A Snowy Story

Examining Snow Cover Duration on Mt. Baker from 2018 to 2020

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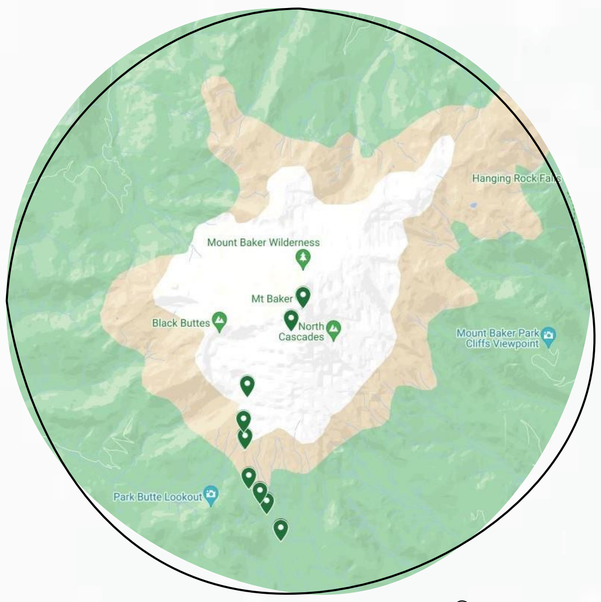
background

Mt. Baker…

- Is located in the North Cascades in Washington State.
- Is one of the snowiest mountains
- Has an elevation of over 3,200 m
- Have been impacted by global warming at an accelerated rate, which include
  - Retreating glaciers, which are highly sensitive to warming temperatures
  - Disrupted ecosystem, including both plants and animal species
  - Less water resources, especially when there is reduced snowfall



Map of Mt. Baker & LSRI sensor locations

motivation

My motivation for studying Mt. Baker's snow cover is driven by its vulnerability to climate change – the mountain's glaciers and snow play a crucial role supplying energy and water to nearby regions and the communities within them, so any effects caused by warming temperatures would be have dire, widespread consequences.

Through my research, I hope to contribute to the effort put into preserving this precious ecosystem. As a Washington State resident, Mt. Baker means a lot to me.

method

1. Site and Data Collection

The data was collected from the south side of Mt. Baker using temperature sensors known as iButtons. They are either buried in the ground or attached to trees (with and without shade). The data spans 5 years, from July 2018 to July 2023.

2. Snow Cover Analysis

The snow cover duration data were obtained from iButtons buried in near-surface soil at various elevations. These iButtons detect diurnal temperature undulations in the soil – except when there is snow cover, which serves as both an insulator and a reflector (of solar radiation)[1]. Therefore, snow-covered days can be identified by minimal temperature variance and temperatures around 0 °C

3. Data Visualization

To gain insights into any patterns and trends, I created two dot/scatter plots that represent snow cover duration visually (see below).

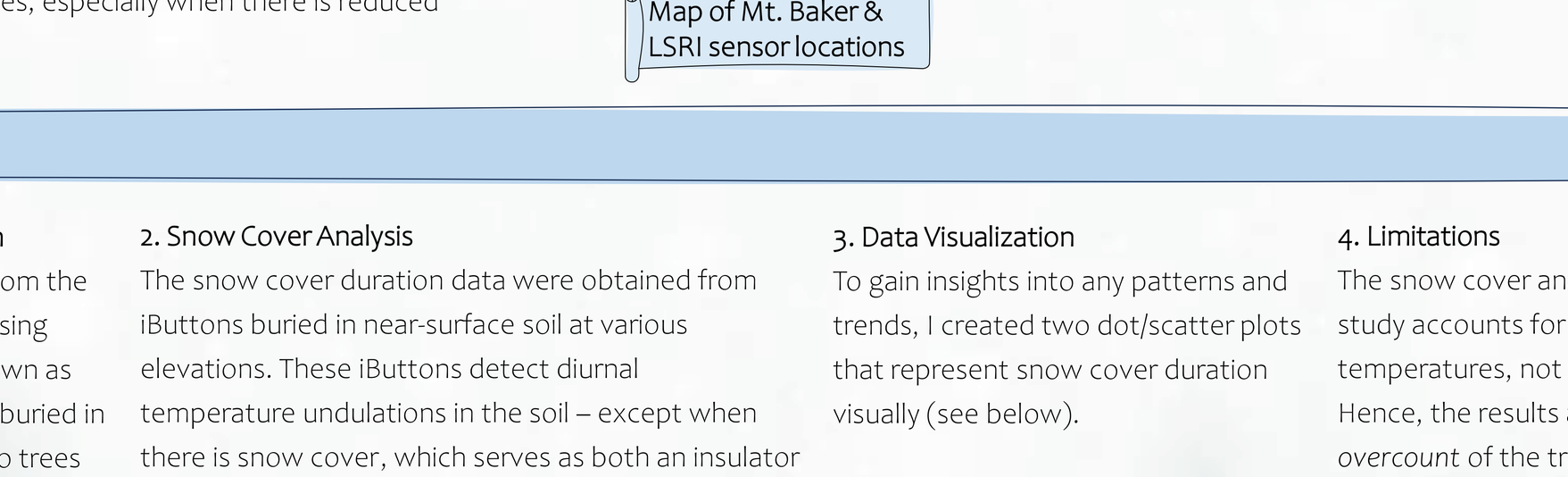
Both graphs were created using Matplotlib, a python library for data visualization.

