

Eight Decades of Glacier Change, Canadian Rocky Mountains

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Photo-topographic Survey

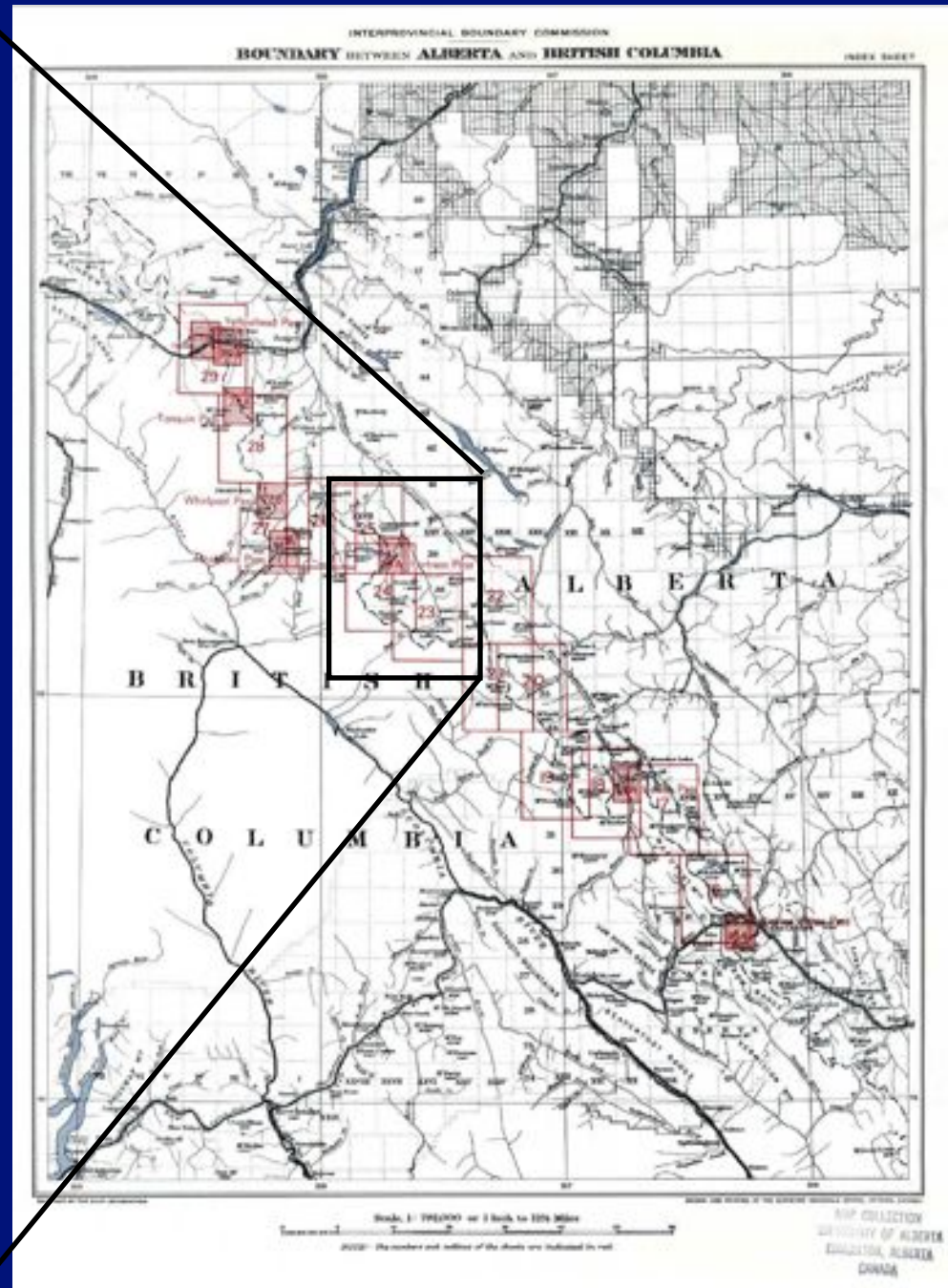
- Two photos, different angles
- Points => Plan => Elevation => Contours

