Climatology Field Exercise

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GEOB 309

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1| Introduction

This assignment focused on analyzing microscale meteorological effects in Cheakamus Centre specifically anabatic and katabatic flows. This area is located in a valley between two mountain ranges. Using the data collected from the Kestrel Sensors and Environmental Sounding, conclusions can be made about the microscale meteorological processes that may be occurring in this area.

2| Kestrel Analysis

2.1 Diurnal Variations, Cold Air Drainage, and Inversions

From the data collected it can be seen that the temperature decreases from late afternoon to evening. This could be evidence of katabatic flows indicating that cold dense air sank into the valley between the two mountain ranges. Looking at figure 1 we can see how temperature varies diurnally. Anabatic flows can be seen at the beginning and end of figure 1. Warm air from daytime heating began to rise. Since the sampling started in late afternoon we captured the peak temperatures of the day at the start of figure 1. Anabatic flows are also seen starting around 10:30am as the sun gradually heated the slope. The elevation of the Kestrel sensors does not seem to influence the data collected. There also does not seem to be any inversions that occurred.

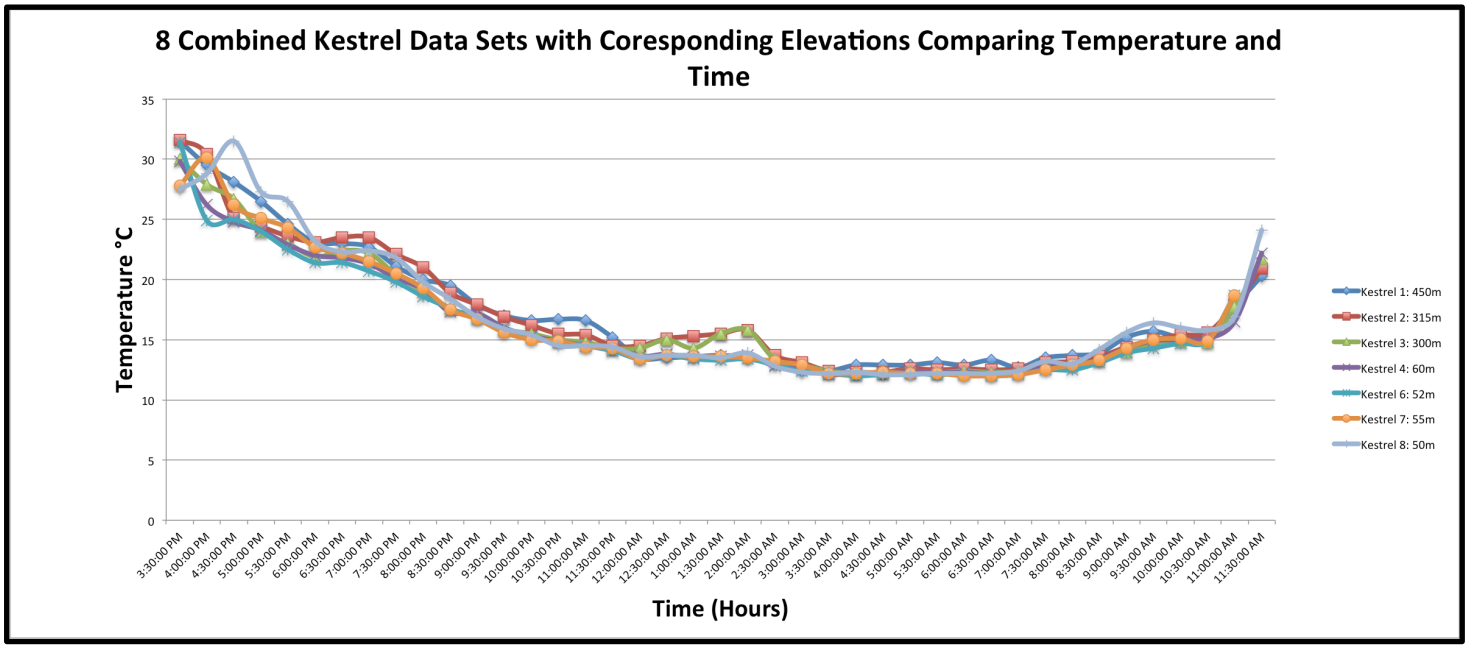

Figure 1. Data collected from the Kestrel Sensors comparing Temperature Vs. Time

Looking at figure 2 we can see that there are spikes of increased wind speed at specific times during the sampling period and lulls with no wind evident. Most of the kestrels displayed an increase in wind speed from 4-7pm this could be evidence of katabatic flows developing as the cold dense air begins to sink into the valley. The wind speed increases again around 10:30am and this could be evidence of anabatic flows as the slope is heated. Without the wind direction it is

difficult to make inferences about mountain flows that are occurring but the timing of the wind speed fluctuations is interesting.

