. of soil divided into six equal parts and added various substances (PVA fibers, silicone, cardboard, Portland cement,and lime). I made two cylinders per sample and two cylinders without any additive to use as a control. Using the cylinders of each soil mixture I tested them for shear strength using an unconfined comperssion test.

Results

The samples with the Portland cement had the greatest shear strength. However, it failed suddenly and would not be a good choice for a lot of places. The next best solution would be the samples with the PVA fibers. The silicone samples were very ductile but lacked shear strength. The lime samples were very crumbly and greatly decreased the shear strength of the soil. The cardboard samples increased the shear strength of the soil and recycled a currently unrecyclable product (the cardboard used was a pizza box which cannot be recycled).

Conclusions/Discussion

My results did not support my hypothesis, which was that the PVA fibers would most effectively increase the shear strength of the soil. The information gathered from this project can be used in every part of the globe. I feel that much more research should be done on this subject to find the best additives to stabilize soil.

Summary Statement

The purpose of this project was to find an additive that would most effectively increase the shear strength of soil.

Help Received

Mr. Gary Welling helped me with the testing at the CalPoly engineering laboratory. My mother helped me with the layout of my board.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Sarah M. McElligott

Project Number

J0708

Project Title

Does Lunar Activity Affect Earthquakes?

Abstract

Objectives/Goals

The gravitational pull of the moon effects the tides on earth. This study was conducted to find out if the moon effects earthquakes as well.

Hypothesis: If earthquakes occur near high tide, then the moon must be having an effect on the earth's fault lines because the moon has greatest gravtional pull on the earth at high (spring) tide.

Methods/Materials

Computer/internet access was used to obtain earthquake locations and tide data for comparison to determine if tides effect earthquakes; data was logged/graphed on the computer.

Results

18 earthquakes (6.0+)and tide data showed 0% occurred at spring tide, 11.1% within 1 day, 44.4% within 2 days, and 61.1% within 3 days. 38.9% of earthquakes occurred closer to neap tide. 66.7% of earthquakes occurred after spring tide; most occurred on Day 2 (27.8%).

Expanded data for 92 earthquakes showed 9.8% occurred at spring tide, 21.7% within 1 day, 37.0% within 2 days, and 50% occurred within 3 days. 50% of earthquakes occurred closer to neap tide. 60.9% of earthquakes occurred after spring tide; the most occurred on Day 2 (13.0%). 4.4% of earthquakes occurred at perigee, 8.3% within 1 day, 15.2% within 2 days, 19.6% within 3 days, and 54.4% within 7 days. On perihelion, 2 earthquakes occurred (2.2%).

Conclusions/Discussion

The hypothesis is neither proven nor disproven by the initial data. No earthquakes occurring at spring tide seems to disprove it; however 44.4% occurring within 2 days of spring tide, and 27.8% occurring on Day 2 seemed significant, so data collection was expanded.

The hypothesis appears disproven with the expanded data since 50% of earthquakes occurred within 3 days of spring tide, and 50% occurred closer to neap tide. The largest number, 13.4% was on Day 2 again, suggesting the need for further study.

The data for perigee was similar. 54.4% (about half) of earthquakes occurred within 7 days around perigee; about half occurred closer to apogee. The data sample for perihelion was small, hence additional data on earthquakes around perihelion would be helpful for further study.

Summary Statement

The project is to find out if the moon effects earthquakes.

Help Received

Father provided computer and internet access. Mother provided funds for website information and helped type the report.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Joseph P. Monaghan

Project Number

J0709

Project Title

The Dirt on Soil: Does Soil Type Affect Building Stability During an Earthquake?

Abstract

Objectives/Goals

This project is about which type of soil would be the best to build a building on and would withstand shaking in an earthquake. My hypothesis was that if clay soil was better to build a building upon than bedrock, soil, gravel or sand, then there would be less sway of the building.

