



CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY

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| <b>Name(s)</b><br>Yu (Joy) Sun   | <b>Project Number</b><br><b>J0899</b> |
| <b>Project Title</b><br><b>Dead Spots in the Ocean: HNLC Areas' Restriction to Phytoplankton's Uptake of CO<sub>2</sub></b>  |                                       |
| <p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>A current solutions to global warming is to fertilize HNLC (High Nutrient Low Chlorophyll) ocean areas lacking iron with iron to increase CO<sub>2</sub> absorption from phytoplankton. However, besides iron, some HNLC areas also lack silicate. The objective of this project is to determine if the absence of silicate or iron has a greater restriction to diatoms# uptake of CO<sub>2</sub>. I also want to determine if fertilizing HNLC areas with iron to decrease the rising levels of CO<sub>2</sub> in the atmosphere is really the best solution, as opposed to fertilizing it with silicate, another needed but lacked nutrient.</p> <p><b>Methods/Materials</b><br/>Thalassiosira weissfloggi, a common diatom, was chosen to be used for the experiment. They were inserted into three different environments modeling after each of the two different HNLC areas and the standard culture that diatoms live in. After CO<sub>2</sub> was inserted into the air tight vials, the Gas Chromatography was used to monitor the absorption of CO<sub>2</sub> over time. The pH level was also tested at the beginning and end of the experiment to observe the CO<sub>2</sub> uptake. To study the growth in diatoms, a cell count was conducted at the beginning and end of the experiment as well.</p> <p><b>Results</b><br/>Based on the results from the Gas Chromatography, diatoms in the culture without silicate had the least amount of CO<sub>2</sub> absorption, at 7μl less than the standard culture. The results of the pH measurements corresponded with the Gas Chromatography results. Diatoms in the vials without iron were found to have the least cell growth, with a difference of approximately 6,800 cells/μl less than the standard culture.</p> <p><b>Conclusions/Discussion</b><br/>After the research and experiment, it is reasonable to presume that fertilizing the ocean with iron might not be the best choice. From the results, one can conclude that iron in the ocean doesn't cause diatoms to have additional CO<sub>2</sub> absorption but population increase instead. The extra phytoplankton would absorb more CO<sub>2</sub> if it didn't trigger zooplankton, a predator of phytoplankton, growth as well. The population increase in both of the organisms eventually evens out, because the extra zooplankton would consume the extra phytoplankton. On the other hand, the lack of silicate causes diatoms to have a decrease in CO<sub>2</sub> uptake, so with the silicate stimulation, there will be more CO<sub>2</sub> uptake without more population. Silicate fertilization also only triggers diatom growth and would not result in unwanted consequences.</p> |                                       |
| <b>Summary Statement</b><br>HNLC areas lacking silicate has a greater restriction to diatom#s uptake of CO <sub>2</sub> than areas without iron, thus fertilizing the ocean with silicate is a wiser decision.   |                                       |
| <b>Help Received</b><br>Used Gas Chromatography and pH meter at the Department of Chemistry at UCSB under the supervision of Dr. Shouli Sun; Use the Hemacytometer and Microscope at the Department of Marine Biology at UCSB under the supervision of Mr. Mark Demarest; Mom helped with transportation.  |                                       |