

EVALUATING SNOW ACCUMULATION THROUGH THE APPLICATION OF IBUTTON TEMPERATURE SENSORS

NOAH LISIN, ZARA ZONG, FELICITY WANG, KAIDEN PAK

PROJECT SUMMARY

Through this project, I hoped to gauge the snow depth at a static altitude during 2022. By utilizing data collected from iButton temperature sensor arrays where each sensor is at a different height, snow accumulation can be roughly evaluated since the sensors do not experience temperature oscillations when covered by a layer of snow. This data can be extremely valuable, as it can illustrate the devastating effects of climate change on snow precipitation which is vital for the surrounding ecosystem and human population. In the 2022 year, a maximum depth of 2.3 meters was recorded and snow coverage lasted from approximately January to mid-June.

METHODS

To parse the provided data, I created a Python program that compiled temperature data from various CSV files and plotted it, shown to the right (Fig. 1).

As illustrated in the plots, there are large stretches of days when the temperature was 0 C. This represents the sensors being covered; thus, the snow coverage reaching the height at which the sensor was placed. I created an algorithm to extract these days and plotted it alongside the other sensors (Fig. 2, Fig. 3). This algorithm searched for temperature data within a threshold of ± 1 C and a daily standard deviation of less than 0.45, a number discovered thanks to work by Tavni G. '21, during the 2021-2022 program.

