



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Milagros Marquez	Project Number 38587
Project Title How Can We Use Magnetic Levitation to Identify a Ground Cavity (Sinkhole)?	
Abstract Objectives/Goals This project investigates how magnetic fields can be used in combination with small variations of Earth's gravitational field strength (due to the composition of Earth's crust at a specific location) to locate ground cavities (sinkholes). Methods/Materials The materials used were: magnets, wood Popsicle sticks, magnetic field sensor, table, electronic scale, hot glue gun, journal, pencil with eraser. We created a wood stand. We then glued two magnets at the bottom of the wood stand. Next we created a support for the sensor and finally placed the remaining two magnets enclosed in a wood structure (but free to move/levitate) to the top of the sensor. The sensor is enclosed between the two sets of magnets. Next, we started our measurements using the empty space under the desk as a simulation of cavity under the surface of the desk. Once we completed three trials we then placed 21 kg of rocks under the table in order to simulate land mass under the table and completed the same steps as explained above. A final step was to increase the amount of mass under the table to 45 kg and complete the same steps. We recorded our measurements and average calculations in the research paper. Results By creating the graph between the dependent and independent variables and by taking the line of the best fit, one can conclude that as we increased the mass (measured in kg) under the table the magnetic field strength (measured in mT) increased as well. This is called a linear relationship. We only tested masses values between 0 to 45 kg. We assume that this linear relationship will continue if we increase our scale. Conclusions/Discussion I concluded that my hypothesis was correct since I was able to identify and measure the relationship between slight changes in the composition of the ground and the magnetic field strength of my gravity magnetometer. Furthermore, I was able to further enhance the design of the gravity magnetometer by creating a 3D printed case for it.	
Summary Statement This project investigates how magnetic fields can be used in combination with small variations of Earth's gravitational field strength (due to the composition of Earth's crust at a specific location) to locate ground cavities (sinkholes).	
Help Received Mr. Incze, Physics teacher at Alisal High School	