4. Limitations

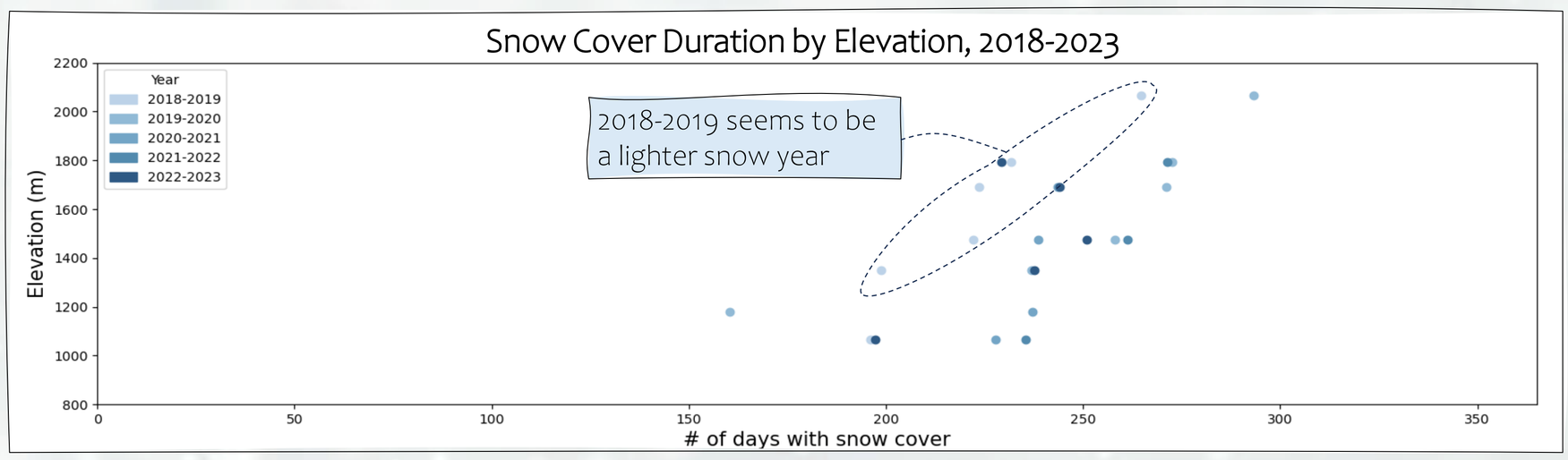
The snow cover analysis used in this study accounts for only near-zero temperatures, not temperature variance. Hence, the results are likely to be a slight *overcount* of the true number of snow-covered days, as it would include days without snow cover but with diurnal temperatures near zero.

results

Snow cover duration is longer at higher elevations, which is expected



These spaces are from missing data, not lack of snow cover



2018-2019 seems to be a lighter snow year

future work

As mentioned in the **Limitations** section above, my current snow cover analysis only accounts for near-zero temperatures and not temperature variance. In my future work, I would like to include variance in my calculations to more accurately identify the days with snow cover.

Additionally, I would like to investigate the snow cover start and end dates from 2018 to 2023, any anomalies in which could provide further insights into climate change patterns on Mt. Baker.

acknowledgements

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[1] Lundquist, J. D., and F. Lott (2008), Using inexpensive temperature sensors to monitor the duration and heterogeneity of snow-covered areas, *Water Resour.*