CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
Ji Won Chae

Project Number
38719

Project Title
The Effects of Ocean Currents on the Distribution of Particle Matter

Abstract

Objectives/Goals
This science fair project studies the movement of particles in relation to ocean current patterns.
The purpose of this project was to determine whether the materials and compounds used in the process of offshore drilling reach shore ecosystems, through experimental small-scale applications of large-scale processes. It was hypothesized that that contaminants would likely settle near the ocean floor, and be transported by rising deep water currents towards the shore.

Methods/Materials
Sites with public access were chosen for their convenience as well as the direct impact on human life. Immediately after the sampling procedure had ended, ocean currents were recorded.
The samples were delivered to a laboratory. The samples were analyzed through ICP-MS.
In addition, arsenic, barium, bromine, cadmium, chromium, iron, strontium, and zinc were chosen for analysis. Arsenic and cadmium are heavy metals. Chromium, iron and zinc are metals that are beneficial in trace amounts. Bromine is present in brine and seawater due to its properties as an ion. Strontium is abundant in the crust and can form salts. Barium can form precipitates.

Results
The hypothesis that the highest levels of contamination would be observed in the region subjected to the greatest amount of outward directed surface ocean currents was proven as the trends in the data indicate the sample sites that experienced outward surface level ocean currents. The overall trend in the data favors the outward currents with elevated quantities of contaminants, distinctly higher than the nine other beaches.

Conclusions/Discussion
The hypothesis was supported by data collected. Beaches which had experienced outgoing surface-level ocean currents were correlated to higher levels of contaminant content within the water.
Difficulties isolating this experiment from contamination limit the bounds of the research. Despite these limits, the overall conclusion is unaffected. Iterations may incorporate sediment and sea water may be tested separately in order to refine the results of the experiment and to isolate specific characteristics of metal contamination. A greater emphasis on the effects on life may be worthwhile. By understanding how drilling by-products are spread by oceanic currents, we can predict and trace the path of contaminants in the case of potential error, minimizing damage and impacts upon the environment.

Summary Statement
My project examined the relationship between ocean currents and natural patterns with the spread of particulate matter as manifesting in possible contamination from offshore drilling platforms.

Help Received
Exova Lab provided the ICP-MS data analysis service.