Signals of climatic variations in the northern most part of the Antarctic Peninsula and the South Shetlands Islands

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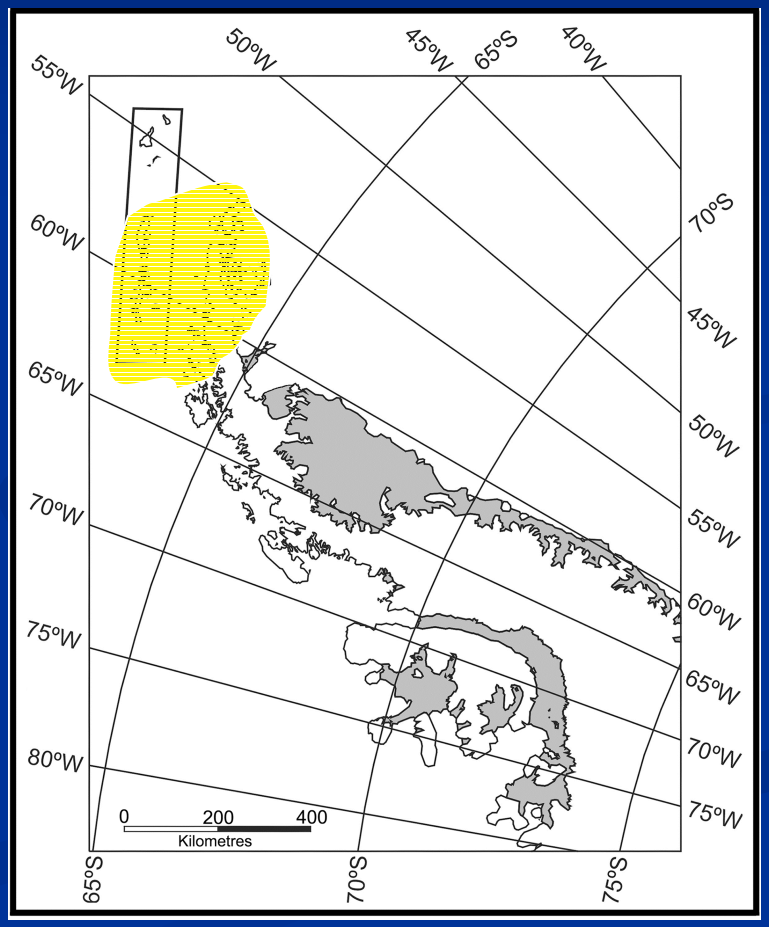
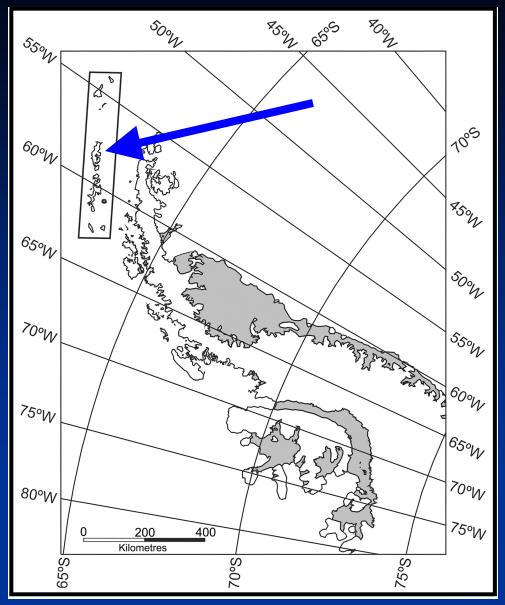
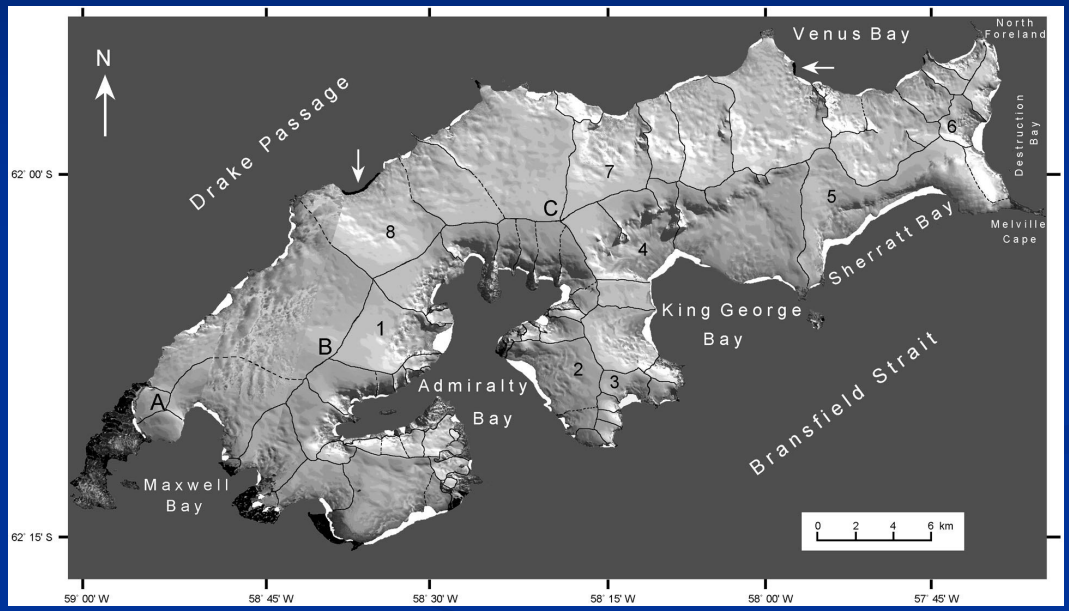


