



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> Nisha S. Rao	<b>Project Number</b> <b>S1195</b>
<b>Project Title</b> <b>An Analysis of Solar Activity vs. Atmospheric CO<sub>2</sub> on Earth's Surface Temperature &amp; the Effect of Excess CO<sub>2</sub> on Flora</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective is to analyze if CO <sub>2</sub> or solar activity has more influence on the Earth's increasing surface temperatures. I conducted an experiment to determine the effect of excess CO <sub>2</sub> on plants. <b>Methods/Materials</b> To analyze the relationship between solar activity, Earth's surface temperatures, and atmospheric CO <sub>2</sub> , I used data from NASA (temperature), The Royal Belgium Observatory (Sunspot Number) and Berkeley Earth (CO <sub>2</sub> ). I imported the yearly data(1880 to present) from these organizations into Microsoft Excel and graphed & analyzed the data. To simulate the effect of high CO <sub>2</sub> levels on plants, I used 2 greenhouses, 4 tomato seedlings, soil, 1 bowl, baking soda, vinegar, fenugreek and turnip seeds. I placed 2 tomato seedlings and half of the seeds in each greenhouse. To create excess CO <sub>2</sub> , I mixed baking soda and vinegar in the bowl, placed it one of the greenhouses, and sealed it. The experiment lasted for one week. <b>Results</b> The data demonstrates that Earth's temperatures conformed to solar activity until CO <sub>2</sub> levels started to rise rapidly, overtaking solar activity as the dominant factor. Contrary to my hypothesis, the plants in the excess CO <sub>2</sub> greenhouse did not fare well. The tomato seedlings wilted; the seeds' germination was delayed and stunted compared to the control greenhouse. <b>Conclusions/Discussion</b> The correlation between the number of sunspots and Earth's temperature is very clear. Once the carbon dioxide levels started rising, the global temperatures started reflecting CO <sub>2</sub> levels rather than the sunspot cycle. The results of this research indicates that once the carbon dioxide levels are stabilized, the temperature patterns will again start to reflect the sunspot cycle. While excess CO <sub>2</sub> initially improved the rate of growth of live plants, it was not sustained throughout the experiment; excess CO <sub>2</sub> also delayed the germination of the seeds.	
<b>Summary Statement</b> This project's purpose is to understand if Earth's temperatures are influenced by CO <sub>2</sub> or solar activity, and the effects of excess CO <sub>2</sub> on plants.	
<b>Help Received</b> Mother helped fill forms, helped with board. Parents help with greenhouse setup. Teacher guided the writeup.	