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Purpose of this experiment:

The purpose of this experience is to determine if there is a temperature inversion taking place on the central coast between zero and 1,000 feet. We will test this at Tobin James Winery. If we find out there is an inversion then we will also figure out how large of an inversion.

Background Research:

As you go higher up into the Earths atmosphere the normal characteristics is that it gets cooler as you go higher in the troposphere. On an average of 6.5 Celsius cooler for every 1,000 meters that you are from starting area. The good news is that the cooling temperatures as you climb help mix the air keeping air pollution down. However when it is cold near the ground and warmer above it this causes a temperature inversion which results in stopping the air from mixing the air leaving a layer of pollution.

What Causes Temperature Inversion:

There are many reasons why a temperature inversion might occur. One situation in which a low level, or surface inversion, might take place is on a clear night, when the earth's surface radiates heat away rapidly. If the air is clear, the ground, and the air directly above it, can be cooler than the air at higher altitudes. This type of situation may occur on winter nights in California, and can be a problem for citrus growers, because if enough heat radiates away, the temperature at the ground surface can drop below the freezing level.

Another type of inversion, called an Advectional inversion, involves a horizontal inflow of cold air. This might be air blowing in from cold water to a coastal area. Along the California coast, winds frequently blow onshore, passing over the cold ocean waters before reaching land. When this occurs, the air at ground level may be colder than the air above it, and the air is stable.

A third type of surface inversion takes place at night in valleys, when cold, dense air flows down slope under the influence of gravity, draining off the slopes and uplands, and into the valleys. The air in the valley bottoms is colder than the air above.

Other types of inversions may also develop under various conditions. In California, upper air inversions develop because much of California is on the eastern edge of the subtropical high pressure cell in the Pacific Ocean. This high pressure cell develops in response to global patterns of atmospheric pressure and circulation, rather than local conditions. The presence of high pressure means that the air in the region is subsiding from high altitudes in the atmosphere. Subsiding air is compressed by the increasing pressure of the surrounding air as it descends, so the air warms up as it subsides. So not only is there cool air at ground level (from onshore flow of cool air), there is also a general subsidence of warm air aloft. The inversion layer acts as a lid to prevent air at ground level from rising and dispersing. If there are mountains inland, the mountains can also help trap the air. This means that any pollutants emitted accumulate in the trapped air. The

bottom line is that conditions in California frequently favor the development of temperature inversions. The pollutants will continue to become more concentrated until a change in the weather leads to the breakup of the inversion layer. A great example of these conditions can be seen in Los Anglos with its smog layer.

Design Brief:

We are trying to test if a temperature inversion is occurring at the launch site, Tobin James Vineyards. We will know if this is occurring if the temperature decrease then increases within the 1,000 feet of the balloon launch. We will attach a gondola, six pounds or under, to the balloon which will then be able to test to prove our hypothesis was right or wrong. The thermometer will be used to calculate the temperature and a barometer that will calculate the height. The Hard Drive will then store the temperature and height data that we gather continuously. However, we need to figure out how to make a system that will record the info, and then be able to save it in a format that a computer will be able to use. The program will need to be built to operate on a Mac or PC. This system will also need to be as cheap as possible, considering little funds.

Hypothesis:

We have a feeling that there will be a slight temperature inversion occurring on the Central Coast. Temperature inversion occurs when we increased in height got cooler and then suddenly got warmer. We also believe that temperature inversion will be within 1,000 ft. because of the surrounding mountains and hills. We expect to have a temperature inversion result within those 1000 feet but there is always the possibility of it being above this.

Test 1:

We should see a gradual decrease in temperature with increasing height. However, if there is a temperature inversion we should see a section of heating with increasing height that will return to normal of increasing height decreasing temperature.

Test 2:

We should see a gradual decrease in temperature with increasing height. However, if there is a temperature inversion we should see a sudden spike in temperature that will show that we have a temperature inversion.

Test 3:

We should see a gradual decrease in temperature with increasing height. However, if we don't see any spike or section of warming then we are wrong in our hypothesis that there is a temperature inversion.

Test 4:

The other possibility is that from start to stop we see a gradual increase in temperature stating there is a temperature inversion present, except very close to the surface of the ground and not containing a smog layer.

Product Design Specification:

This device must weigh less than six pounds for federal standards. The device must carry a thermometer to verify a temperature inversion, a Barometer to measure height and a lab pro that will test the temperature accurately down too a hundred-thousandth of a degree in Fahrenheit continuously. The lab pro must have a large enough storage to hold all the information for our

project.

Sources:

1) http://en.wikipedia.org/wiki/Temperature_inversion
2) http://www.infoplease.com/ce6/weather/A0848126.html
3) http://www.tpub.com/content/neets/14182/css/14182_95.htm
4) http://daphne.palomar.edu/calenvironment/smog.htm
5) http://www.bbc.co.uk/weather/features/az/alphabet27.shtml