Limit (coupled)

- Sea ice extend (winter)
- Antarctic atmospheric front

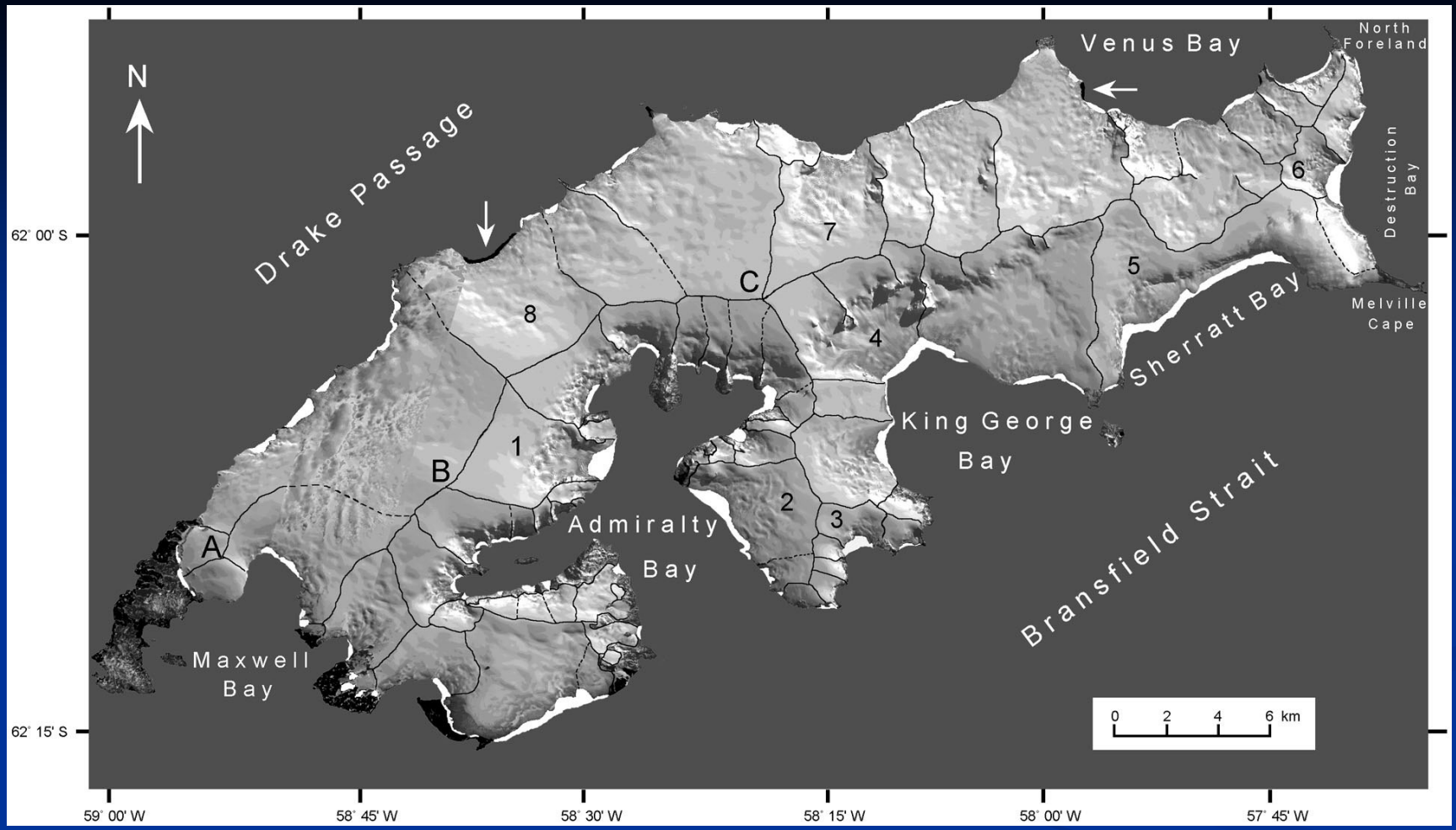


King George Island



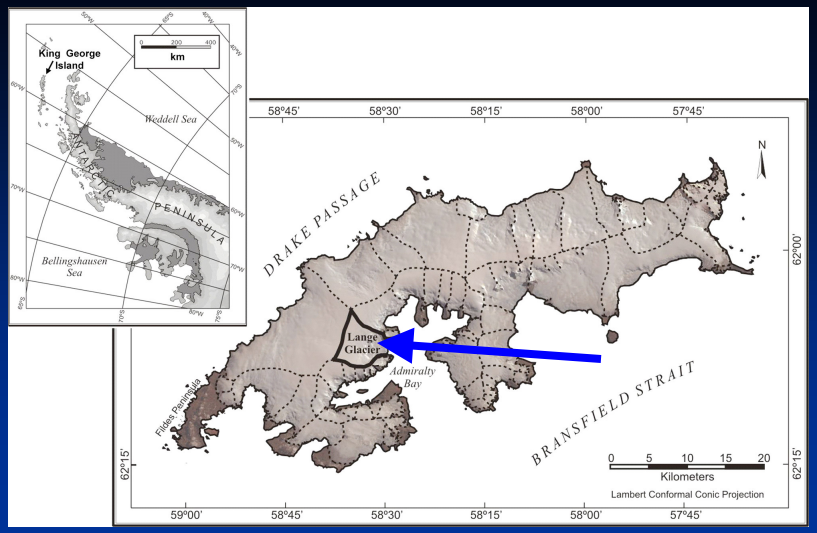
An ice field with 70 drainage basins

92% ice covered (1044 km^2)