Methods/Materials

A shake table was used from a previous science fair project. The shake table was made of wood, pvc pipe, "v" shaped wire and a drill to power the shaking. A brick with an arrow on top was videotaped on a shake table containing nine different types of soils (bedrock, soil, sand, clay, gravel, and mixtures). The amount of sway as well as the time it took for the building to fall for each ground material tested was recorded. Soils were tested ten times each for 20 seconds. Videotape was viewed in slow motion to record movement of the test building seen on a 2cm square graph displayed behind the shake table.

Results

Gravel had the most sway with an average of 6.19 cm. Mixtures of gravel had a slightly lower sway with an average between 4.53 and 5.26 cm. However, bedrock was the best overall in standing up with an average of 18.3 seconds. Wet sand had the lowest amount of time for the building to stand with an average of 1.4 seconds and liquefaction occurred in all of the ten trials of wet sand.

Conclusions/Discussion

Gravel tended to settle which caused more sway. Any type of soil that is loose causes buildings to become unstable. The amount of sway in the test results were very close and may have been improved with a different type of test building. Bedrock was the only ground material to have the test building last 20 seconds without falling. Soft soils caused the test structure to settle, making the building fall. Bedrock would be the best to build a building upon or compacted soils. Soils should be tested for type and stability before a building is built upon especially in an earthquake prone area.

Summary Statement

This project tests how soil types affect building stability during an earthquake by using a shake table and a vertical brick to record building sway and building stability on various types of soils.

Help Received

Mother helped with videotaping trials and assembling display board. Father assisted with editing.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Max B. Olsthoorn

Project Number

J0710

Project Title

Current Affairs: Ocean Currents Effects on the Disposition of Surface Materials

Abstract

Objectives/Goals

My goal was to track the disposition of various pieces of debris in simulated Pacific Ocean currents to measure the speed of their movements and where they would come to rest; on the continental coast or out to islands in the middle of the Pacific Ocean. Based on a recent trip to the Galapagos Islands, I wanted to confirm the theory that the currents played a major role in helping different species of wildlife and vegetation make it out to the islands.

Methods/Materials

Key Material: 1 Trough,3 boxes of Clay,3 Electric Fans,15 Gallons of Water,1 Pound Salt,4 Sweetgum Tree Balls(simulated debris),1 Tube of Clear Silicon,1 Weigh Scale,1 Stopwatch,1 Measuring Tape
Procedure:
1.Mold clay into the islands (Galapagos) and the coast (Continent of South America) to a scale comparable to the real elements. 2.Arrange the clay models in the trough to simulate the positioning of the islands from the continent of South America along the equator. 4.Duct tape 3 fans; one to the north, one to the south, one to the west of the trough, simulating the Humboldt, Panama and Pacific currents. 5.Fill the trough with water and salt to simulate bouyancy. 6.Put a ring of clear silicon around one of the Sweetgum tree balls to increase bouyancy. 7.Turn on the fans for five minutes to allow the currents to be established. 8.Drop the Sweetgum Tree balls into the water in front of the fan, first to the north,and then the south. 9.Once the piece of the debris is dropped, observe and time the movements and final resting points; repeat the 4 Sweetgum tree balls. 10.Take resulting metrics and apply to the mathematical equation.

Results

Equation used: Speed=Distance/Time. (e.g.Trial #5: 34.15 (T) divided by 23 (D), equaled 0.67 inches per second(S)in the simulation). The trials of debris moving from the south had shorter travelling times than those from the north. Also, all the trials moved along the coast before going out along the equator toward the Galapagos Islands. In addition, the more buoyant debris always moved out to the islands while the heavy debris got wedged back into bays along the Ecuador coast.

Conclusions/Discussion

It turned out that the more buoyant the debris, the shorter amount of time to reach the endpoint. My hypothesis was correct, the ocean current affects the speed of debris moving along the current based on weight and buoyancy because the two lightest Sweetgum Tree Balls had the two fastest times.