- Accuracy
 - Triangulation
 - Stations
 - Points
 - Scale



Columbia Glacier, 1920

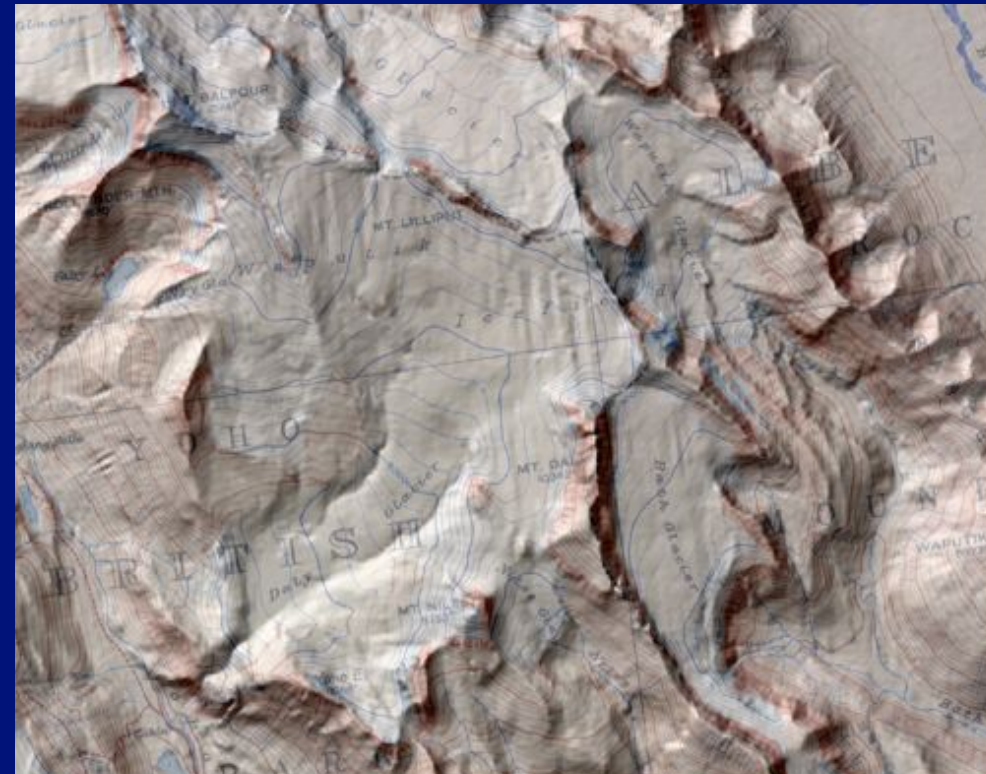
IBC Map Series



Geocoding

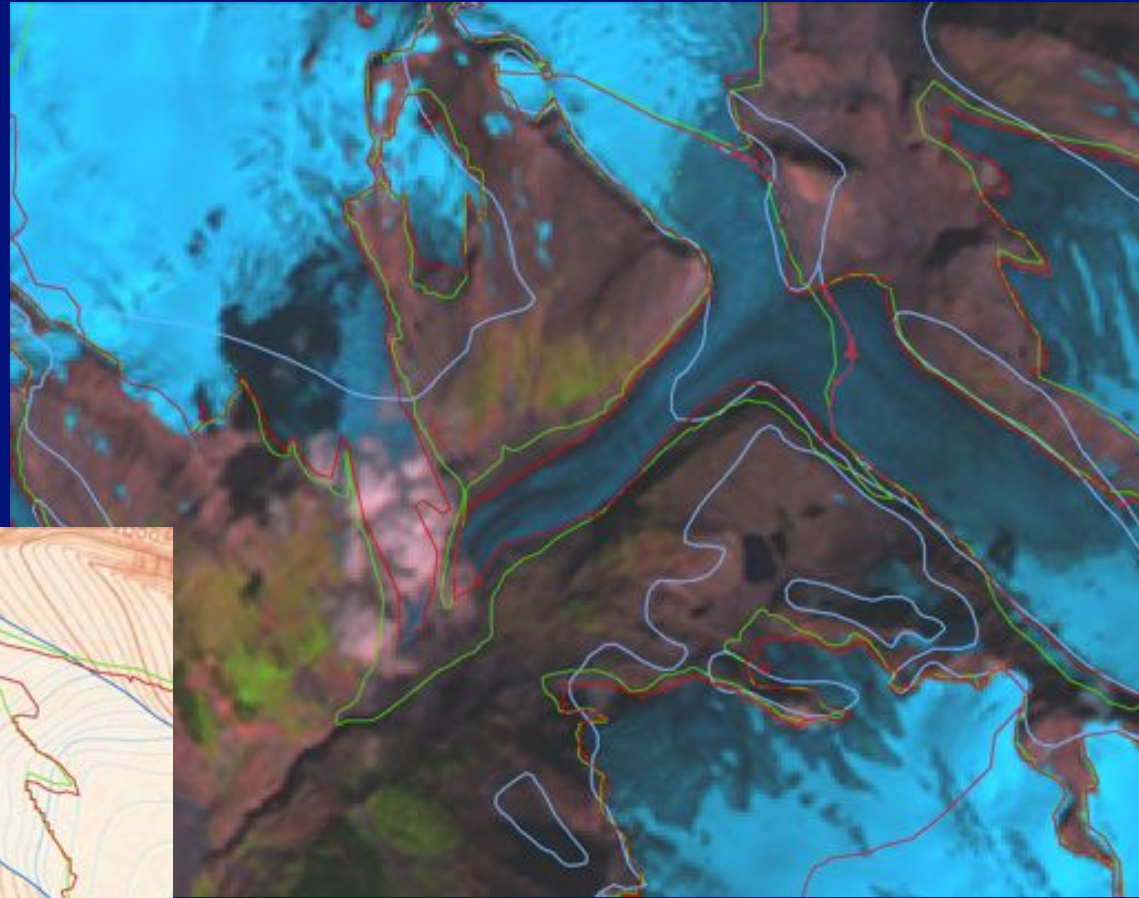