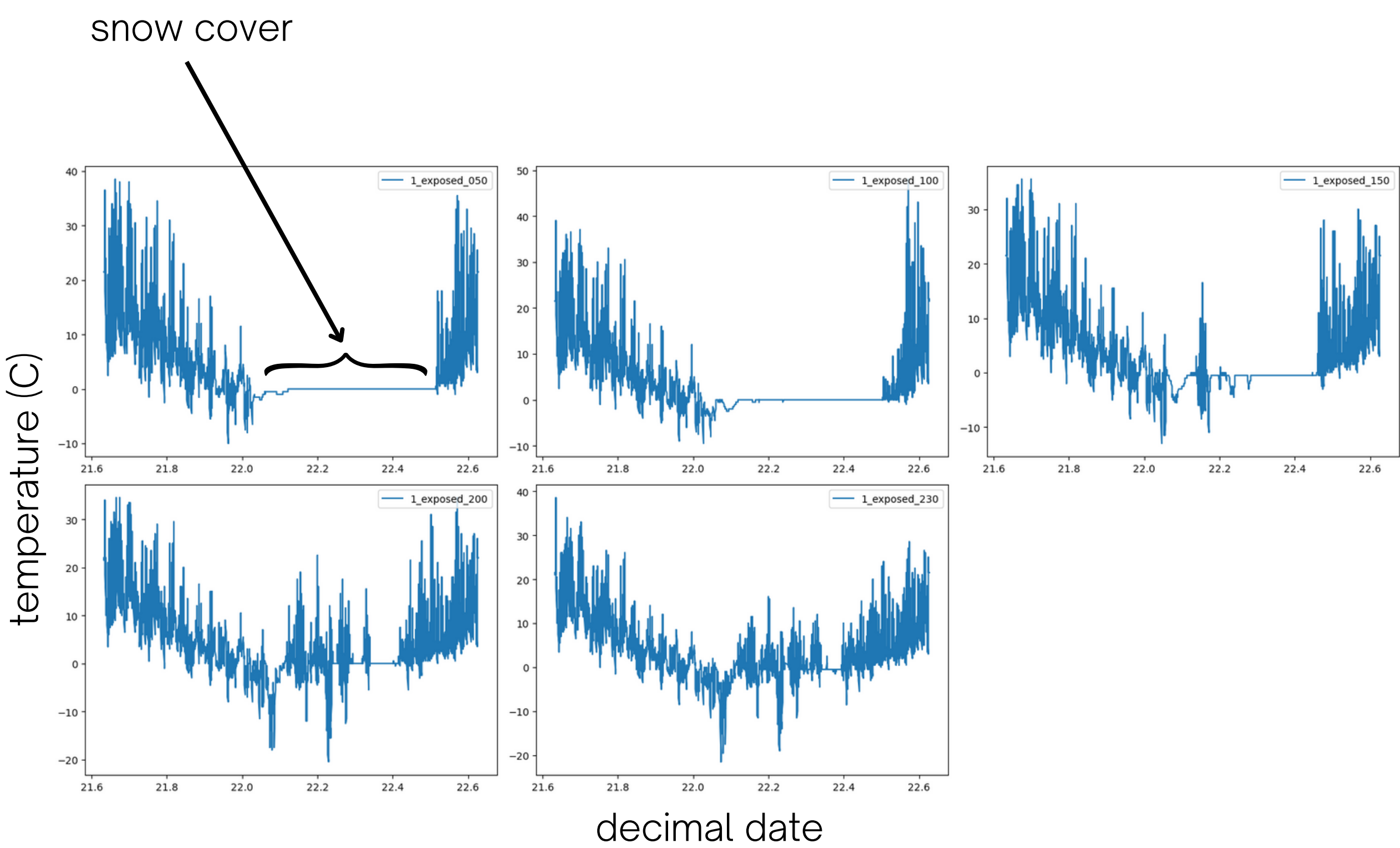


Fig. 1: Plots of iButton temperature data, separated by sensor height, which is noted in the legend to the top right of each graph (in centimeters).

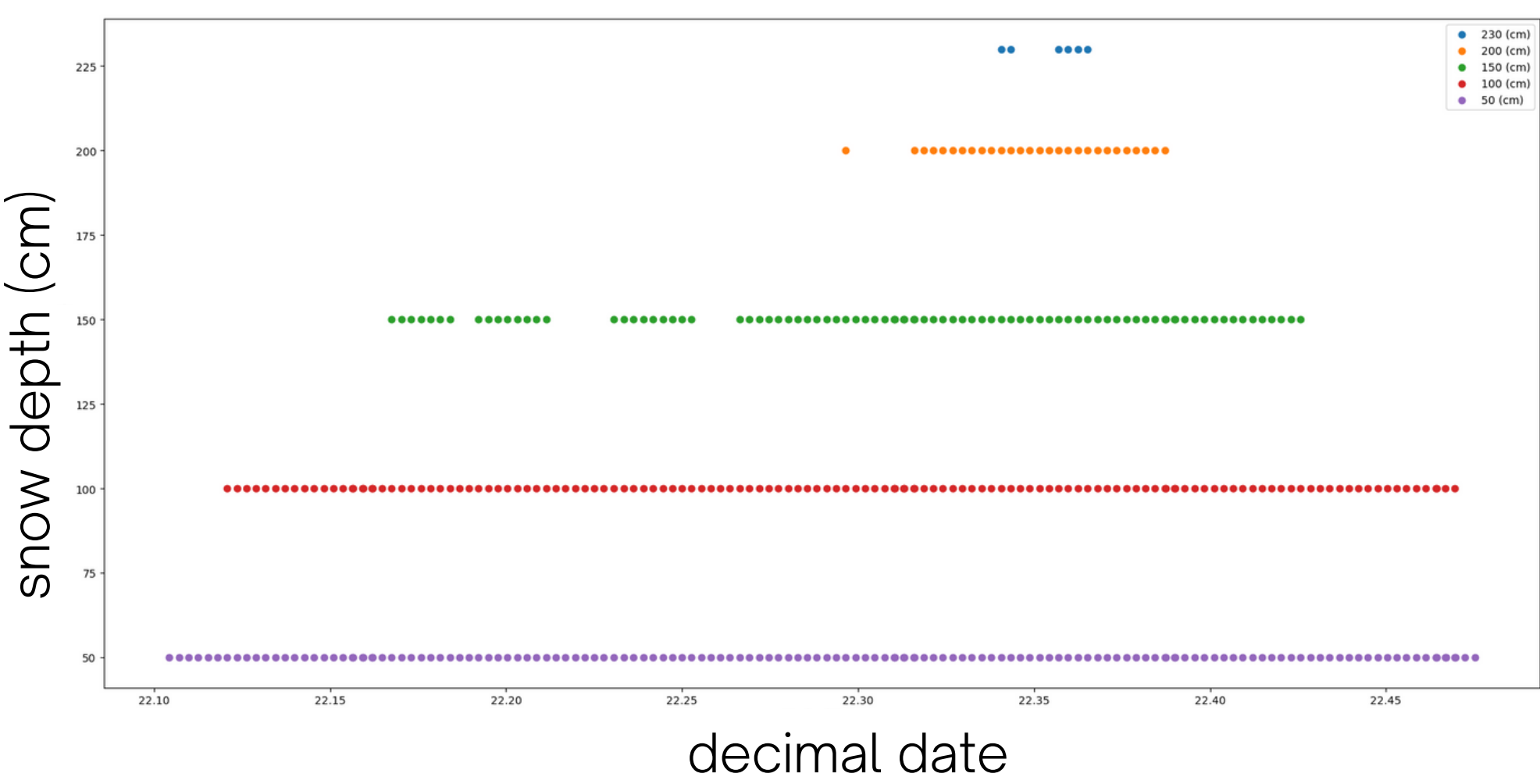
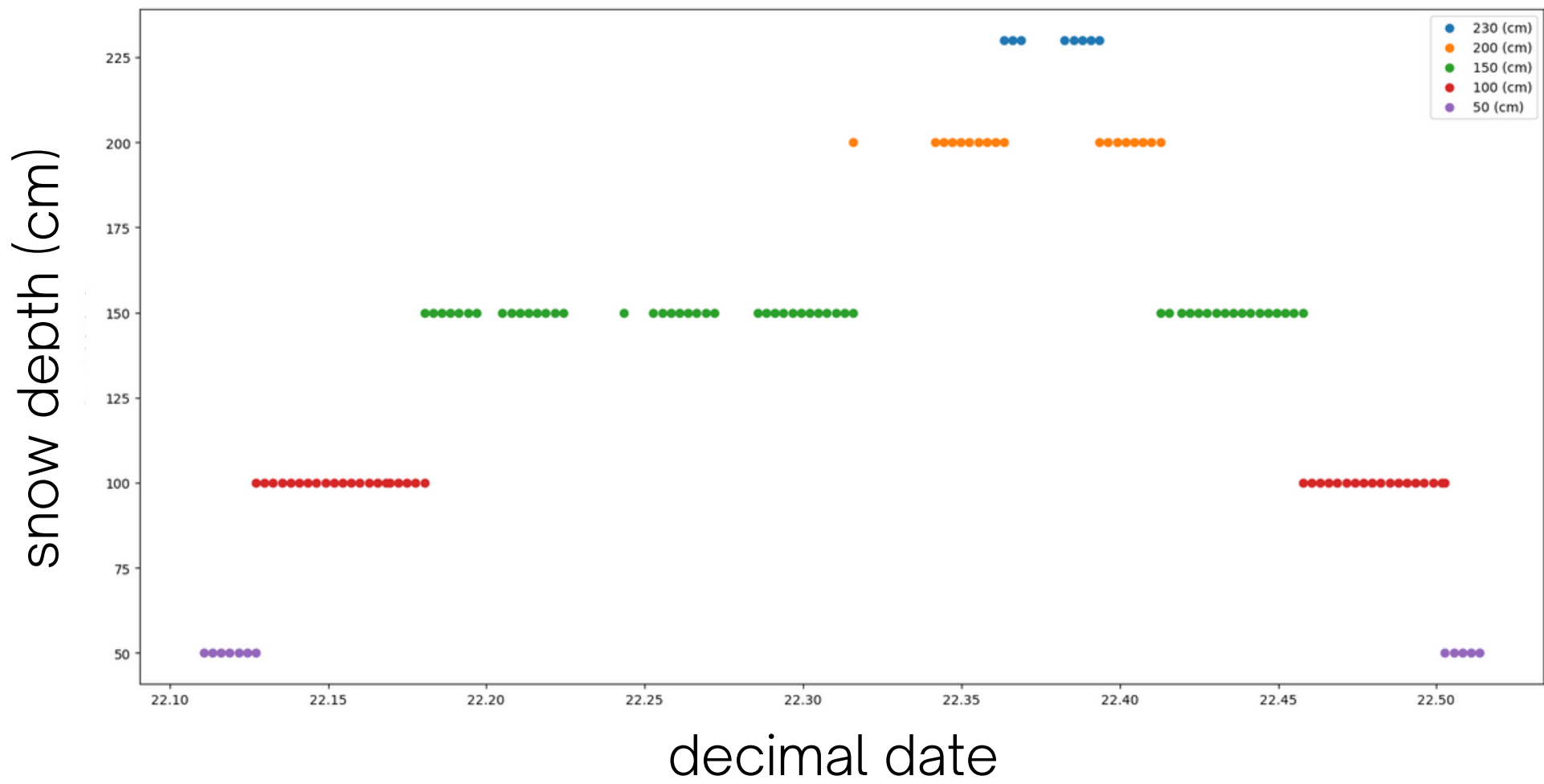


Fig. 2: Snow depth in centimeters over 2022.

Fig. 3: Snow depth in centimeters with data points dynamically omitted when a sensor at a higher altitude is covered.



CONCLUSION AND SIGNIFICANCE

Due to the significance of snow precipitation on Mt. Baker, creating these diagrams is of high importance to ensure the delicate balance of snowfall and snowmelt is maintained over the years. Unfortunately, this balance is at risk on account of the devastating effects of climate change. Having charts of snow extent can be used to track these changes, and help environmental scientists make determinations on the health of Mt. Baker. I hope to continue to track the snowmelt through the 2023 year, and compare the two to see how the climate on this indispensable mountain evolves.

ACKNOWLEDGEMENTS

Special thanks to...

- Dr. Michael Town
- Dr. Susan Howard

