

Relationship Between Velocity Changes and Height Changes in Area around Troll Station

Varun C [REDACTED]^{1,2}, Taryn E Black^{1,3}, Ada C [REDACTED]¹, Alex L [REDACTED]¹, Srivishnu S [REDACTED]¹, Michael S. Town⁴

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

Introduction:

- Goal: To better understand how velocity changes affect height changes
- Expected acceleration to drive dynamic thinning and vice versa

Methodology & Data:

- Gridded Velocity: MEaSUREs¹
- Time Series: ITS_LIVE²
- Height Data: ICESat-2³
- Calculated rate of change of height and velocity
- Data only overlaps one year (2019-2020)

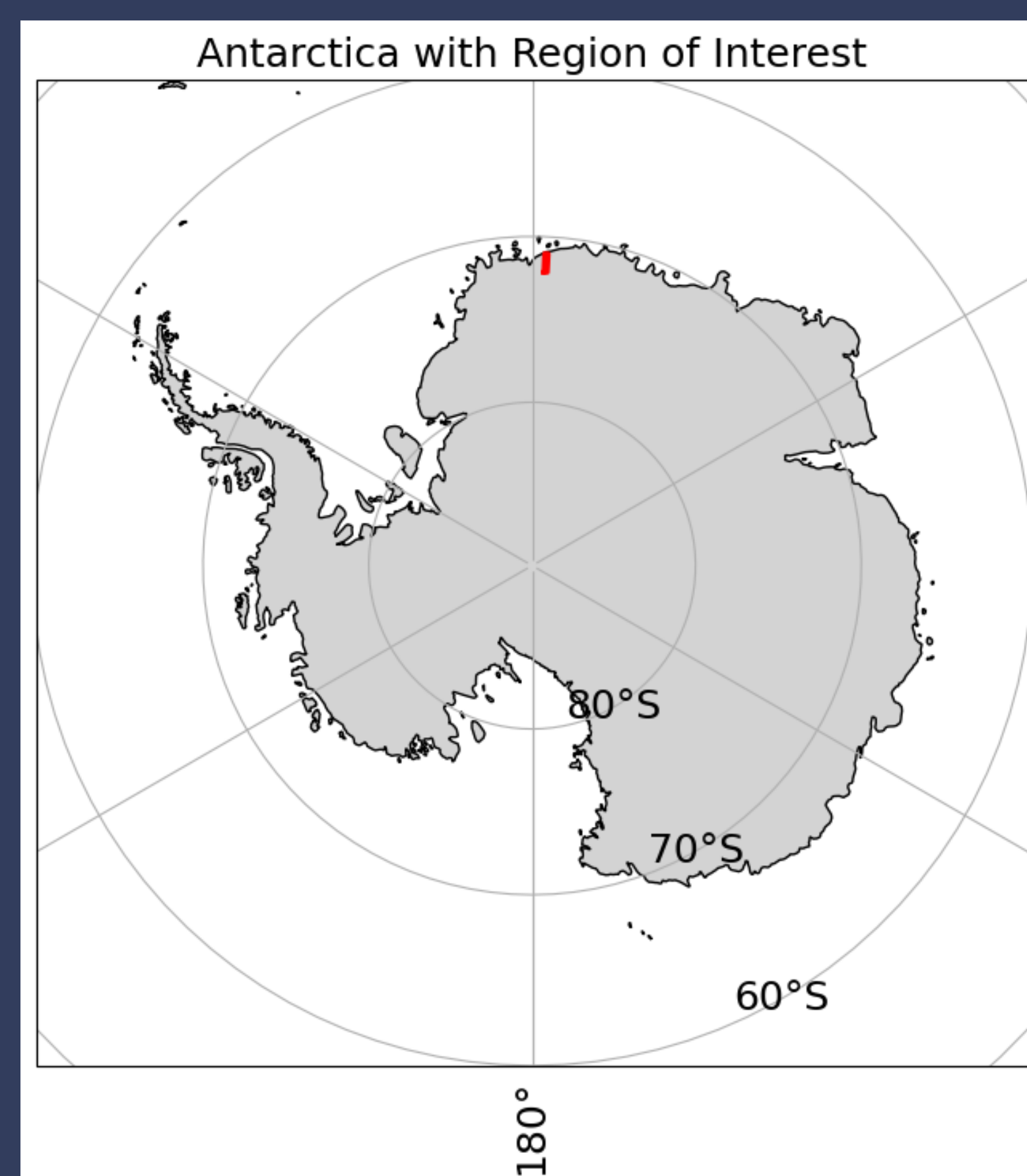


Fig 6. Troll Location

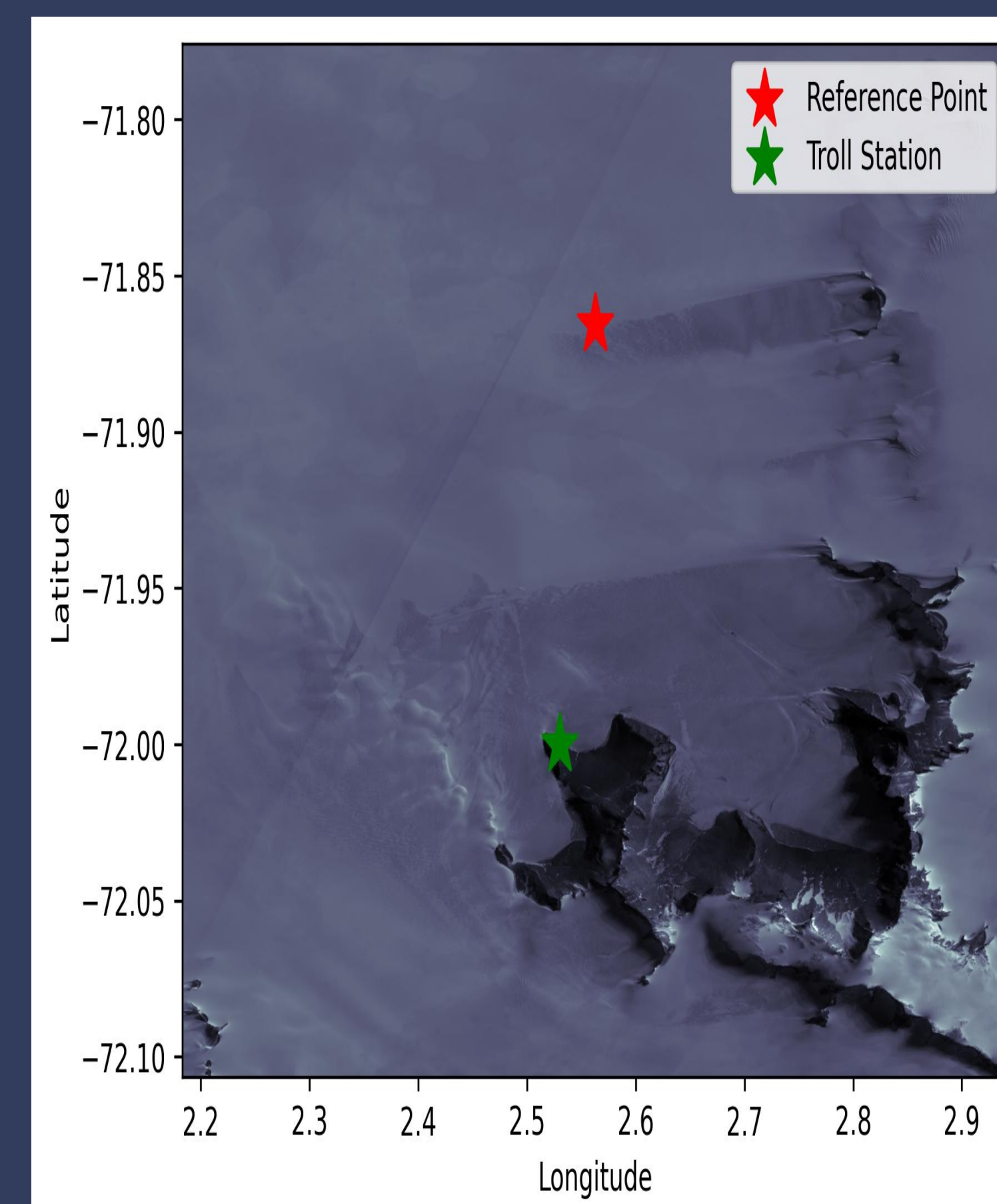


Fig 1. Troll Focus Area

Results:

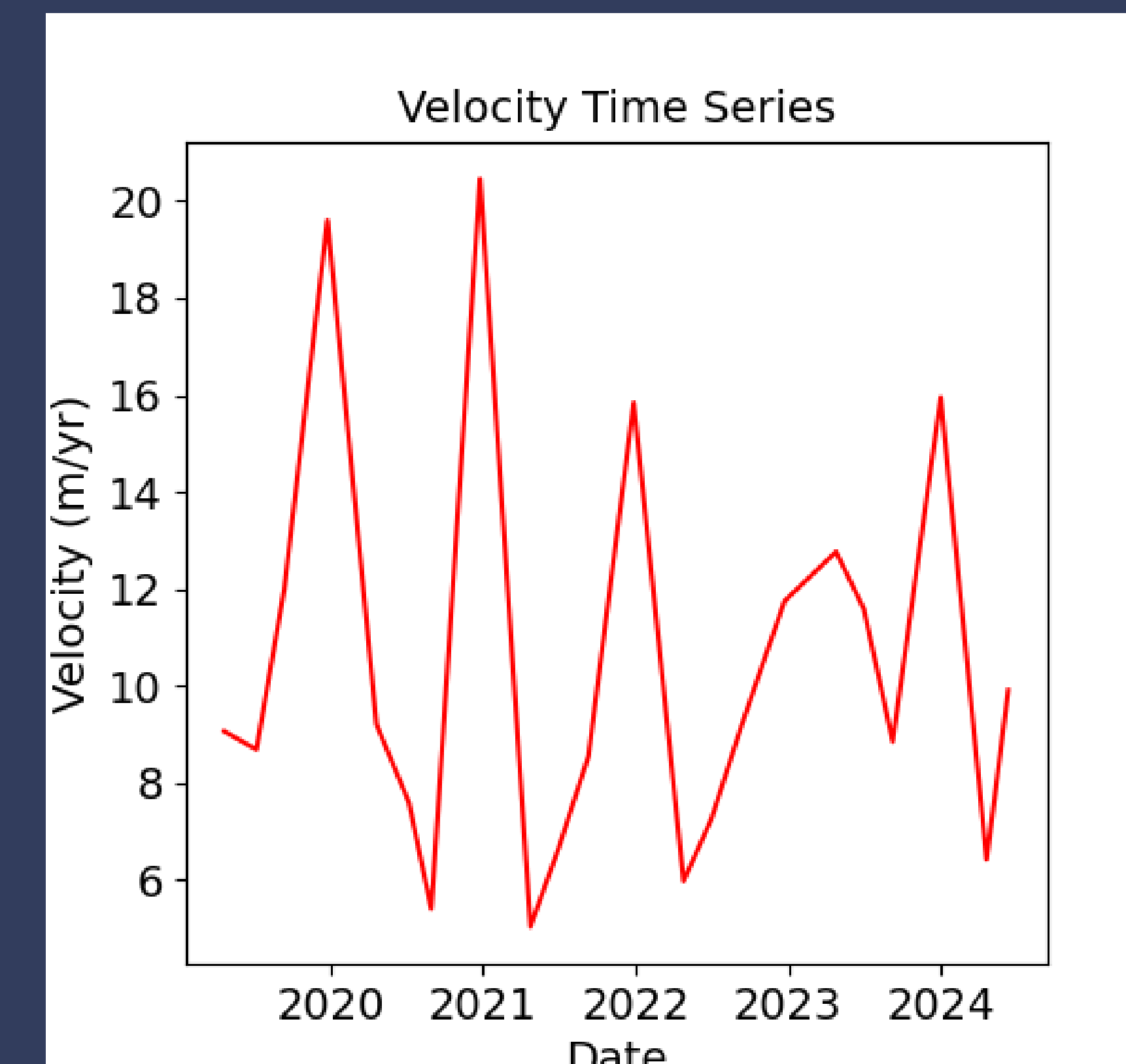


Fig 2. Reference Point Time Series

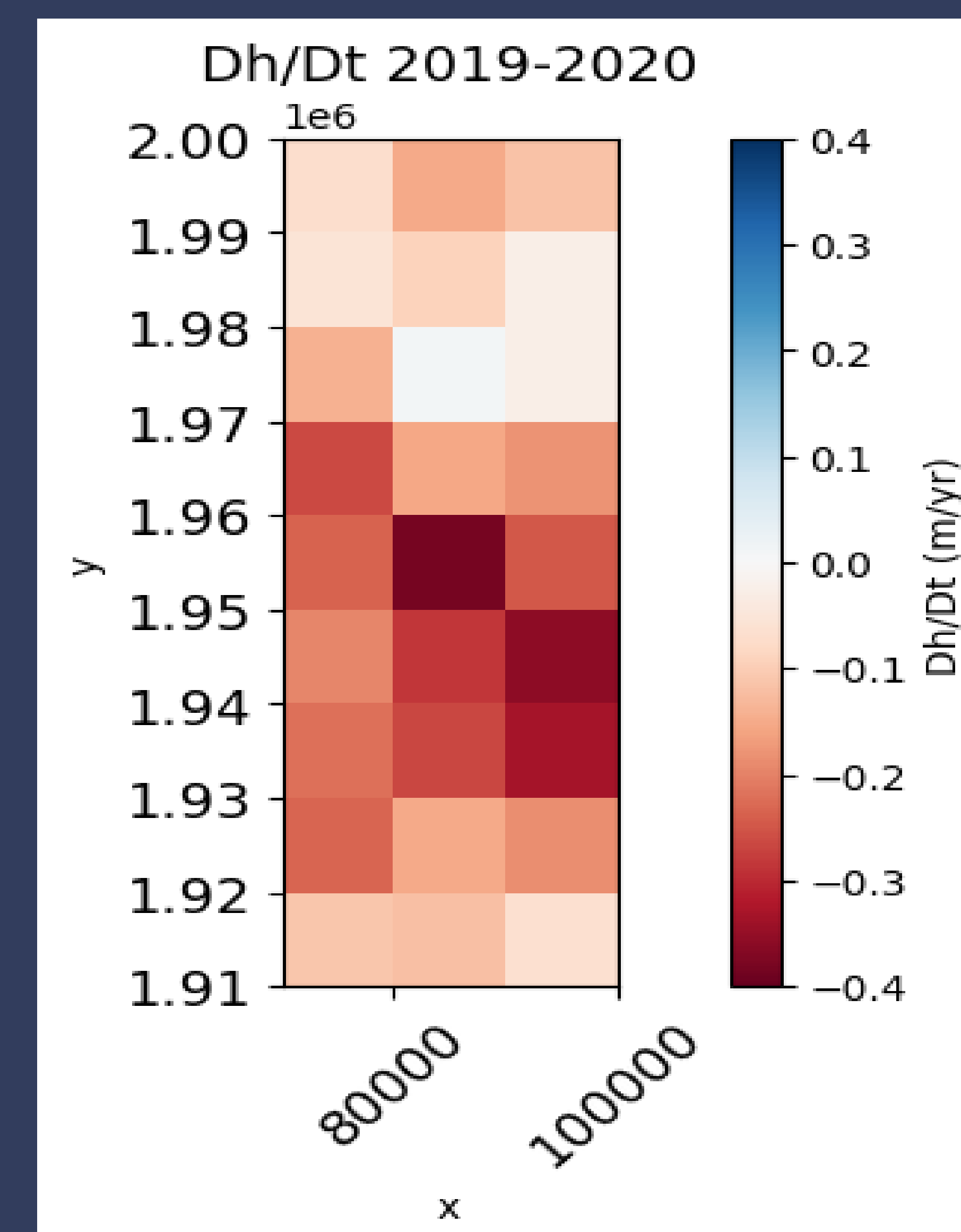