- 25-30 GCPs
- RMS ~ 16 m
- Maximum offset ~ 60 m



Extents

- Positional offset near edges
- Termini not mapped

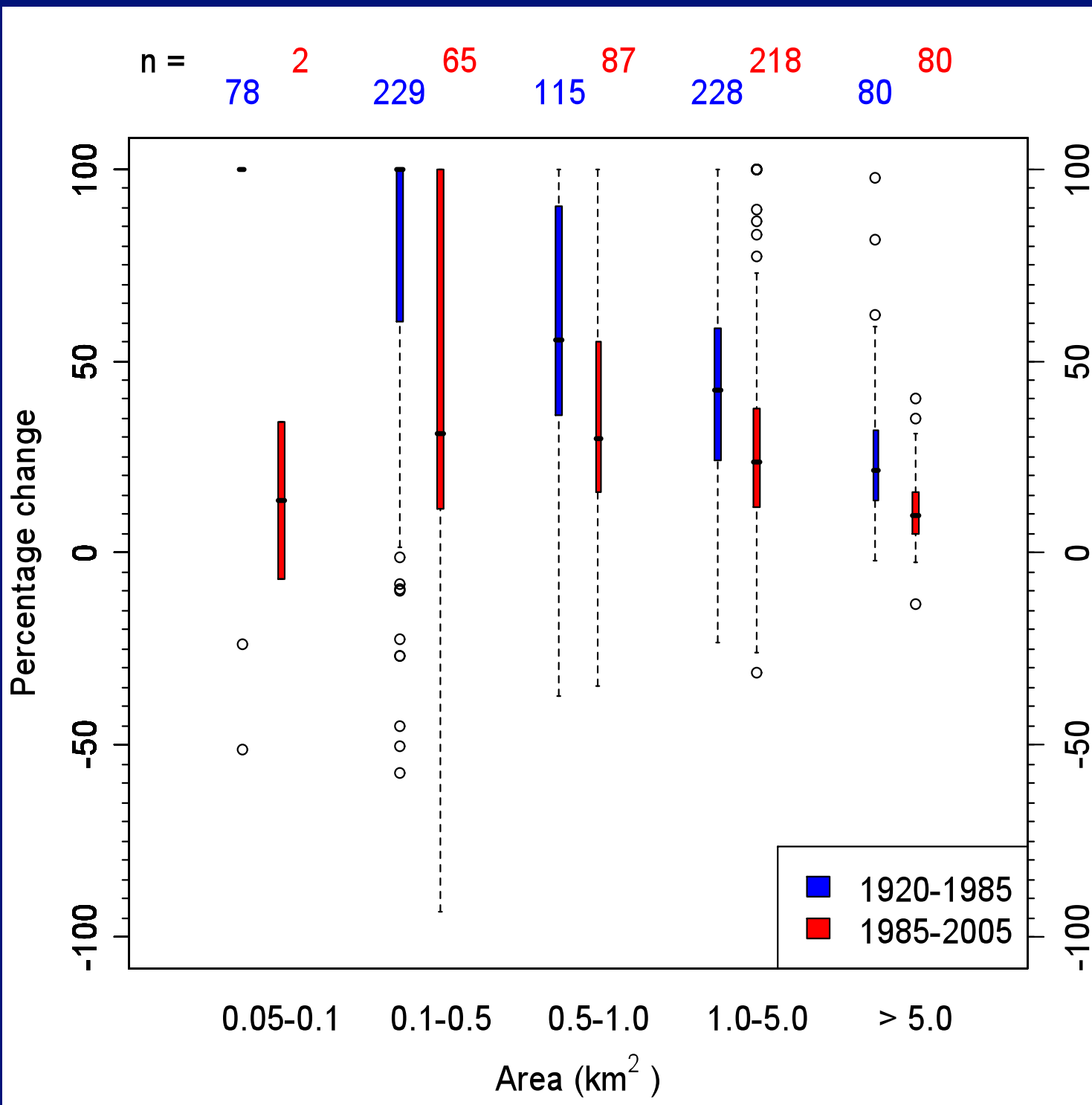


- Missing glaciers
- Possible inclusion of snow patches

