Improving the Safety of Operation Zones with ICESat-2

Srivishnu S[redacted][1,3], Taryn Black[1,4], Varun C[redacted][1], Ada C[redacted][1], Alex L[redacted][1], Michael S. Town[2]

1 –ESR Summer Institute, 2 - Earth and Space Research, 3- Skyline High School, 4– University of Maryland,

Introduction

- How can we identify the most dynamic ice areas near Troll Station to improve the safety of operation zones?
- More ice change could lead to dangerous ice features like crevasses

Area of Study and Data

- Change in Height Data from ATL15
- Height and elevation data from ATL 11

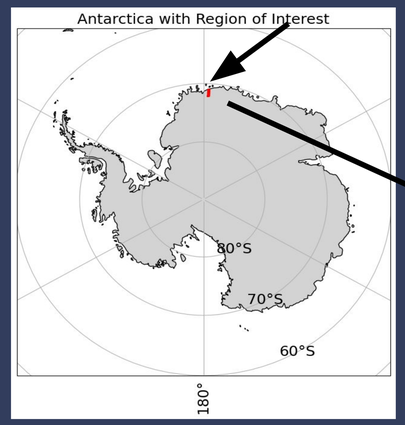

Figure 1. Map of Antarctica with the focused area

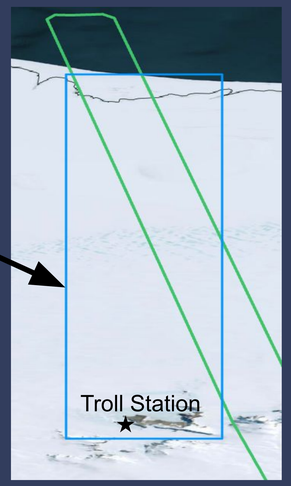

Figure 2. ICESat-2 track (green) over study area (blue)

Results

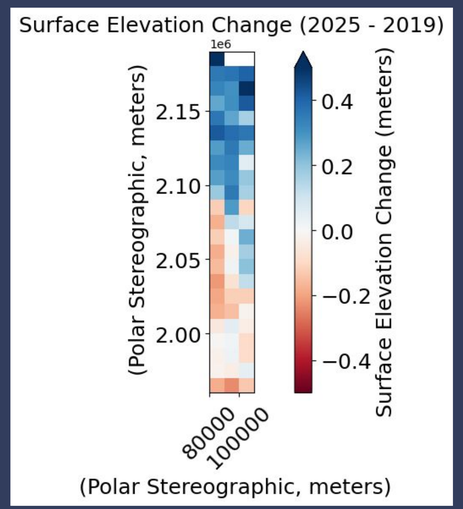

Figure 3. Elevation Change over study area[2]

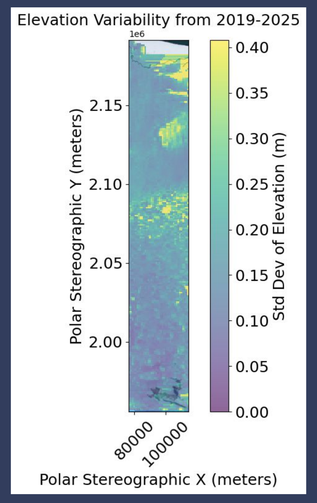

Figure 4. Elevation Variability[2]

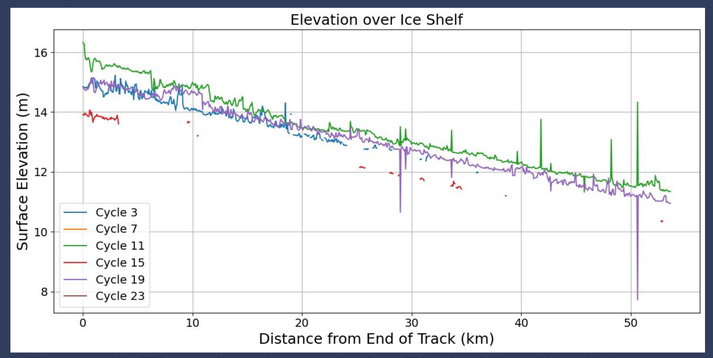

Figure 4. Elevation through the Fimbul Ice Shelf from cycle 3 (3/19) to cycle 23 (3/23)[1]

Results/Discussion

- Higher variability zones occur when there is thickening (figure 3 and 4)
- Thinning corresponds to low variability (figure 3 and 4)
  - could make ablation areas safer to travel
- Data show tidal influence over the ice shelf (figure 5)
  - removing tide correction could reveal features in Ice Shelf

Conclusion and Future Work

- Lots of change within the Ice Shelf
- Dangerous ice features like crevasses could be possible in the high variability areas
- Finding data that covers the ice shelf-> will help map out variability stronger there
- Creation of a model that can identify the best route to get to Troll Station

References

[1]Smith, B., Dickinson, S., Jelley, B. P., Neumann, T. A., Hancock, D., Lee, J. & Harbeck, K. (2023). ATLAS/ICESat-2 L3B Slope-Corrected Land Ice Height Time Series. (ATL11, Version 6). [Data Set]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/ATLAS/ATL11.006. [Troll Station]. Date Accessed 07-14-2025.

[2]Smith, B., Sutterley, T., Dickinson, S., Jelley, B. P., Felikson, D., Neumann, T. A., Fricker, H. A., Gardner, A. S., Padman, L., Markus, T., Kurtz, N., Bhardwaj, S., Hancock, D. & Lee, J. (2024). ATLAS/ICESat-2 L3B Gridded Antarctic and Arctic Land Ice Height Change. (ATL15, Version 4). [Data Set]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/ATLAS/ATL15.004. [Troll Station]. Date Accessed 07-14-2025.

Acknowledgments

Thanks to ESR for the running the summer institute
Thanks to Ben Smith and Tyler Sutterly for ideas on the Ice Shelf
The focus of the ESR summer institute was based on TB's research at the University of Maryland, which is supported by a NASA STV grant