Balloon Fest Experiment Analysis

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Purpose of the Experiment:

The purpose of our experiment is to send a helium filled balloon, Kabutur, to 1000 ft. in the air from Tobin James Winery at the hours between 8:00 and 12:00 pm, taking measurements of pressure, and humidity as the balloon ascends, while another pressure sensor at ground level takes readings. Kabutur was looking to find two things: a connection between altitude and humidity, and find out why the measured pressure is higher at the end of the experiment than at the beginning based on the instrumentation.

Source and Origin of the Data:

We acquired our data using real time readings acquired from the humidity sensor and the two barometer sensors that were connected to the Lab Pros. One Lab Pro was sent along with one pressure and a humidity sensor in a gondola's payload attached to the balloon. The last pressure sensor and Lab Pro remained at ground level to take readings throughout the course of the experiment. At the start of the experiment, we initialized the programs loaded on the Lab Pros from the Vernier program.

Hypothesis:

A1) I am expecting a rise in humidity as the gondola ascends due to altitude, followed by an equal decrease in humidity as the gondola descends until the end.

A2) Wind drafts may provide more or less moisture, and it might cause spikes in the data.

B1) I believe that the ground pressure increases as time wears on, and the change is only visible through long periods of time.

Tests A:

1.)The humidity should equally rise and fall with altitude, as the balloon enters altitudes with higher moisture, and falls from them.

2.) When the altitude reaches ground, the humidity should also return to its initial value.

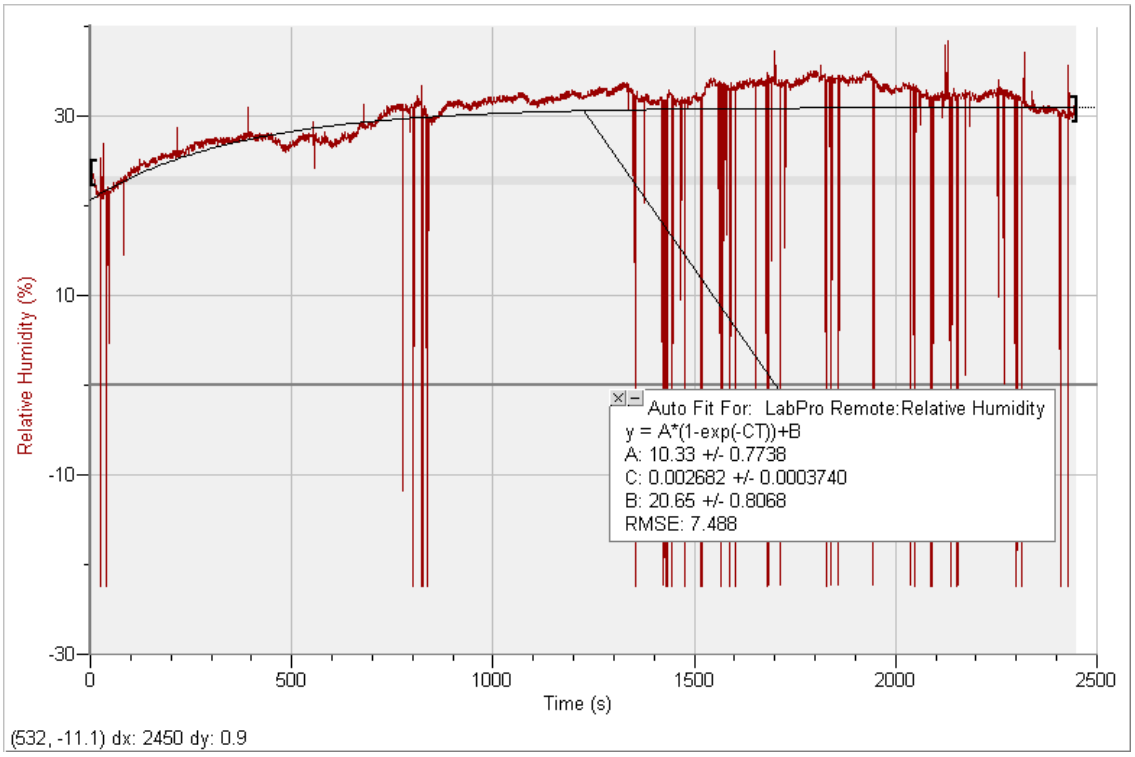
Tests B:

1.) Local pressure should have changed, causing an augmentation in pressure.

2.) Ground pressure should increase slowly, finishing at the same place where air pressure ends.