Summary Statement

My experiment was focused on the affect of various ocean currents on the deposition of surface materials moving from various origin points near the intersection of the Continent of South America, the equator and the Galapagos Islands.

Help Received

Supervision by Grade 6 Teacher, Ms. Trenner.   Introduction to southern Pacific ocean currents provided by Jose Luis Cornejo Ortiz, #Pepo#, Galapagos National Park Conservationist, of San Cristobal, Galapagos, Ecuador. Also, thanks to my Father for helping me get my materials.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Caitriona M. Parker

Project Number
J0711

Project Title
Soil vs. Water

Abstract

Objectives/Goals
The purpose of my project was to determine if adding different materials to soil will have an effect on liquefaction during an earthquake. I was curious about soil liquefaction because we have many earthquakes in northern California. I wanted to see if the effects of liquefaction could be prevented by adding various materials to soil, for example, packing peanuts, rocks, bark, and leaves. I believe that packing peanuts will have the greatest effect on mitigating liquefaction.

Methods/Materials
Prepared two pieces of 2" wide PVC pipe 21" long, with 4 drilled holes spaced 5" apart, filled cylinders with soil and completed 6 trials with additives (clay soil, sandy soil, sandy soil with packing peanuts, rocks, bark, leaves). After soaking in water, dowels were placed in the 4 holes, cylinders were dropped to simulate an earthquake and spring scales were used to pull out the dowels.

Results
Trial 4 had the overall highest average grams of force to extract the dowel from the cylinder. This trial was sandy soil mixed with rocks. Trial 1 had the smallest average grams of force to extract the dowel. This was clay soil. The dowel that came out the hardest the most times was dowel 2 which was the second one up from the bottom. The dowel that came out the easiest the most times was dowel 4, the one on the top.

Conclusions/Discussion
My conclusion is that sandy soil with rocks greatly compacted the soil around the dowels because the rocks were heavy on top of the soil on and the dowels. This compression of the sandy soil and rocks made the dowels very hard to remove. As a result of my study, it would appear that soil mixed with rocks would lessen the effects of liquefaction.

Summary Statement
My project is about adding various materials to soil in order to make the strucuture of the soil stronger to limit liquifaction hazards.

Help Received
Father helped use power tools

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Fairliegh G. Quinn

Project Number

J0712

Project Title

Soil and Structure Survival during Groundshaking

Abstract

Objectives/Goals

I examined four different soil "types" to assess soil & structural survivability to earthquake damage. A model for ground motion was built using an electric motor to generate the vibrations and results were recorded and analyzed. The experiment informed my understanding about structure suvivability in active earthquake zones.

Methods/Materials

A testbed using a small table and electric fan was built. Test cups were prepared with crushed rock strata and a fixed water-table at depth. Finally a topsoil strata of loam,alluvium,sand or bedrock was added. The earthquake was presented and performance latencies recorded. I repeated the following proceedure as necessary to collect the required data. 6 plastic cups were numbered and prepared with a layer of 3\4" crushed rock. Next each cup was layered with smaller 1\2" crushed rock and 500ml of water was added. The simulated water table remained below the prepared layers of rock. Next a 1" layer of experimental soil topped each test cup. Six cups were tested per table trial with all soil types represented at least once,perhaps twice with each test trial. The trial began with the simultaneous start of the timmer and vibration. When a building fell, the timmer and vibration were stopped and the elapsed time recorded. The trial was restarted and continued recording each building failure in turn,up to two minutes. Fresh cups were prepared, rotated & place matched on the table and a new trial begun.

Results

My findings show that alluvium and bedrock performed best while sand was poor. The four soil conditions performed differently. The shake table-model was not perfect but I planned & collected data that fairly represented the variables I could control. The epicenter of vibration had different effects at location on the table. The small structures were not perfectly the same in weight or shape. To characterize the soil types. My concept required many trials to test each variable.