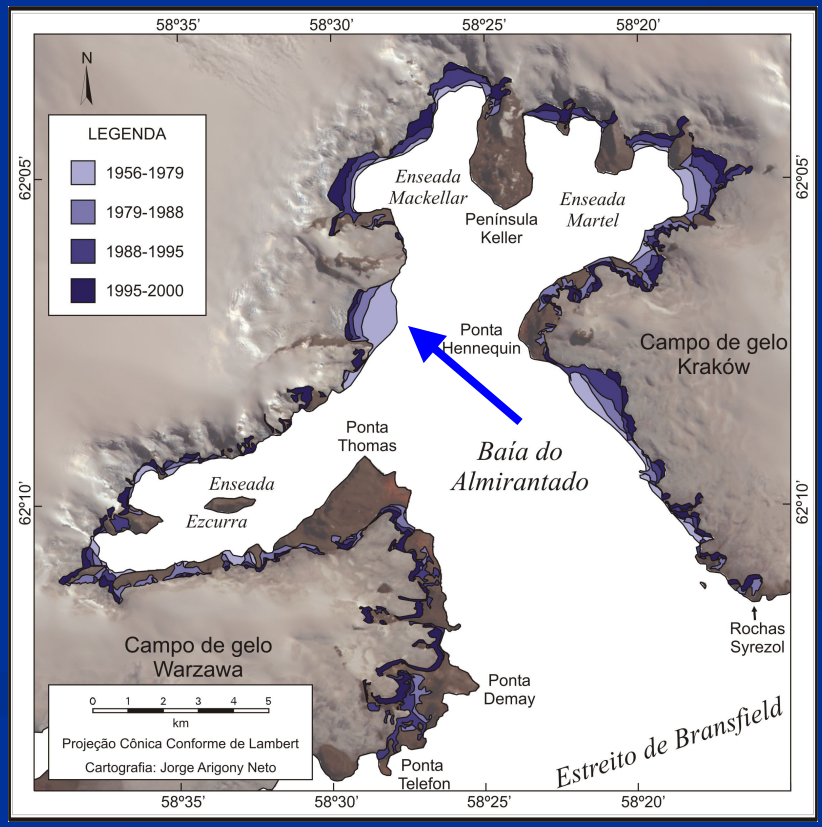


King George Island has lost 7% of its ice cover area from 1956 to 1995.

