CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
22621

Project Title
Stable Oxygen Isotope Paleothermometry using CaCO3 Shells of Fossil Plankton: SST Reconstructions of the Western Pacific

Abstract

Objectives/Goals
The objective is to map out a record of sea surface temperature during the past through oxygen isotox analysis of the shells of fossil plankton foraminifera.

Methods/Materials
1500 samples of a 3000 cm deep ocean sediment core was obtained from ODP (Ocean Drilling Program). All samples were washed, filtered, weighed, and cleaned before individual fossil forams of the species g. ruber were hand-picked under a microscope. Samples were run through a dual-inlet mass spectrometer which calculated the ratio of oxygen 16 to oxygen 18 within the sample. Ratio values are graphed on the computer to provide a visual representation of the relative sea surface temperature of the ocean.

Results
My entire core sample shows striking similarities with the sawtooth pattern graph even though it is only one section of many sawtooth patterns documented by previous research. The values of the samples frox 0-500 cm range from negative 2.5 to negative 3.5, which represents the peak of the graph. These negative values show the relative abundance of oxygen 16 in the water during this time, which tells me that this is an example of a warming trend which we are currently in.

Conclusions/Discussion
The logic behind stable oxygen isotope analysis can be described in the following manner: We understand that oxygen 16 is the lighter isotope as opposed tx oxygen 18; thus oxygen 16 is more easily evaporated from the ocean than its counterpart. During periods of cool climate or #mini ice-ages#, the easily-evaporated oxygen 16 is usually trapped on land in the form of ice or other reservoirs of water on land, thus the ratio of oxygen 16 to 18 is more closer to a 1:1 ratio€ During warm climates, the melting of the ice will result in a mixing of the water and the ratios migx reach 3:1. My results support the idea of global warming and that it#s truly happening. If the warming trend doesn#t drop in the next 1000 years, then it will further confirm our suspicions, however it will be too late by then.

Summary Statement
By looking at the ratio of oxygen isotope 16 to 18 in the calcium carbonate shells of fossil plankton, we can document the relative sea surface temperature at a certain time, which gives us an idea of what the climate was like in the past.

Help Received
Core samples obtained from ODP; mass spectrometer and other laboratory equipment used at the University of Southern California Geological Sciences Dept. under the guidance of Dr. Lowell Stott