CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
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Project Number
J0605

Project Title
Into Thin Air: The Effect of Elevation on Temperature

Abstract

Objectives/Goals
This project's objective is to determine if temperatures change randomly or if there is a specific pattern of change, and also to determine if the elevation of a certain place is a key factor in a change in temperature.

Methods/Materials
This project involved placing eight thermometers at different altitudes, beginning at 1,000 feet above sea level to 8,000 feet, in similar topographical areas. I checked the thermometers in three different seasons -- summer, autumn, and winter -- during the same time of day, and recorded the temperature and weather conditions. The materials used for this experiment were: thermometers, altimeter, and a vehicle.

Results
I discovered that temperature mostly decreases as elevation increases, but that these temperature changes are random rather than occurring with any set pattern. At three of the selected elevations, however, a temperature inversion always occurred. It was significantly warmer at these specific sites than at elevations that were lower. This is due to a consistently rising current of cool air that lost its buoyancy when reaching a pocket of warmer, less dense air that was trapped at these elevations due to the prevailing breezes caused by the river canyon.

Conclusions/Discussion
There are several factors for variations in local temperature. Air pressure decreases as elevation increases. Air density decreases as air is heated. In a process called adiabatic cooling, when an air parcel is moved to a lower pressure level (higher elevation), it expands (lower density) and the temperature decreases. Weather systems that bring higher (warm, compressed air) or lower (cold) air pressure also affect the air's density and, therefore, temperature. These results supported my hypothesis that temperature decreases as elevation increases, but these findings also conclude that although the general population is aware that snow falls at higher elevations (mountains), while in the lowlands that precipitation is in the form of rain, it is important to know that there are many factors involved in temperature both locally (air pressure, air density, weather systems, and elevation) and globally (latitude, seasons, and the greeenhouse effect).

Summary Statement
The study of weather and temperature patterns at varying elevations.

Help Received
My parents provided my transportation so I could check my eight thermometers.