Mainly in S-SE coast

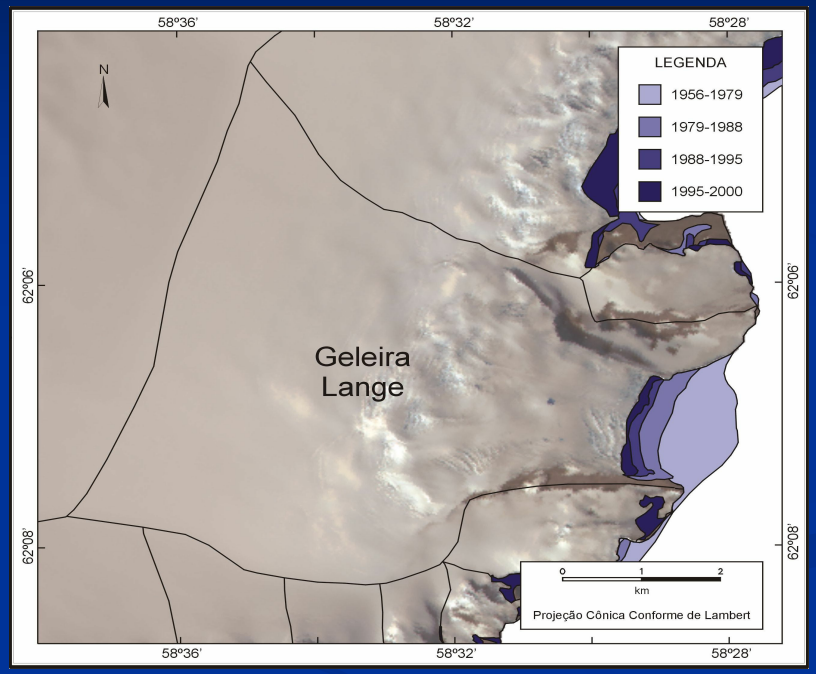


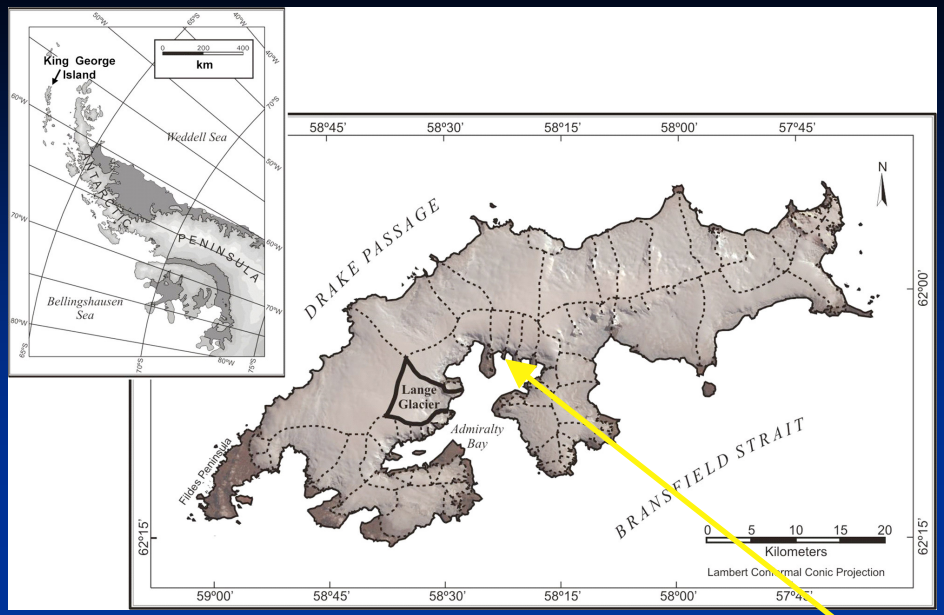
Lange Glacier retreated 1 km in 40 years



