CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

Natalie Gallagher; Connor Lydon

Project Number

S0801

Project Title

Secret of San Lorenzo Valley's Atmosphere: Vertical Meteorological Measurements Part 2

Abstract

Objectives/Goals

To determine the affect of atmospheric inversions on ground particulate matter 2.5 (PM 2.5) levels. To compare San Lorenzo Valley's particulate matter 2.5 levels to neighboring areas. To take into account vapor pressure by using the standard of Virtual Potential Temperature and to determine if this has an effect upon on the atmospheric inversions of PM 2.5 levels. We hypothesize that fluctuations in vapor pressure will have little effect upon atmospheric inversions and ultimately PM 2.5 levels.

Methods/Materials

We used: radiosondes, 200g balloons, helium, parachutes, dereelers, an i-Met 3050 Sounding System, and data from EBAMs. In the 2012/13 season we collected atmospheric data over a period of three months, launching weather balloons three times a week, twice a day to obtain atmospheric inversion data. This year, we launch weather balloons when inversions are forecasted to be present or if other drastic changes in weather patterns are seen. We collect our data by weather balloon, compile, then analyze it.

Results

Particulate matter 2.5 clearly was affected by atmospheric inversions, and increased greatly on inversion days. In some cases, PM 2.5 levels were "unhealthy" on inversion days and "healthy" on non-inversion days (determined by our Modified Air Quality Index table). San Lorenzo Valley#s topography had an evident affect on PM 2.5 levels. Vapor pressure fluctuation did not have a major effect on the inversions (as determined by temperature recordings) and as a result little effect on PM 2.5 levels.

Conclusions/Discussion

Inversions do affect levels of particulate matter 2.5, and due to this San Lorenzo Valley experienced many unhealthy days for particulate matter 2.5. San Lorenzo Valley experiences much higher particulate matter 2.5 levels due to its topography. Differing vapor pressure does not affect atmospheric inversions and as a result does not effect PM 2.5 levels in San Lorenzo Valley. Our data has supported our hypothesis.

Summary Statement

We analyzed the effect of atmospheric inversions on particulate matter 2.5 levels in San Lorenzo Valley with weather gallons and EBAMs; also, vapor pressure has little effect upon atmospheric inversions and PM 2.5.

Help Received

Scott Norton trained us for data collection; Bob Nunes and Mike Gilroy helped us interpret data; and the Monterey Bay Unified Air Pollution Control District donated money and data; intermet donated money and equipment.