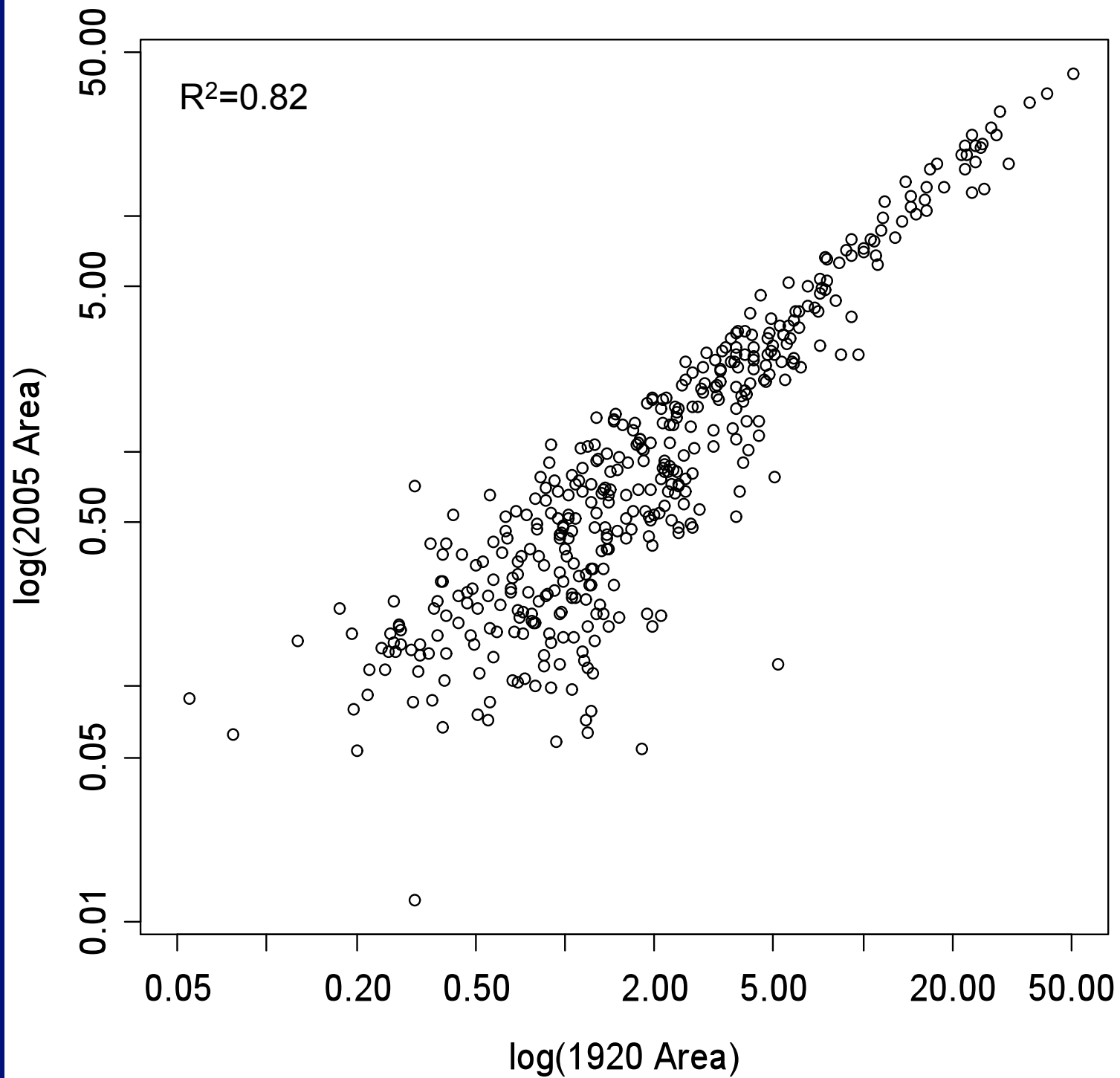
Area Change

Period	1920-1985	1985-2005
Δ Area (km ²)	514 \pm 97	157 \pm 40
Δ Percentage (%)	30 \pm 6	13 \pm 3
Rate (% a ⁻¹)	0.5 \pm 0.09	0.7 \pm 0.17

