Difference Between Surface Temperature at High and Low Elevations

6th Grade Elevation Group

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Table of Contents

Abstract

The research question states: What is the difference between surface temperature at high and low elevations? The hypothesis states the difference between surface temperature at high and low elevation is that at higher elevations it is warmer. On the flip side, it is colder at the lower elevations. I think this because the sun is closer to the higher elevations. We took surface temperature date as a class and then, as a small group, used the ADAT system to find higher elevation data. The data shows the higher elevations did have warmer temperatures, which supports the hypothesis which states the difference between surface temperature at high and low elevation is that at higher elevations it is warmer. On the flip side, it is colder at the lower elevations. I think this because the sun is closer to the higher elevations.

Difference between Surface Temperature at High and Low Elevations

Research Question and Hypothesis

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Introduction

What is surface temperature? Surface temperature is the function of thermal inertia of the soil. The soil gets heated up by the sun. This leads us to knowing that the ground may heat up from geothermal heat pumps that may cool or heat up the ground the sun may also heat up the ground which makes the soil warm. Next, color affects the heat absorption on things because when something is illuminated in the color white that means that it is absorbing all other colors this means that if grass is darker in one spot and another spot is lighter, then the dark spot may absorb more sunlight and the darker spot will be warmer than the lighter spot.

Materials and Method

- SPER Scientific 800103 Infrared Thermometer
- Etekcity Lasergrip 1080 Infrared Thermometer
- DIY GLOBE Thermal Glove
- Cloud Viewer (from UCAR)
- Clipboard
- Pen
- GLOBE Surface Temperature Data Sheets

Method

Procedure taken from GLOBE Surface Temperature Protocols

Surface Temperature Protocol

1. When necessary, either wrap the IRT in a Thermal Glove before going to the study site or place the IRT outdoors for at least 30 minutes prior to data collection. For more details, refer to the Thermal Glove -or- Place IRT Outdoors For At Least 60 Minutes section of this protocol.
2. Complete the top section of the Surface Temperature Data Sheet (fill out the Supplemental Site Definition Data section if Surface Temperature Measurements are being taken at a particular site for the first time, or if one of the values in that section has changed).
3. Take cloud observations following GLOBE Cloud Protocols.
4. If there is no snow on the ground anywhere in the Site, then check either “Wet” or “Dry” for the Site’s Overall Surface Condition field on the Surface Temperature Data Sheet.
5. Check the box that corresponds to the method used to prevent the IRT from experiencing thermal shock.
6. Pick 9 Observation Spots that are in open areas within the site and are at least 5 meters apart. The Spots should also be away from trees and buildings that create a shadow on the land and in locations that have not been recently disturbed by people or animal traffic. (Note: It is best that readings are taken at the 9 individual Observation Spots within seconds of each other.)

7. Go to one of the nine Observation Spots and stand so that a shadow is not casted on the Spot.
8. Record the Current Time and its corresponding Universal Time (UT) on the Surface Temperature Data Sheet.
9. Hold the infrared thermometer (IRT) (wrapped in a Thermal Glove when necessary) with an arm extended straight out and point the instrument straight down at the Ground.
10. Hold the IRT (wrapped in a Thermal Glove when necessary) as still as possible. Press and release the recording button. [The recording button MUST be released for the instrument to register and hold the spot's surface temperature.]
11. Read and record the surface temperature from the digital display screen located on the top of the IRT. (Note: Surface Temperature is recorded in Celsius to the nearest tenth degree, ie. 25.8)
12. Measure and record the snow depth in millimeters at the Observation Spot.
13. Repeat steps 7-12 at each of the remaining eight Observation Spots.
14. Record any other information that explains the environmental conditions of the day or site in the Comments field.

Map 1: This map shows the site where the data was collected.

Data Summary

Date	SFX Elevation (151 m) Surface Temperature (C) on Grass	High Elevation (1213 m) Surface Temperature (C) on Grass
2018-10-18	10.5	37
2018-10-19	12.5	31
10/22/18	9.4	29
10/23/18	-4.6	48
10/24/18	8.4	41
10/26/18	5.4	38
10/29/18	9.2	38
10/30/18	11.3	37
11/01/18	22.5	36

Table 1: This table shows surface temperature at high and low elevations.

