CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
S1205

Project Title
Volatile Climate of the Miocene: A Glimpse into Our Future?

Abstract

Objectives/Goals
Determination of how CO2 levels (the greenhouse effect) and organic carbon burial (the Monterey hypothesis) affected the climate of the Miocene

Methods/Materials
Sediments from the Miocene (23-5 Ma) were studied ODP site 1490 and ODP site 1482. 5 samples of Trilobatus Trilobus between the size fraction 212-250 micrometers were picked from the sediment from each section of the core, cleaned, and analyzed through a mass spectrometer for Delta C-13. 400 micrograms of T. Trilobus were also picked from the sediment from each section of the core, cleaned, and analyzed through another mass spectrometer for magnesium and calcium

Results
Temperatures of the Miocene were highest ~17-15 Ma, a time period called the Mid-Miocene climatic optimum, and then decreased into the late Miocene before stabilizing during the late Miocene. This data was compared to global CO2 records obtained from previous experiments. Delta C-13 values increased ~18 Ma, and this data was compared to the change in temperatures during the Mid-Miocene.

Conclusions/Discussion
Global CO2 levels were highest during the Mid-Miocene climatic optimum, and then decreased when temperatures decreased heading into the late Miocene, supporting the greenhouse effect. However, CO2 levels decreased during the late Miocene, but temperatures stayed relatively constant at both sites, showing a deviation from the greenhouse effect. The Monterey Hypothesis states that the high delta C-13 caused the decrease in temperatures during the Mid-late Miocene, but Delta C-13 values increased ~18 Ma and temperatures did not start decreasing until ~15 Ma, indicating a lag time, which contradicts the Monterey Hypothesis

Summary Statement
I reconstructed the climate of the Miocene to determine how and why it changed

Help Received
I crushed, sieved, and picked all samples using the lab equipment from University of California Santa Cruz. My mentor Dr. Tali Babila cleaned the samples and ran the mass spectrometer