Lange Glacier front variations

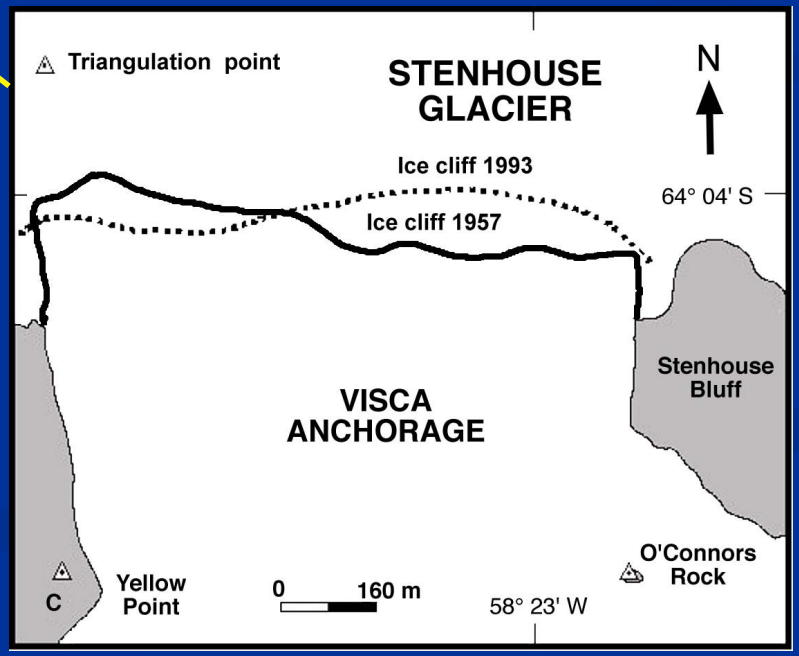
1956

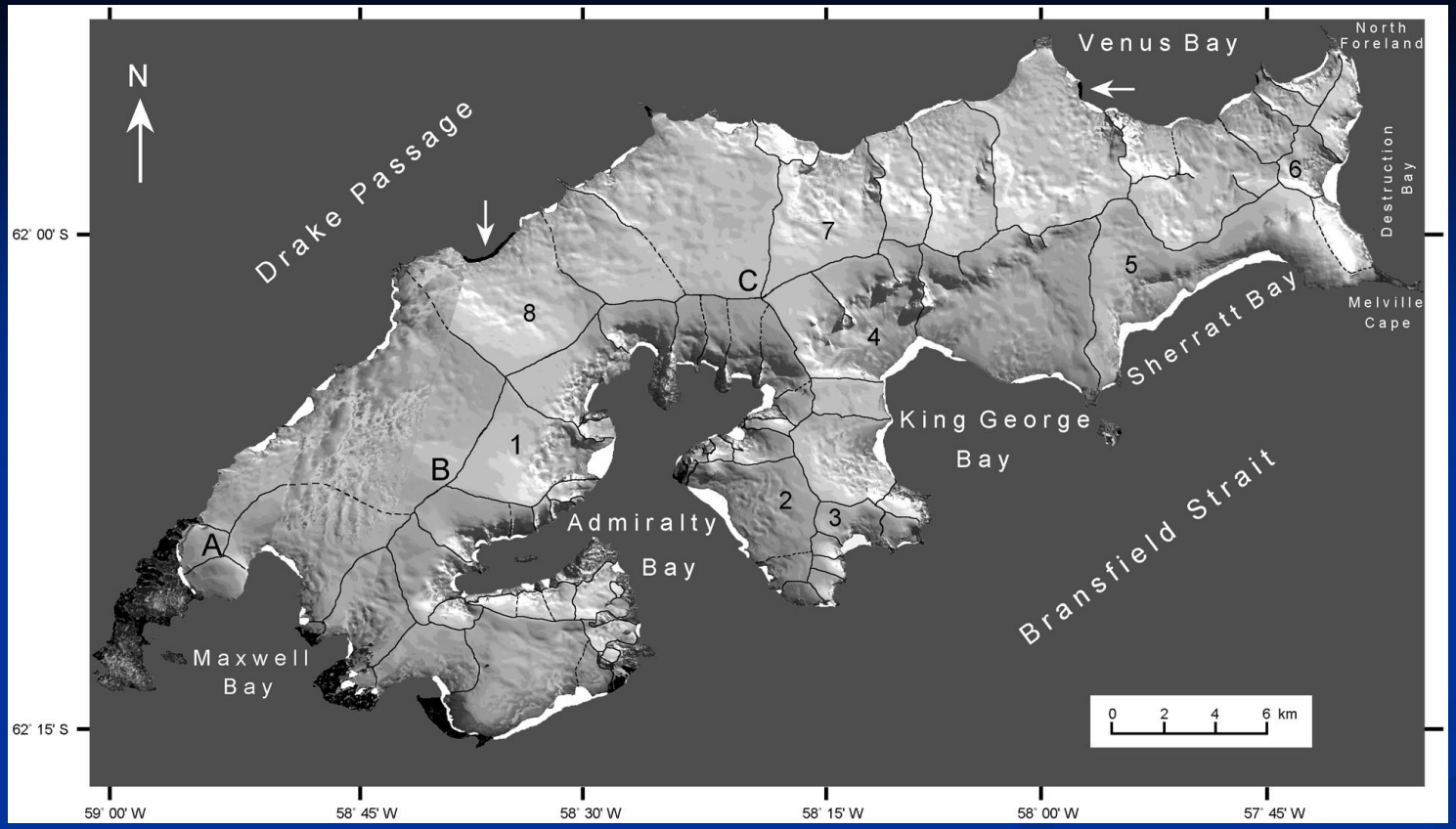




Glaciers with ice fronts over land

