

# Firn Model vs ICESat-2 Height Data Comparison

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## Introduction

This study compares height change data from the the NASA Goddard Space Flight Center Firn Densification Model (GSFC-FDM) and ICESat-2 datasets, with the goal of understanding how these two sources agree or differ in capturing surface height changes over time.

## Methodology

- Data is sourced from the GSFC-FDM and ATL15 height estimates (2019-2024)
- Variability (standard deviation of quarterly height change) was used as the main metric to compare ATL15 and GSFC-FDM data.
- Specific focus was on Troll Station, a region with complex terrain

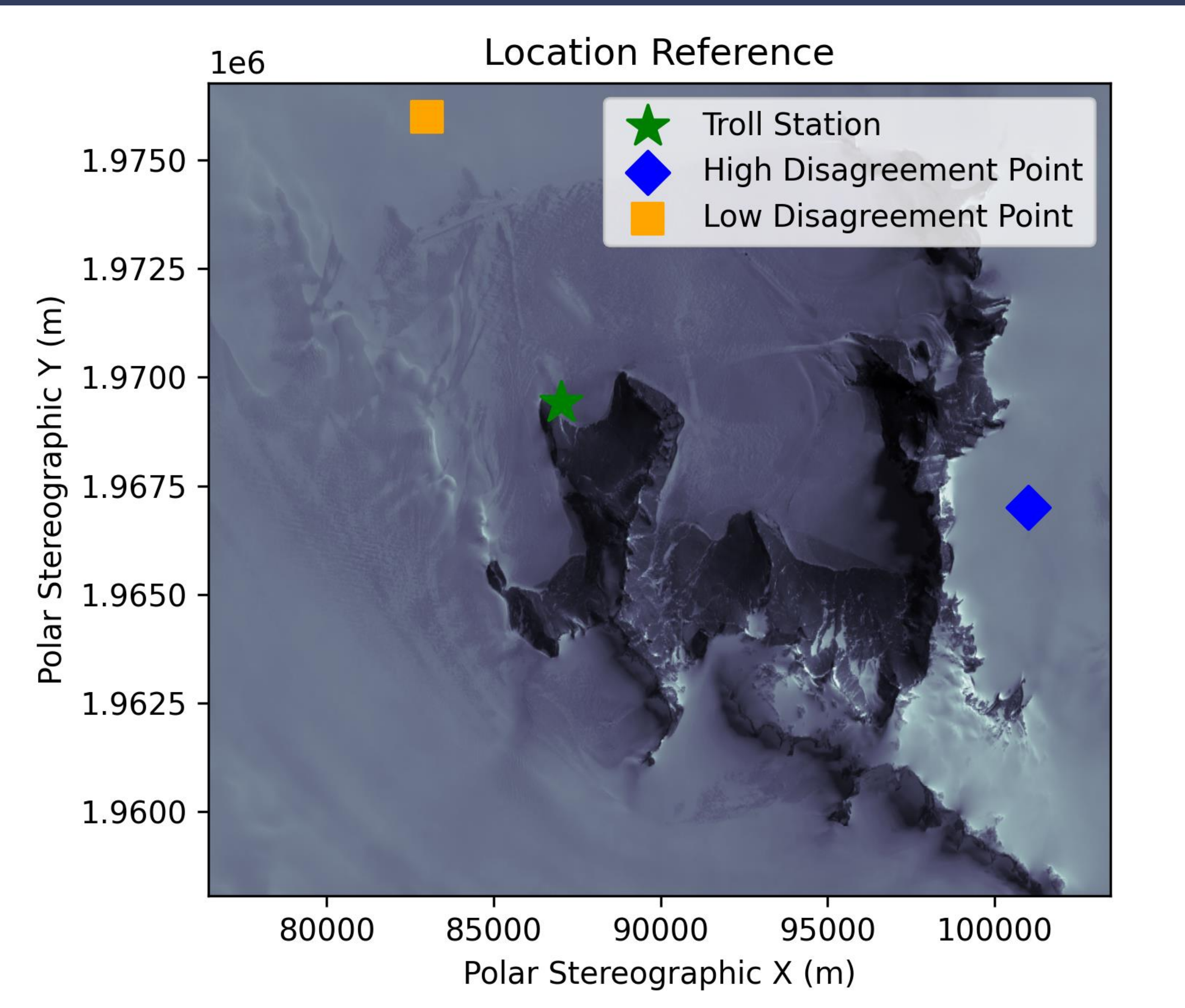
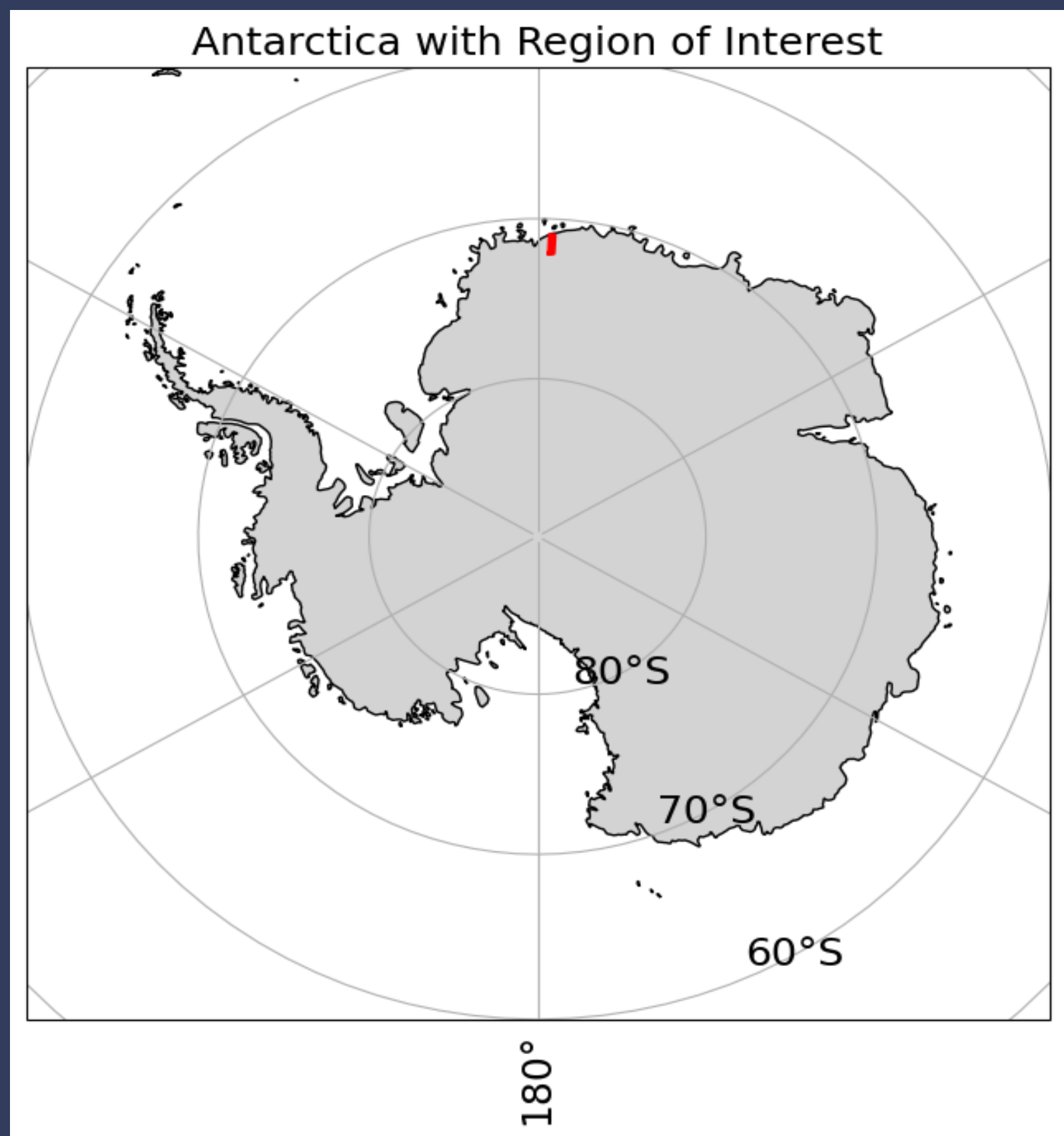