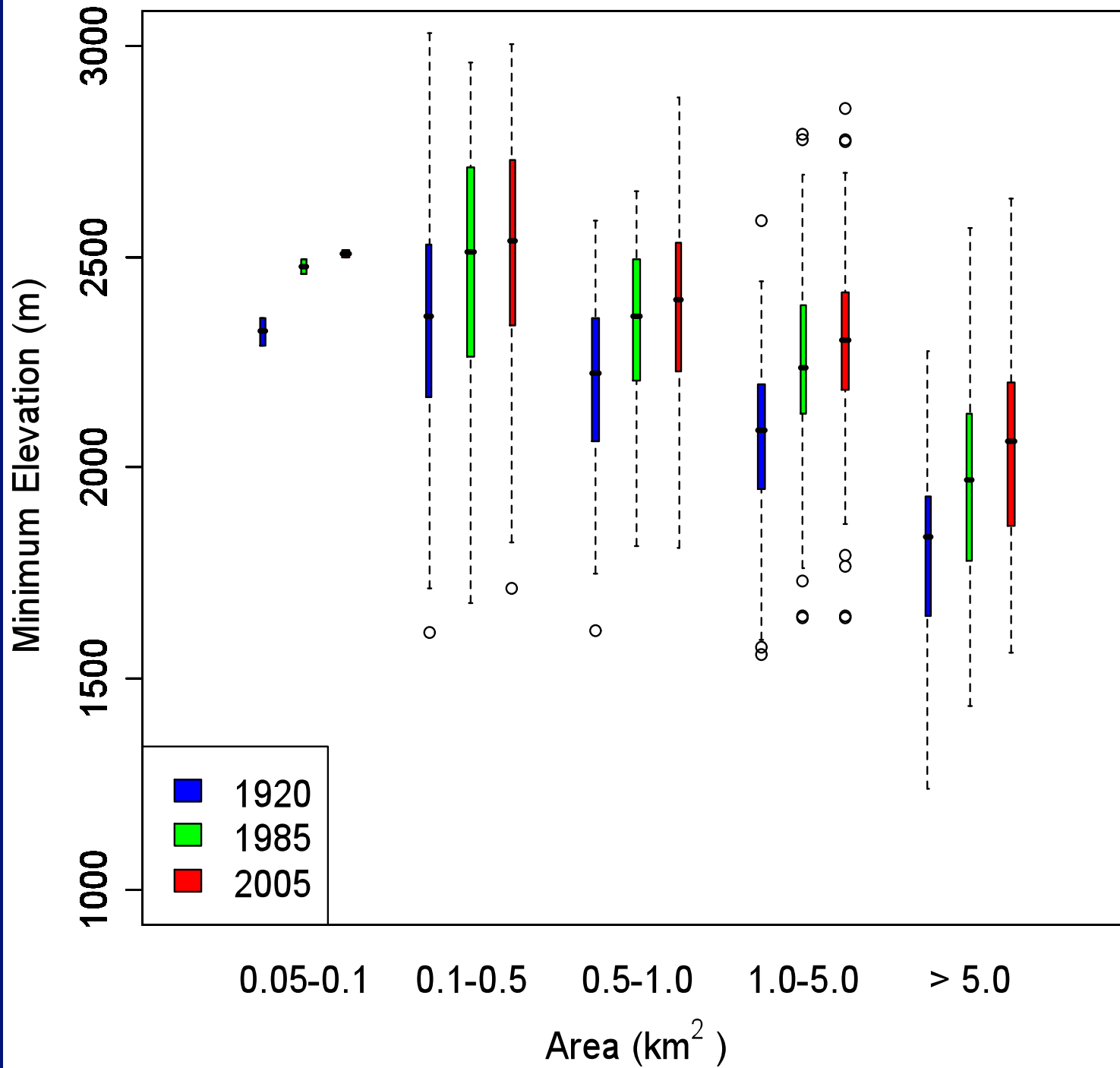
Percent Area Change vs Glacier Area



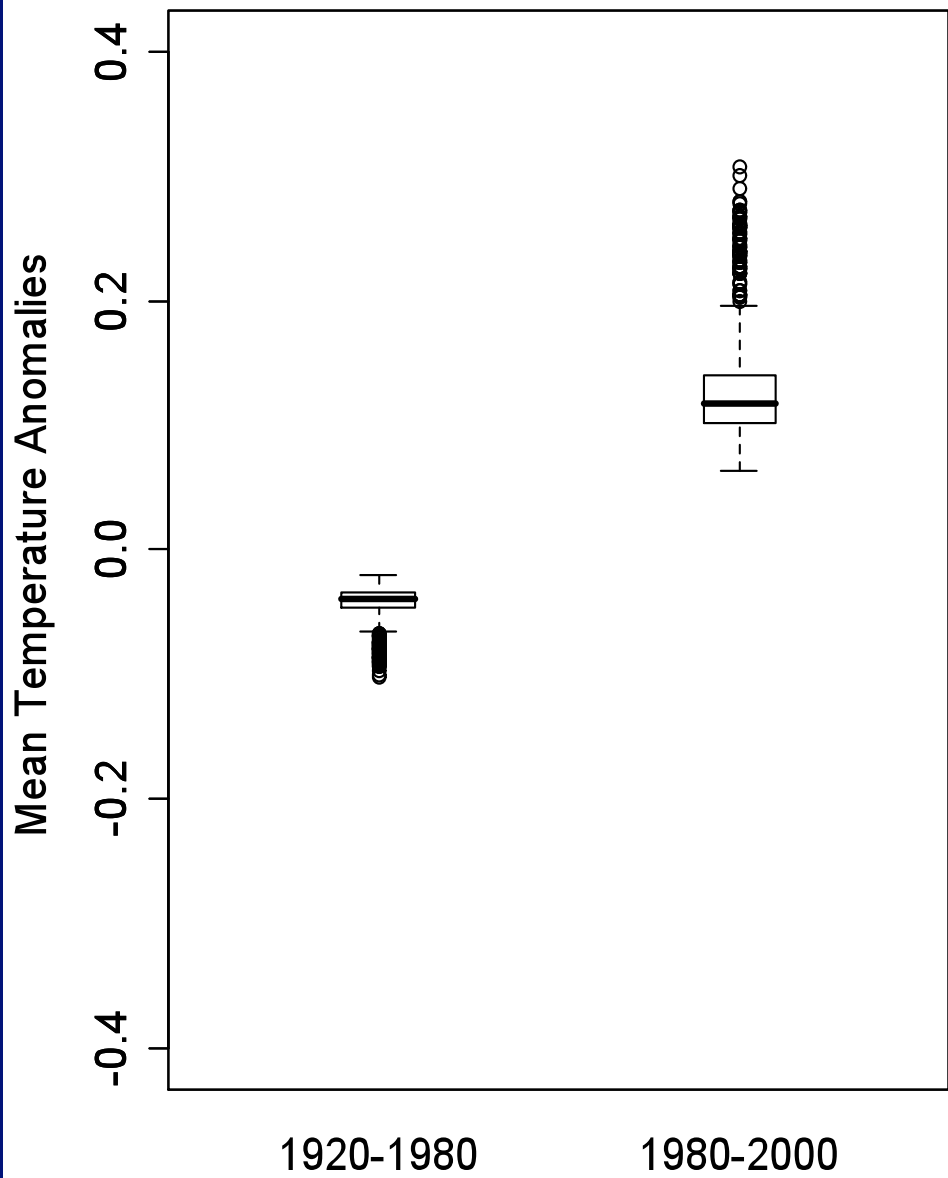