** No or small retreat*



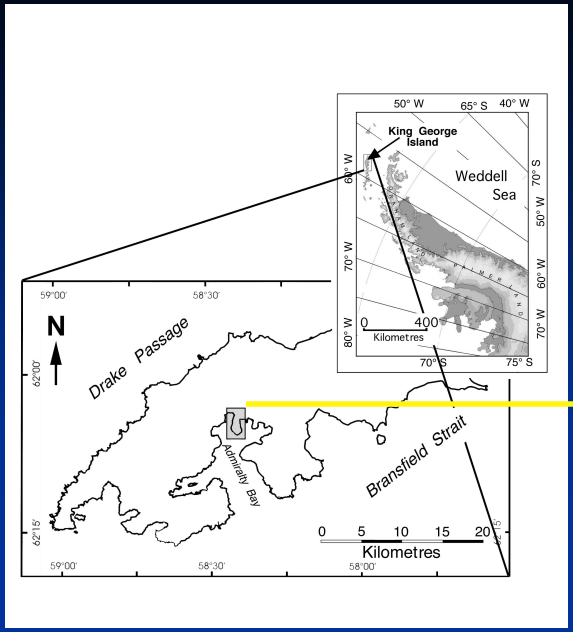


Tidewater glaciers in the SE coast were retreating fast while their fronts where afloat (until late 1980s).