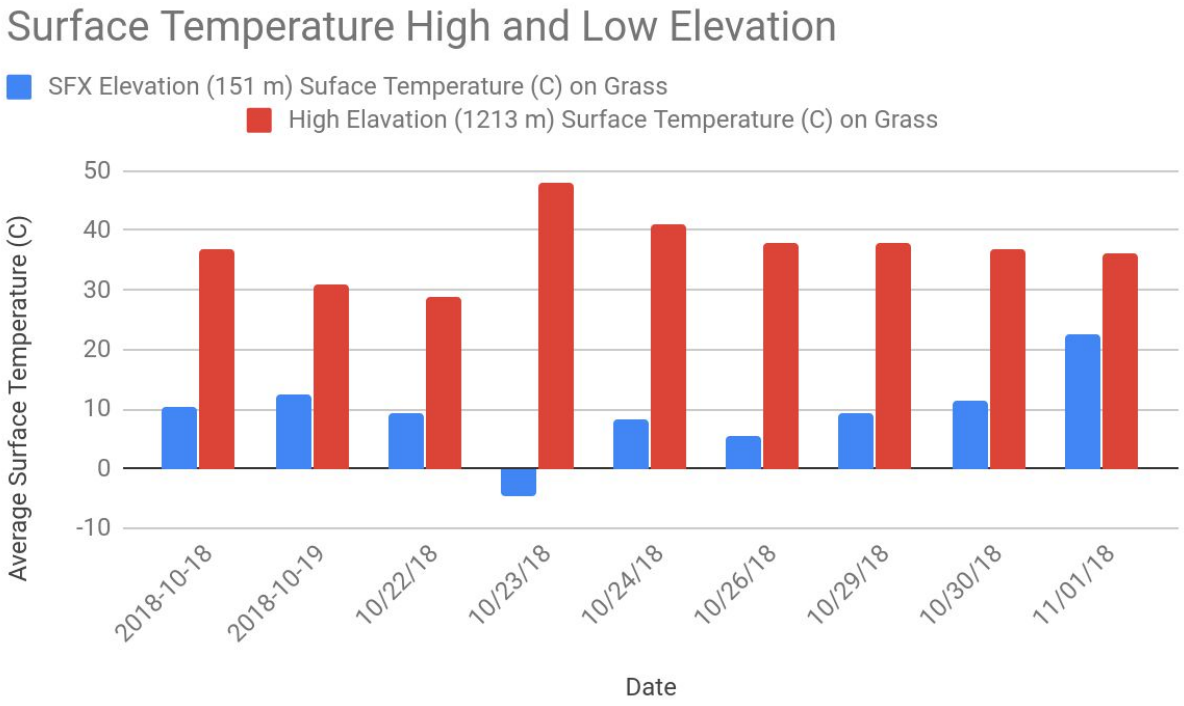

Chart 1: This chart shows the date of when we took this data, it also shows the height of the elevation and it is measured in meters, lastly this chart shows the temperature of the land in the low and the high elevations.

Analysis and Results

Possible sources of error are taking temperature in F instead of C, taking temperature of something other than the surface like a shoe or the thermal glove, incorrectly entering the data and making a mistake in averaging the trials. The group tried to check each other to keep these errors from happening.

Discussion

The data shows the average surface temperatures at high and low elevations. In addition, it also shows the dates of when we collected our data, and the data is transferred to Celsius. The

surface temperatures shows the temperature on the grass when it is hit by the sun. The red is the high elevation average surface temperature, and the blue is the sfxcs low elevation average. The data shows the higher elevations did have warmer temperatures, which supports the hypothesis which states the difference between surface temperature at high and low elevation is that at higher elevations it is warmer. On the flip side, it is colder at the lower elevations. I think this because the sun is closer to the higher elevations.

Conclusion

If this experiment could be repeated, more data would be collected and more research would be done. Surface temperature is important because we need to know the temperature of the ground to plant, water testing is important to make sure our water is clean.In the future, other protocols like pH of the soil and trees would be studied.

Acknowledgements

We would like to thank Mr. Toth for providing the weather station and IR thermometers. We would like to thank GLOBE for all the resources.

Badges

Collaborator

Our class collected surface temperature together and shared it with other classes. We then broke into smaller groups with similar interests to complete the report and find more data.

References

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