2005 Glacier Area vs 1920 Glacier Area



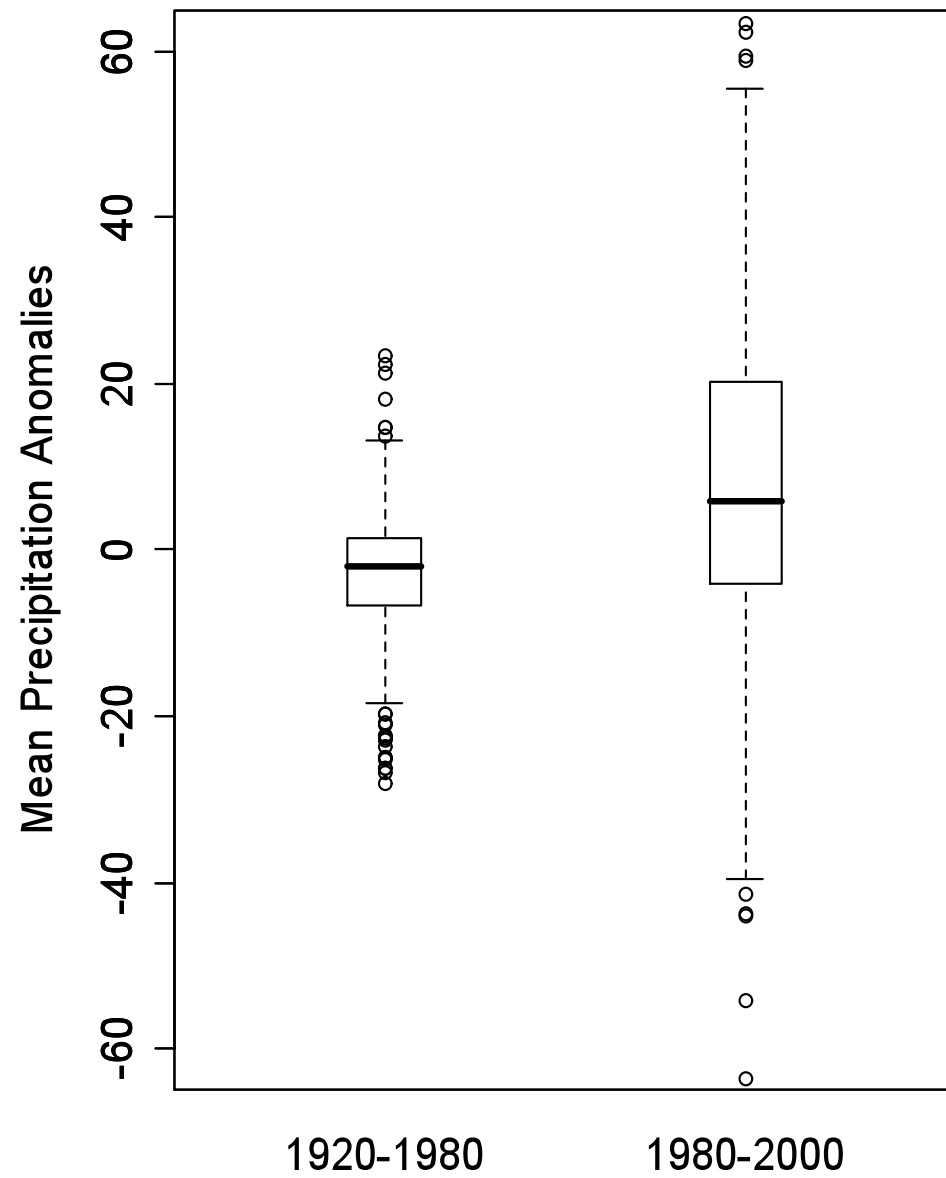