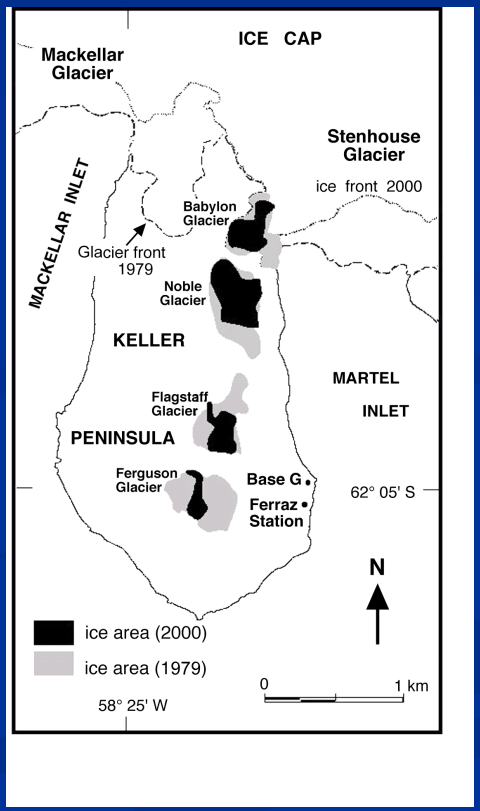
Then they reached a relatively stable position.

At least for KGI bays

- *It is known that sea ice duration has decreased.*
- *Last 10 years - some years without sea ice.*
- *Important: pack ice comes from the Bransfield strait moved by strong SE and S winds!*



Equilibrium line altitude has gone up at least 100 to 120 m since 1950s



Corrie glaciers in Keller Peninsula

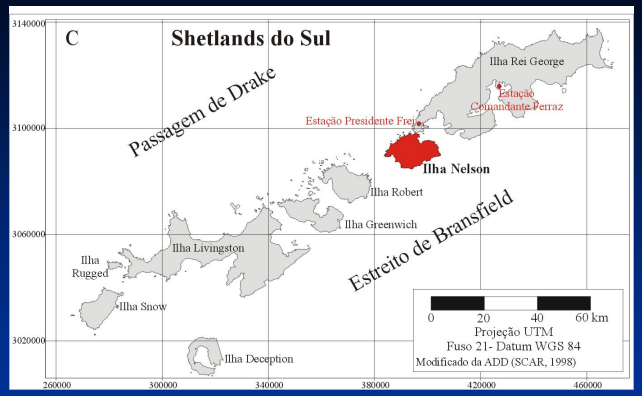
Lost 44 to 83% of their area since 1956

Orheim (1970) - ELA at 150 m

by 1995 firn at 320 m a.s.l.