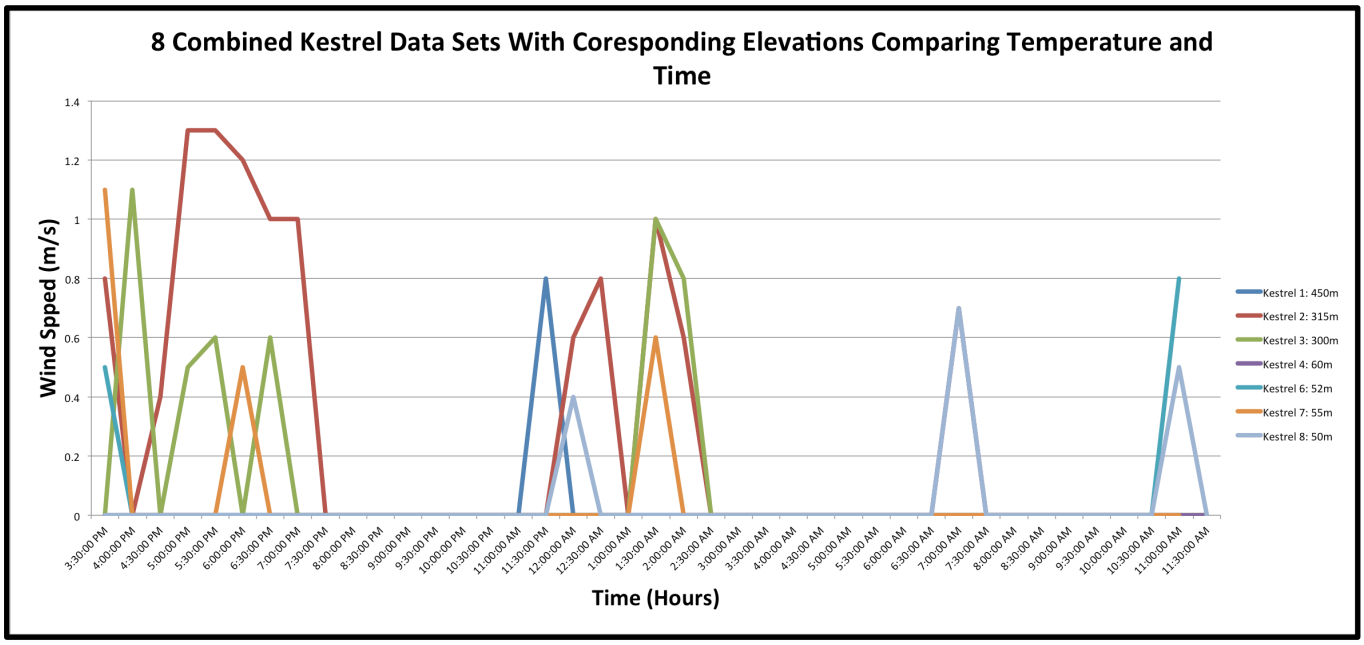

Figure 2. Data collected from the kestrel sensors comparing time and wind speed

3| Sounding Data

3.1 Atmospheric Profiles

Based on the sounding data we can see that there are three different atmospheric layers that are represented in Figure 3 and 4. At each layer there is an inversion, which indicates the balloon traveling into another layer. The atmosphere is stable for the most part accept for the start of each new microscale layer in the atmopshere. The three layers seen represent microscale layers in the atmospheric due to topographic effects.