Minimum Elevation vs Glacier Area

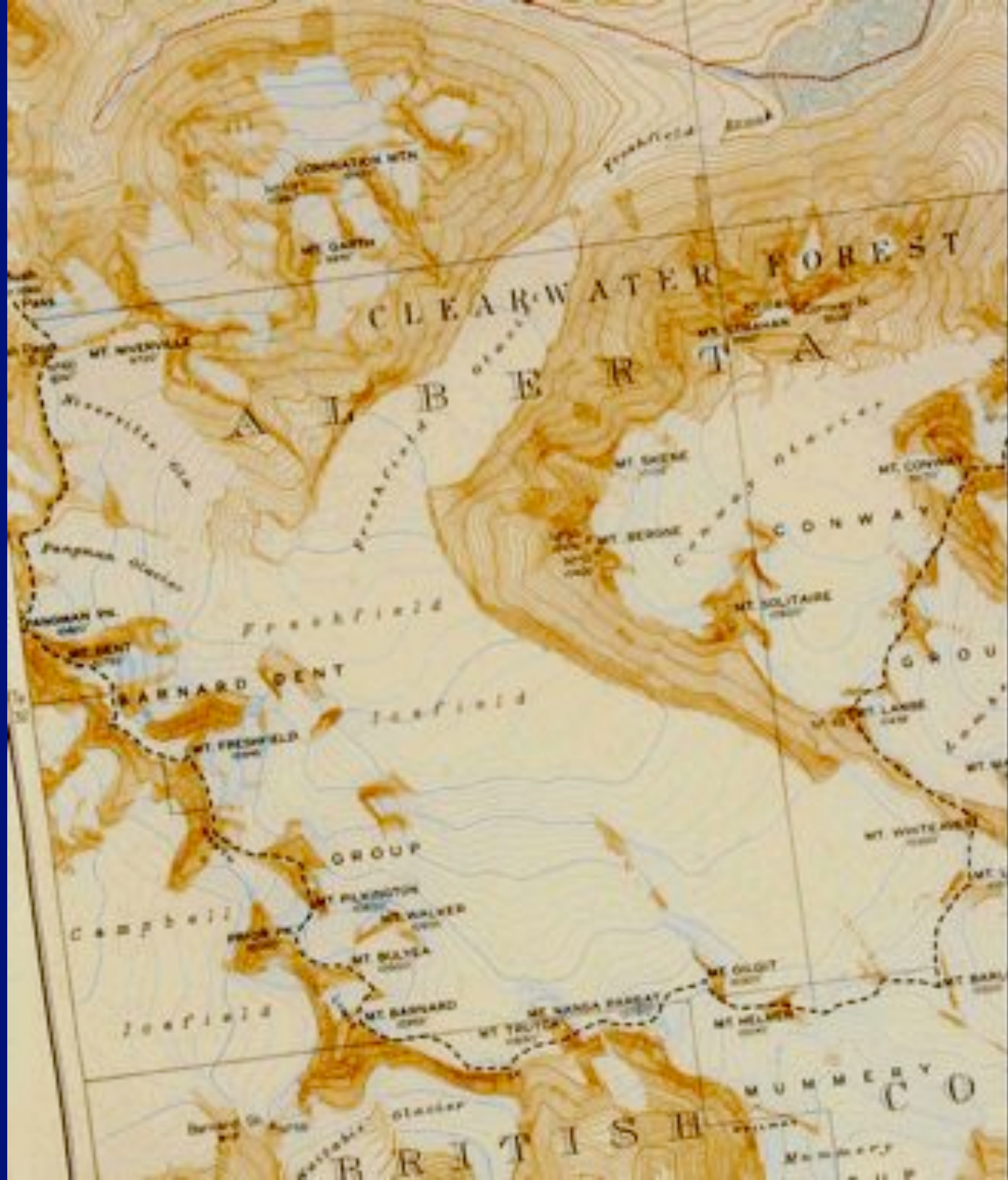


Ablation Season (May-Sept)