Conclusions/Discussion

I prepared my data for analysis by considering the soil type performance and my experimental design. As expected the data showed experimental bias by individual building and again by shake-table position. The place-matching and multiple tests proved necessary & interesting. My shaketable model performed well. My main finding was that soils consist of both large and small particles and that in the presence of water and earthquake hazards, the earth's is dynamic.

Summary Statement

My project tests what is the best soil to build a structure on during groundshaking.

Help Received

Dad helped me build the shake table. My mom helped me with stay organized and helped with glueing the board. . Bryant Falk a student at SDSU explained to me in detail what happens when groundshaking occurs.

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

Juliana Reyes; Larissa Rocha

Project Number

J0713

Project Title

Wash Out

Abstract

Objectives/Goals

My goals are to determen how slow low energy waves verses the high energy waves could affect the beach.

Methods/Materials

Methods:Step1: cover the shallow end of the paint roller pan with 1 quart of sand, making a beach. Step2: pour 2 quarts of tap water in the deep end of the pan. Step3: note the way the beach looks after you pour in the water. Step4: make waves by laying a pencil gently on top of the water, then slowly move the pencil up and down 1 inch (2.5 cm) into the water each time. Note: Repeat 3 times each using different things in water. Example: Toy cars on beach, twigs in water, and rocks in water. Step 5: Then observe the "beach" after the water waves hit against it. Materials: Pencil, Paint-roller pan, 2 quart (2 liters) of tap water, 1 quart (1 liter) of sand, little toy cars, twigs or little pieces of wood, rocks (small).

Results

With Sand: After two minutes of making study waves the sand began to erode after another one an a half min. more sand began to go with the waves. With the twigs: The sand bareley moved. Whith the cars: the sand didn't moved but started sinking. With rocks: little amount of sand was washed away.

Conclusions/Discussion

For our conclusion we concluded that high energy waves made more damage to the beach then low energy waves.

Summary Statement

Heavy waves of the beach wash out the sand causing erosion.

Help Received

PARENTS HELPED PUT SOME MATERIALS TOGETHER

CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Allysun R. Robie

Project Number
J0714

Project Title
Action Packed Liquefaction

Abstract

Objectives/Goals
The purpose of this project is to determine how the transfer of force varies in different types of soil mixtures. The reason I performed this experiment was to measure how the effects of soil liquefaction, which can occur during an earthquake, can be prevented by changing the soil composition.

Methods/Materials
Four PVC pipes (12" height X 2" diameter) were filled to the same level with four different pre-measured dry soil mixtures. The soils used were sandy soil, sandy soil mixed with clay, sandy soil mixed with organic matter (mulch mixture), and sandy soil mixed with inorganic matter (polystyrene pieces). The same volume of water was added to each mixture. Dowels were inserted two inches though the 1/4" hole in the middle of each pipe. Small round weights were placed on top of each soil mixture to compact the soil. Settlement time was one hour. A shake table was used to simulate earthquake motion for 30 seconds. A spring scale was used to measure the amount of force needed to remove the dowels from each pipe. The amount of settlement was measured in each pipe. Three complete trials were performed.

Results
The pipe filled with the moist sandy soil and mulch mix settled the least and required the greatest force to remove the dowel. The three other pipes had greater soil compaction and required less force to remove their respective dowels.

Conclusions/Discussion
The moist sandy soil and mulch mix withstood the process of liquefaction the best. This mixture demonstrated the most cohesive strength and since it settled the least, suggests that a liquefied ground of this mixture would maintain the greatest physical stability of the four soil mixtures. My experiment demonstrated that the moist sandy soil mulch mix sustains the least amount of disruption from the liquefaction process that occurs during an earthquake. Location and the soil composition of the ground are two interdependent factors affected during earthquake activity.

Summary Statement
This experiment measured how the effects of soil liquefaction, which occur during an earthquake, can be prevented or lessened by changing the soil composition.

Help Received
My parents helped build the shake table and obtain supplies for my project. My project advisor, Mr. LaBolle, provided spring scales.