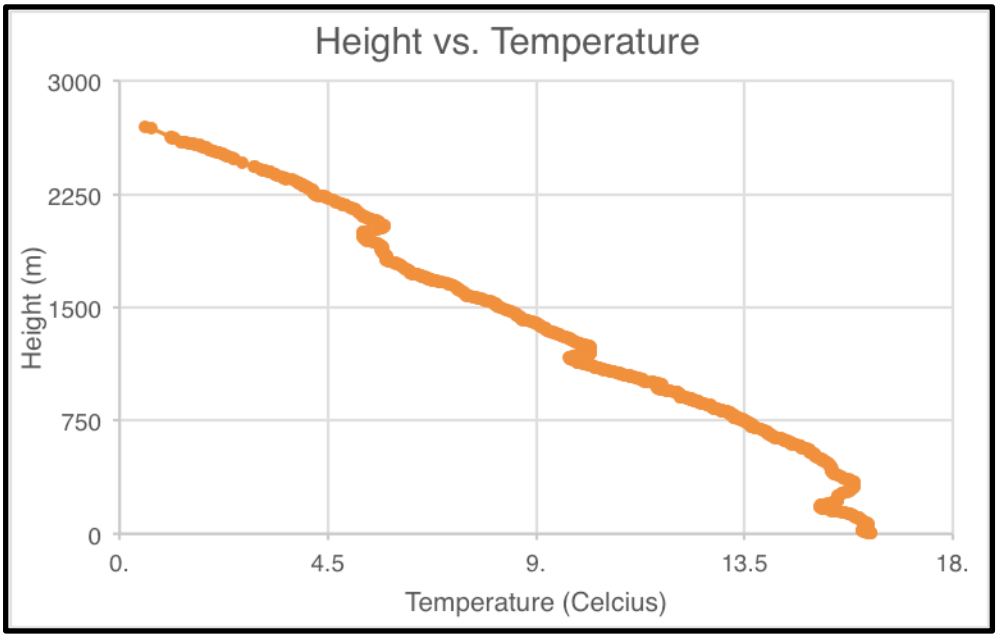

Figure 3. Data collected from the atmospheric sounding comparing temperature and height.

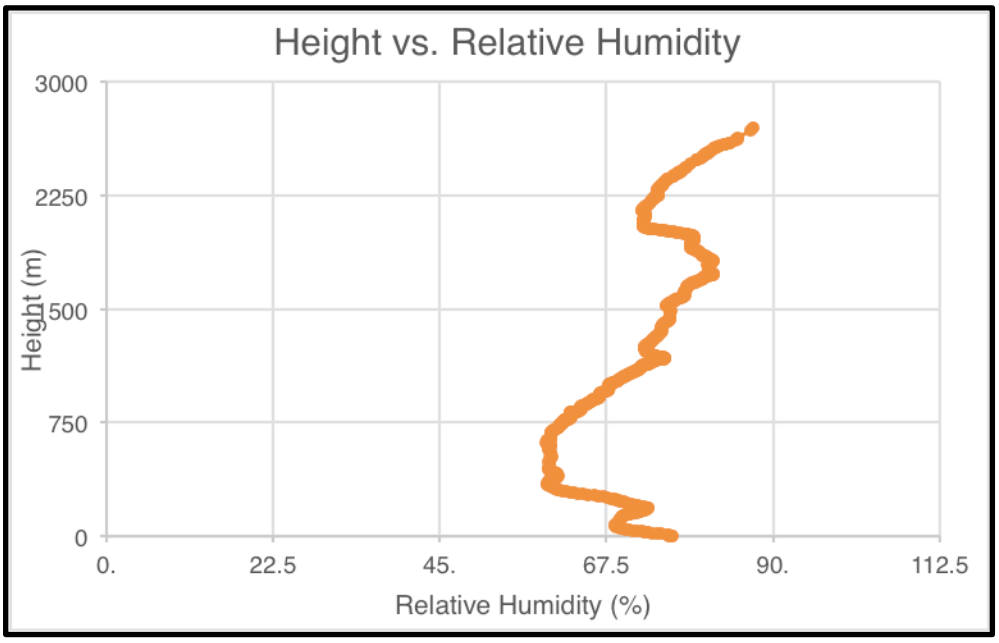

Figure 4. Data collected from the atmospheric sounding comparing relative humidity and height.

3.2 Local Valley Effects

A noticeable change within figure 5 regarding Height vs. Wind Speed is identifiable around 1,600 m as the wind speed drastically picks up indicating that the balloon entered the free atmosphere and was no longer effected by the friction of the topography. Frictional surfaces such as mountains and vegetation slow down the wind speed below 1600m and that is why the wind speeds are slower below this elevation.

