CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Wyndia Ohm

Project Number

J1720

Project Title

Gravitational Anomalies: (a) A Novel Multiphysics Approach with Data from NASA, and (b) A Novel Multi-measurement Device

Abstract

Objectives

Many magazines like Via (published by AAA), Bay Area Parent etc. claim that there is a gravitational anomaly at Mystery Spot. There are other such claims of gravitational anomalies: The Oregon Vortex and the movie Interstellar. The claim made by Mystery Spot is that there is a gravitational anomaly and at some places one can lose about 6in in height. The first goal is to determine if there is a gravitational anomaly that could cause a 6in height reduction claimed by Mystery Spot. To meet this goal this project combines three equations: the Gravitational Law, a proportionality equation for height loss, and a fluid pressure equation. A second goal is to build an inexpensive gravimeter that can be used to measure gravity. This new device turns out to be an innovation platform that can be used for other measurements such as friction.

Methods

A small weight, and a thin string are used to create a pendulum. For the novel Gravity Measurement Device (GMD): two tubes, conducting tape, wires, batteries, and a timer device(timer/oscilloscope/arduino) are used.

Since F= GMm/r^2, the control variable is r the distance from the location to earth s center. Other forces such as magnetism are eliminated by using non-magnetic materials. First the number of cycles and the length of pendulum needed for an accurate (less than 5% error) measurement of gravity is tested and chosen: 10 cycles with length >= 25cm. Four control locations and four test locations of similar altitude is chosen. At each test location the 10-cycle period is collected using four trials for each length. Since seven different lengths are used the total number of measurements at each site is 7*4=28. The difficulties involved in field testing (wind effects, and human error) cause an innovation: a new Gravity Measurement Device that eliminates human error and mitigates the effects of wind. A proportionality problem approach is taken to create a model that relates height loss to increase in gravitational acceleration. The coefficient of proportionality is chosen from data provided by NASA. The impact of the gravitational acceleration on blood pressure is then modeled using the pressure equation P = d*g*h where d is the density of blood, g is the gravitational acceleration and h is the height of the person visiting Mystery Spot and other places where there is supposed to be an anomaly.

Results

The results show that the measured gravity averaged over 112 measurements for the control group is about the same as that measured at Mystery Spot using 112 such measurements. The claim of gravitational anomaly is not supported by experimental data. The new device measures gravity accurately and this device

Summary Statement

By combining Gravitational Law with a proportionality equation for height loss, fluid pressure equation and data from NASA, this project shows that if the gravity were so anomalous people can t bear it.

Help Received

I used internet resources on how to use an oscilloscope and how to program the ARduino MCU. NCERT textbooks and web resources were used to understand the multi-physics. Data was obtained from NASA studies.