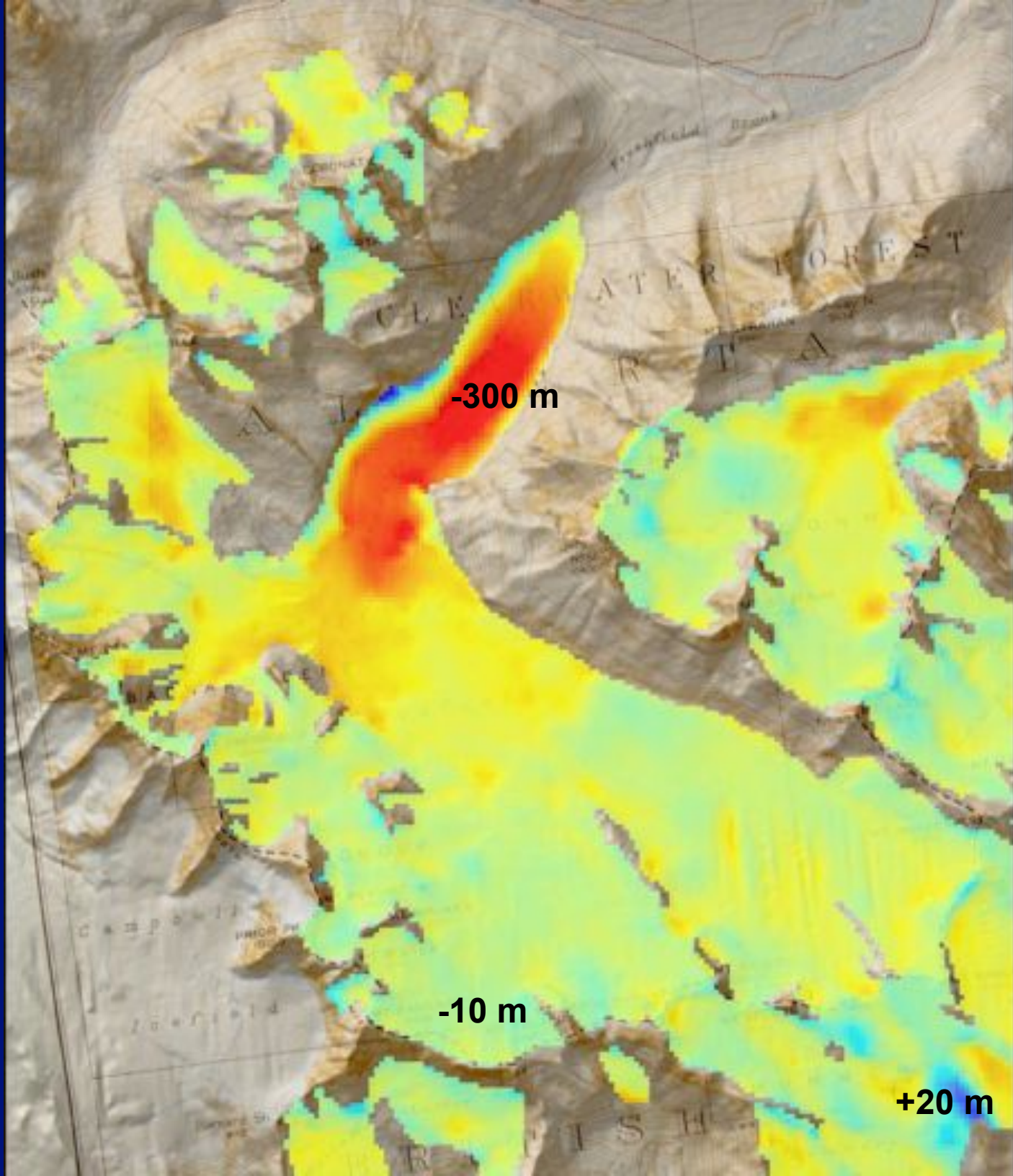


Accumulation Season (Oct-Apr)







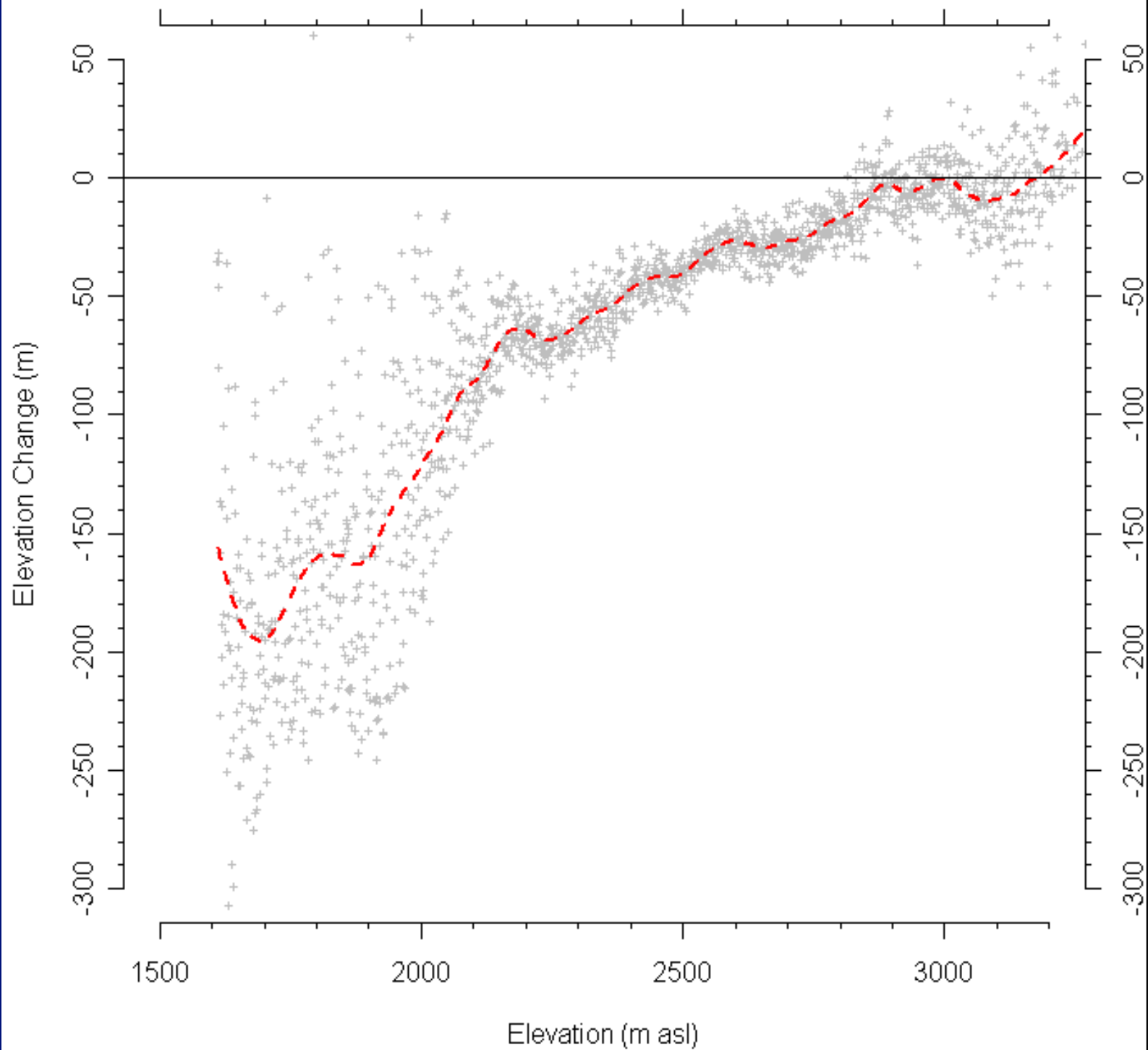


-300 m

-10 m

+20 m

Elevation Change vs elevation for Freshfield Glacier, 1920 to 1985



Summary

- IBC maps are an unexploited dataset
- Percent area change rates, minimum elevation rates and climate variables were similar between 1920-1985 and 1985-2005
- Small glaciers experienced the greatest percent area loss
- Next steps... contours and elevation change

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