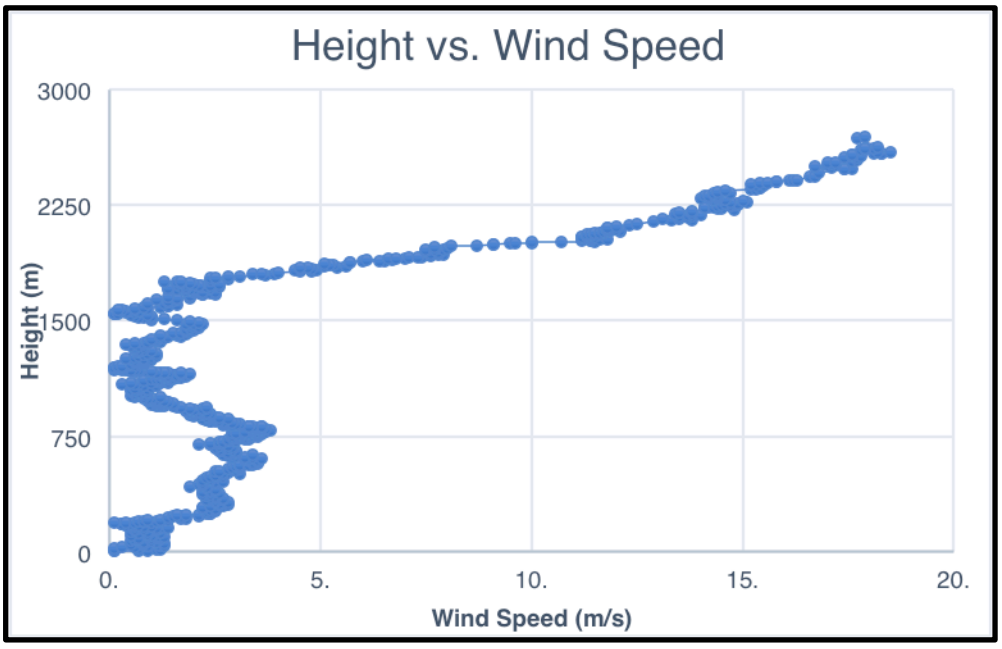

Figure 5. Data collected from the atmospheric sounding comparing height and wind speed

Figure 6 displays evidence of local valley effects as the wind direction changes multiple times below 1600m. These local valley effects cause microcirculations and mountain winds that would cause the instrument to experience turbulence and a change in wind direction. Once the instrument reached the free atmosphere at 1600m the local topography and valley effects did not influence the instrument and it established a clear northern heading due to the ambient southerly wind.

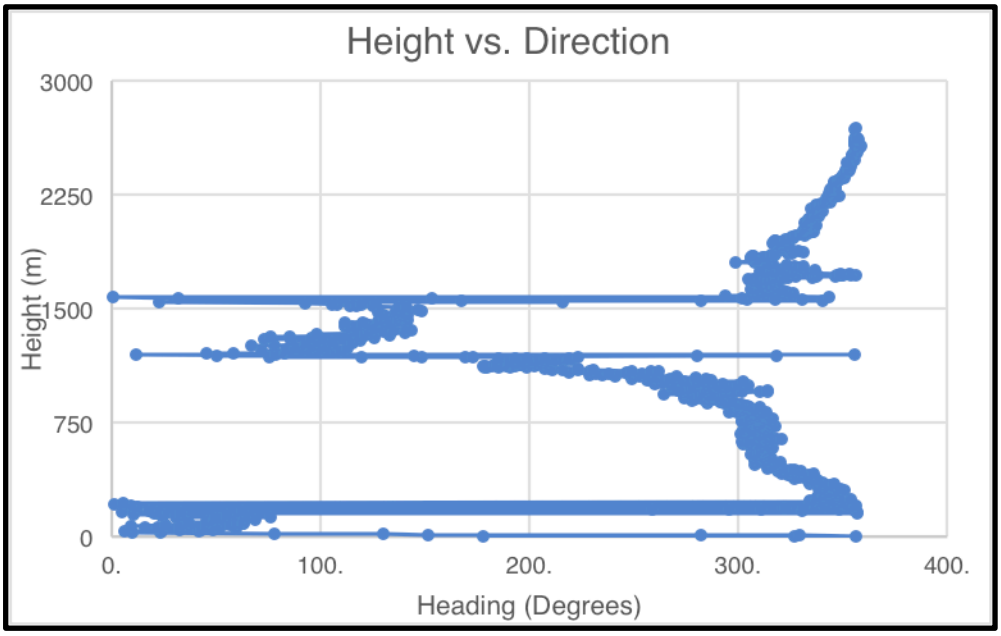

Figure 6. Data collected from the atmospheric sounding comparing heading and height