CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

31477

Project Title

Earth's Energy: How Much Does the Distance of the Sun Affect the Amount of Light Received by the Earth?

Abstract

Objectives/Goals

The objective of my project was to assess whether the distance of the Sun was an important variable in the light received by the Earth. My hypothesis was that the distance of the Sun from the Earth was not very important to keeping our planet at an ideal energy level. It was backed up by research prior to the experiment showing that the distance of the Sun was the least important of three variables, the other two being the planet#s greenhouse strength and albedo (atmospheric reflectivity). The results of this experiment proved my hypothesis wrong.

Methods/Materials

I substituted a flashlight for the Sun, and utilized a globe to represent the Earth. I measured and recorded the amount of #solar energy# emitted from the flashlight that was received by a set amount of the globe#s surface area, namely a solar panel fixed to it. I measured the light by means of a digital display that was connected to the panel, and showed how many lumens (the amount of light that falls on a one foot by one foot square surface exactly one foot away from a lighted candle) of light hit it. I placed the flashlight upon thirteen science textbooks to help it achieve the required height.

Results

The distance of the Sun was clearly important. My greatest measure of light, 200 lumens, was taken at one meter between the two surfaces. My least measure of light, 53 lumens, was taken at three meters. This data was recorded at the closest and farthest distances from the light source that I measured. My results also showed that the distance of the Sun from the Earth could probably be graphed as a quadratic function. Pushing the Earth 0.25 meters away from the Sun would cause a smaller decrease in lumens if the Earth was already far away from the Sun than it would if the Earth were close to the Sun.

Conclusions/Discussion

Looking at my graph, I conclude that the nonlinear function that governs it is due to a concept known to us as diffraction. When the light source is further away, there is a lesser amount of light in one cubic unit of space penetrated by the beam, and it [the beam] spreads out more. Diffraction is what leads me to conclude that, while the distance between the Earth and Sun is not as important a variable as some when considering the light received by our planet it is definitely vital to getting just the right amount of energy to keep our planet capable of supporting life.

Summary Statement

My project proved, using a globe, solar panel, digital display and a flashlight, that the distance of the Sun is vital to getting the right amount of energy for our planet, yielding a quadratic function in its results, due to diffraction

Help Received

My mother read over the reports after I was done with them, and I used equipment belonging to Jane Lathrop Stanford Middle School and Ms. Noel Berghout under the guidance of Ms. Berghout.