Figure 1. Location of points taken from troll station for analysis

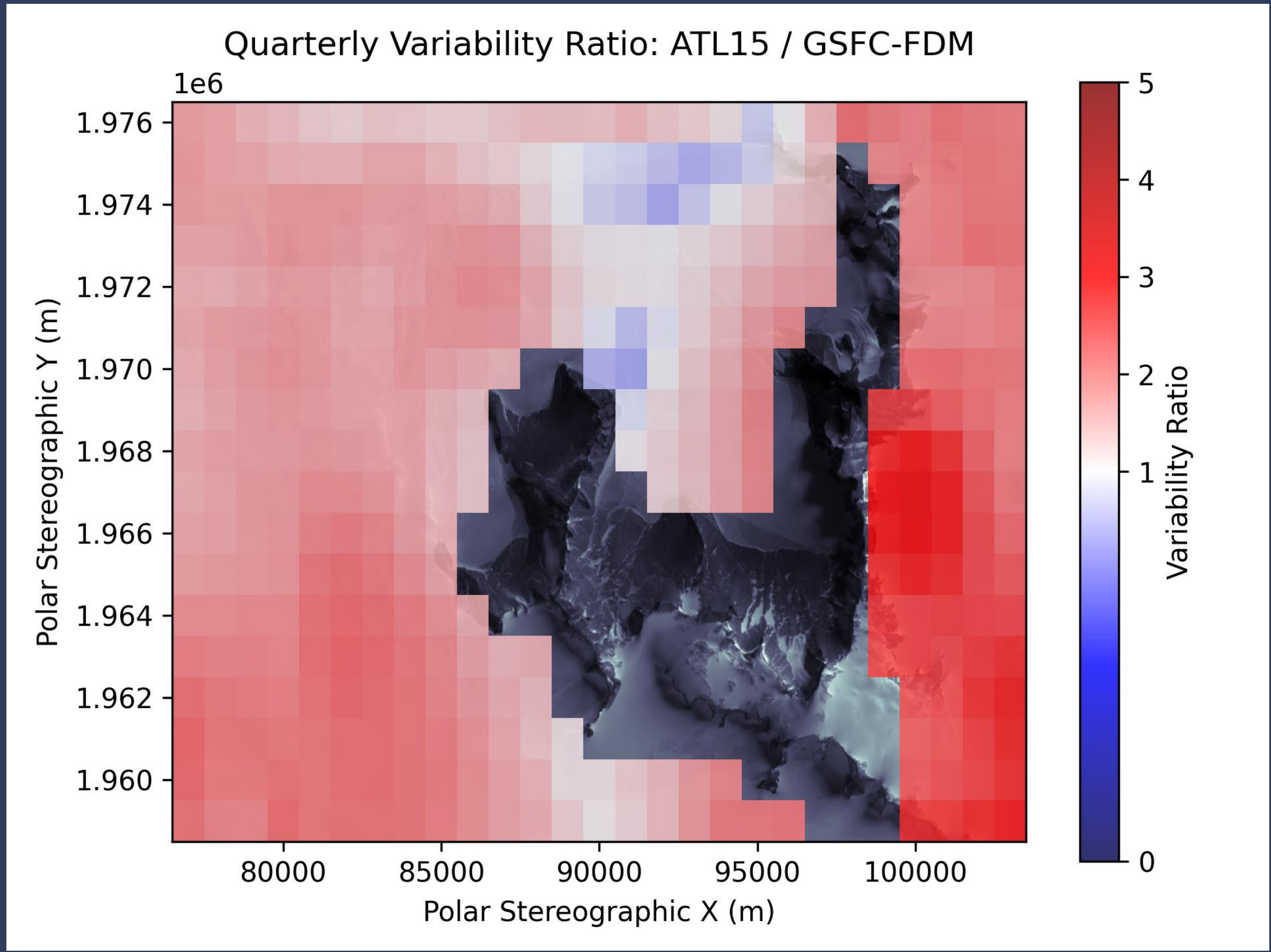


Figure 2. Comparison of the height change variability

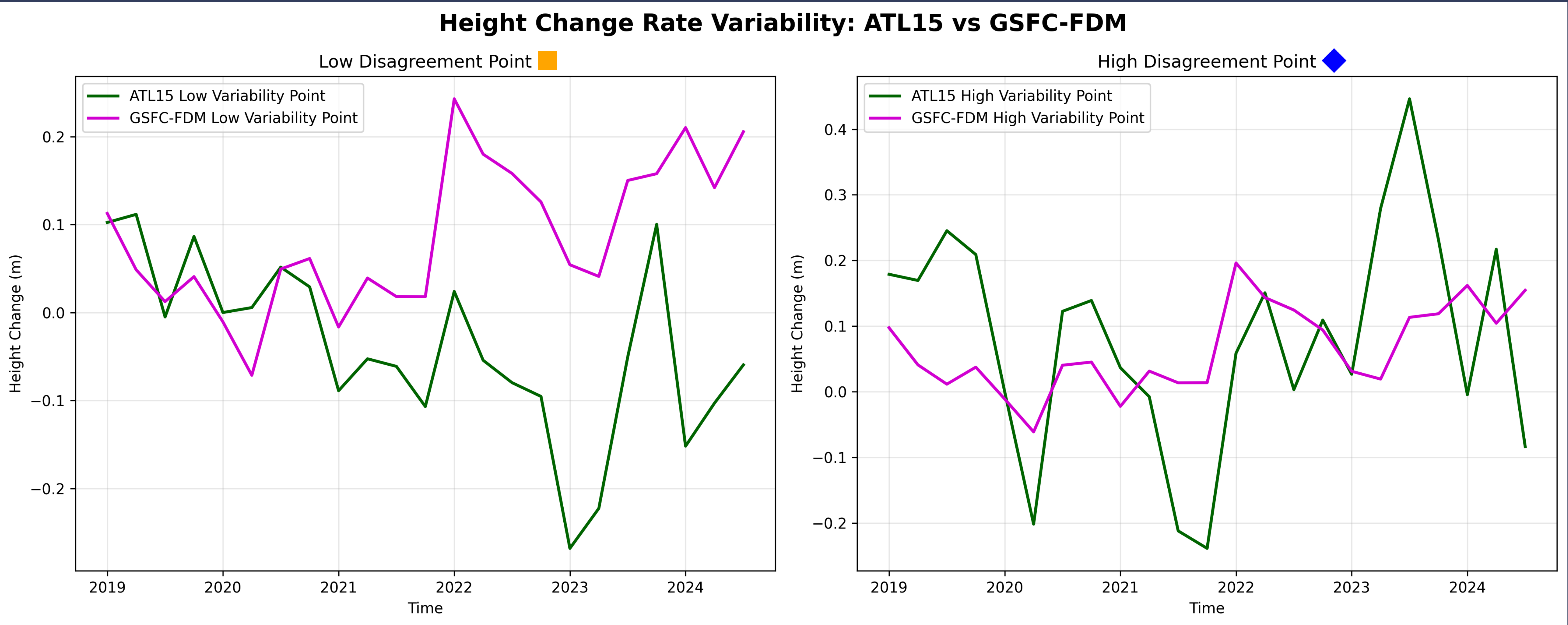


Figure 3. Quarterly surface height change from ATL15 and GSFC-FDM at Troll Station. Two points taken for reference showing where ATL15 and GSFC-FDM have similar and contrasting height change rate variabilities

## Results

- The GSFC-FDM spacial resolution is too coarse to resolve topography, which underestimates the variability of more complex terrain (Figure 2)
- Even when the heights diverge, the measurements can still have similar variability, showing that standard deviation cannot be the only metric used for comparison (Figure 3)

## Questions

- What causes higher ATL15 variability in complex terrain?
- How do seasonal patterns affect the variability differences between ATL15 and GSFC-FDM?

## Future Work

- Expand the study to other regions with complex terrain to see if the variability patterns are consistent.
- Further analyze the data to find areas of improvement for the GSFC-FDM model

## Acknowledgements

- ESR for resources and running the summer institute;
- Ben Smith and Tyler Sutterley for discussing ICESat-2 and glaciology
- Susan Howard for discussing ICESat-2 details
- The focus of the ESR Summer Institute was based on Tayrn Black's research at the University of Maryland, which is supported by a NASA STV grant.

## References

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