Fig 3. Rate of Height Change

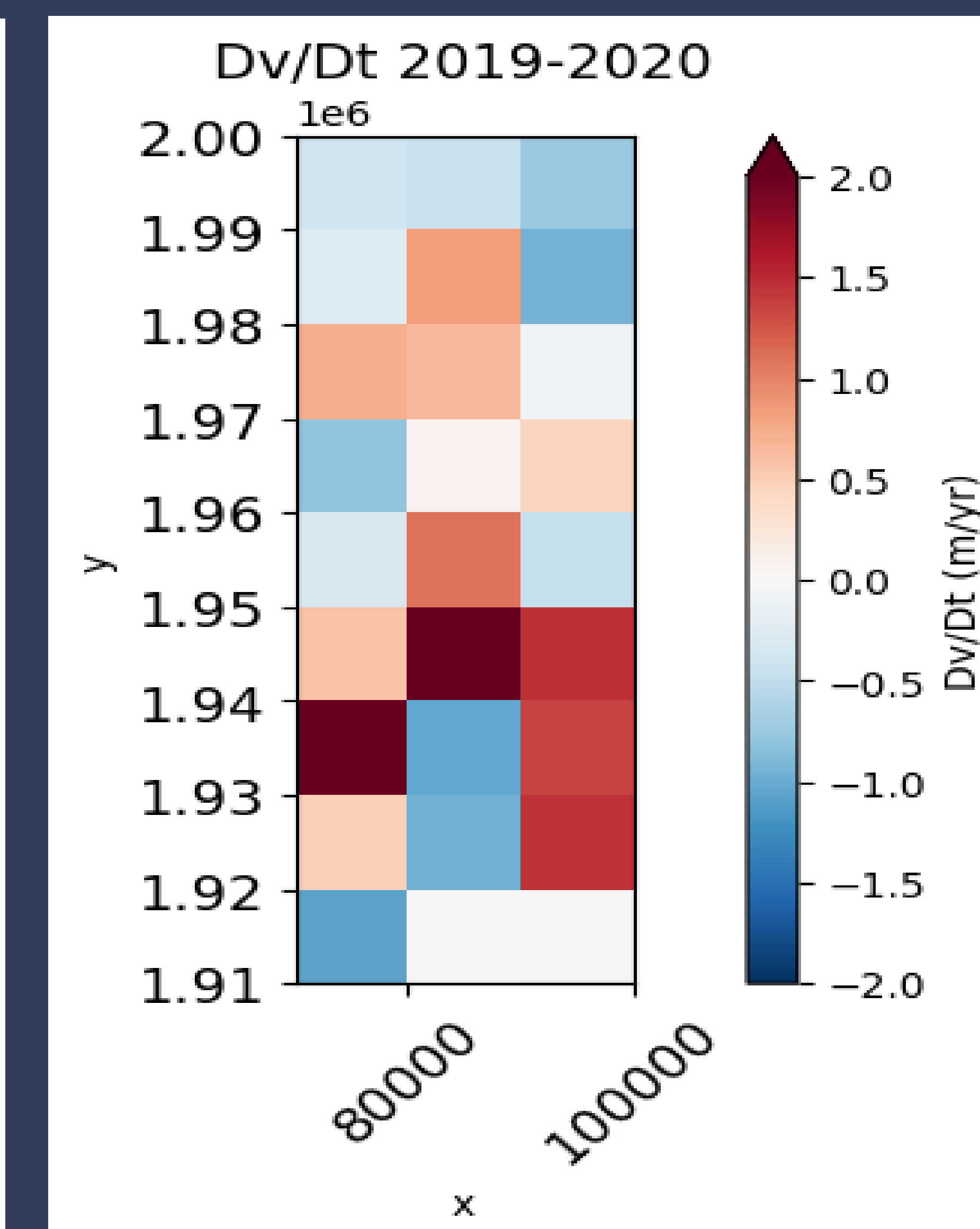


Fig 4. Rate of Velocity Change

- Highest velocity occurs in Antarctic summers (Fig 2)
- Dh/Dt is small but generally decreasing (Fig 3)
- Dv/Dt varies wildly, no trend (Fig 4)

Culmination:

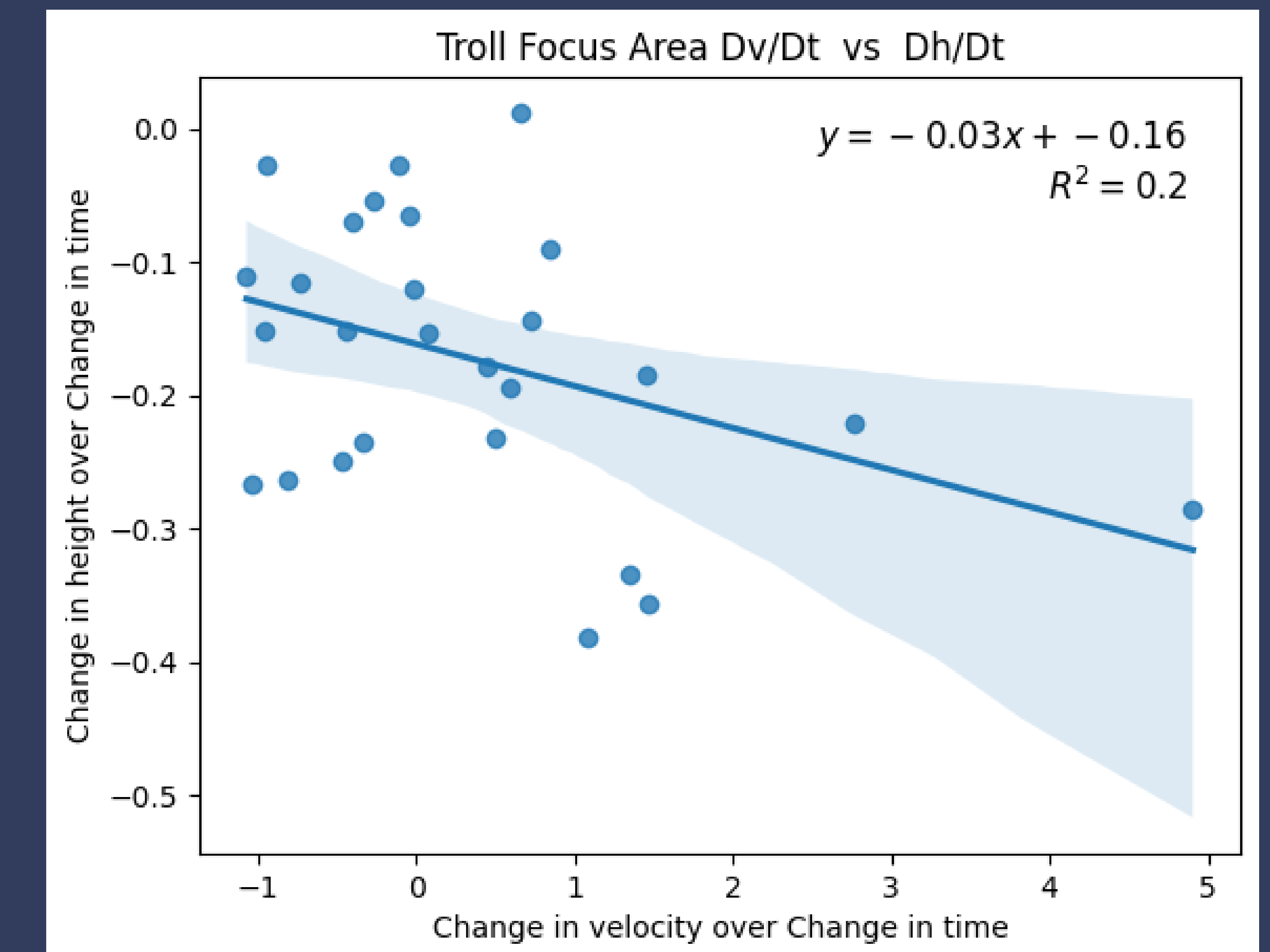


Fig 5. Rate of Velocity Change vs Rate of Height Change

Conclusion and Future Work:

- Can't generalize because of the lack of velocity data
- We observe a weak correlation between acceleration and thinning
- Significance: Can use velocity to cross check/estimate height

References:

¹Mouginot, J., Scheuchl, B. & Rignot, E. (2017). MEaSUREs Annual Antarctic Ice Velocity Maps. (NSIDC-0720, Version 1). [Data Set]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/9T4EPQXTJYW9>. Date Accessed 07-11-2025.

²Velocity data generated using auto-RIFT (Gardner et al., 2018) and provided by the NASA MEaSUREs ITS_LIVE project (Gardner et al., 2025).

³Smith, B., Jelly, B. P., Dickinson, S., Sutterley, T., Neumann, T. A. & Harbeck, K. (2021). ATLAS/ICESat-2 L3B Gridded Antarctic and Arctic Land Ice Height Change. (ATL15, Version 1). Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/ATLAS/ATL15.001>. Date Accessed 07-11-2025.

Acknowledgements:

- Thanks to ESR for providing the necessary resources
- Thanks to Ben Smith for the idea of filtering ITS_LIVE Dt values