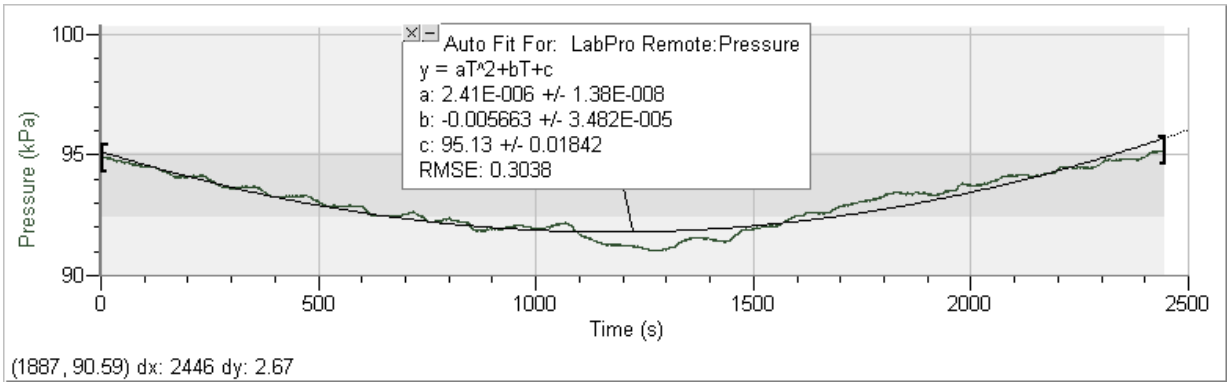
Data and Graphs:

Relative Humidity vs. Time (Test A)

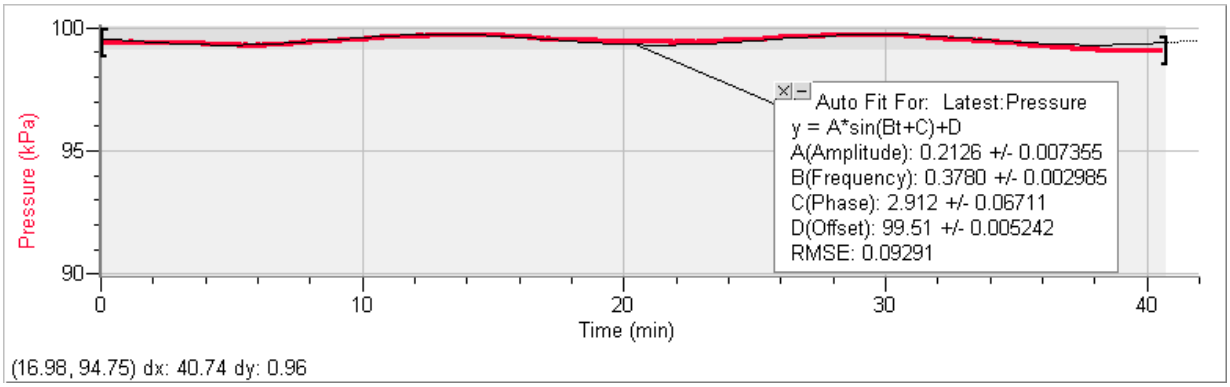


Pressure From The Air/Ground Pressure vs. Time (Test B)

Pressure in the Air



Ground Pressure



Alternate Hypothesis

The data that has been gathered shows allows me to make two other hypotheses:

a) Humidity increases as the balloon gets higher, but as the day wears on and the winds pick up, more moisture is brought to the launch site, causing the sensor to read higher humidity readings at ground level. The data shows this as it rises with altitude, but fails to fall to the same point as it started.

b) Although the ground pressure does shift over time, there is no correlation between air pressure and ground pressure. This means that the Vernier sensors are at fault for incorrect readings, most likely to the extent of time in the air. This can be read from the data by noticing that when the experiment has finished, the ground and air data are not the same.

Alternate Tests:

We may be able to test my hypotheses by:

a) Start the humidity readings at an earlier time, with less wind, and that might eliminate some static, and also to see a constant rise and fall of humidity.

b) A test to measure the variation to see if it can give us the accurate pressure when attached to data.

Conclusion:

We have learned that the barometer isn't a reliable source because it's readings change over an extended period of time, and also that the humidity sensor cannot be a valuable source of information on the way down, due to the change in ground humidity. For the next time that we do this experiment, I feel that we should take measurements of chemicals in the air and find a way to sample the wind speeds as the gondola rises.