Nelson Island

Snow and ice cover 1973-1989



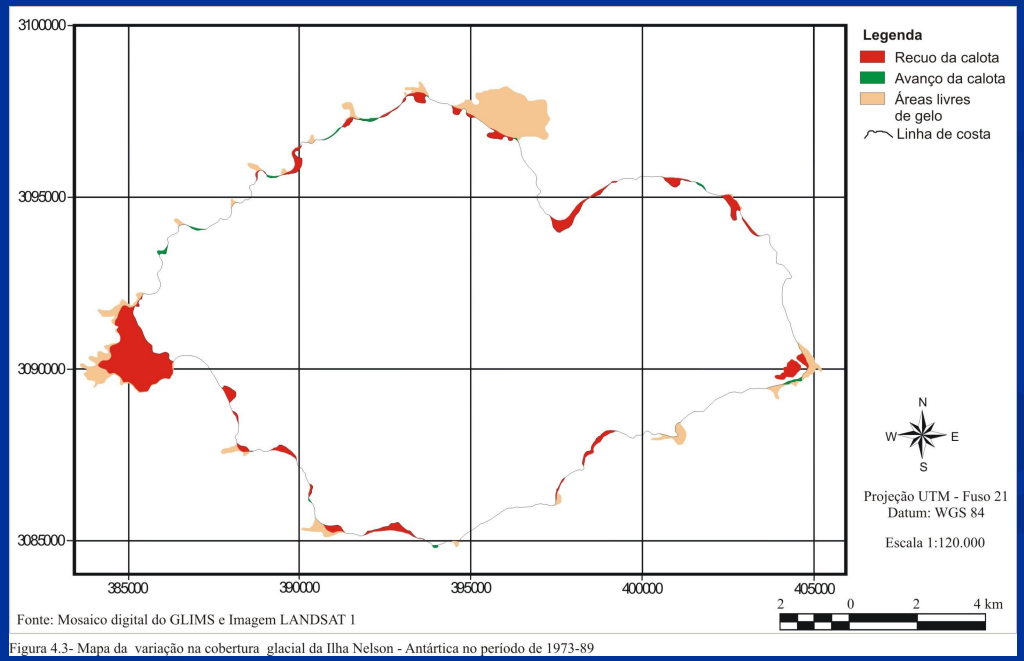
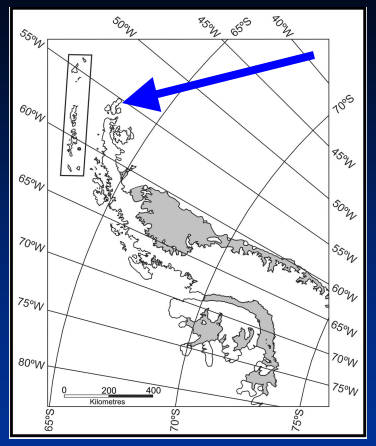
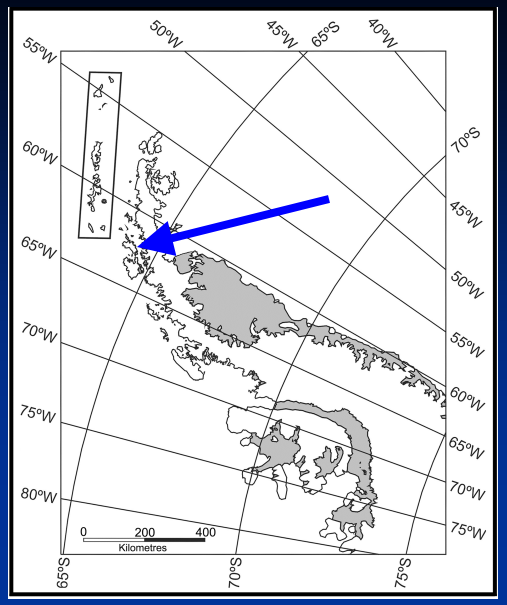


Figura 4.3- Mapa da variação na cobertura glacial da Ilha Nelson - Antártica no período de 1973-89

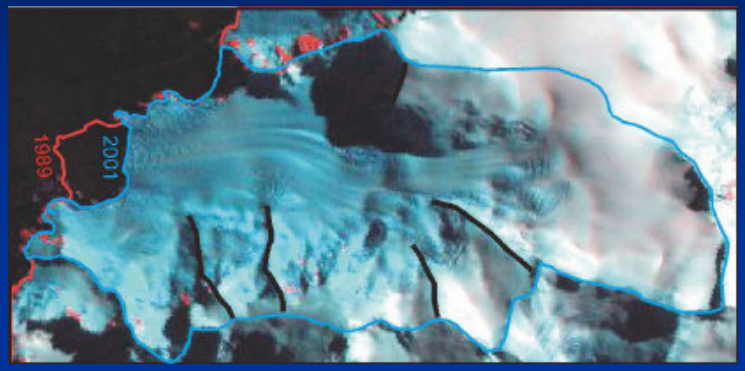


Joinville Island

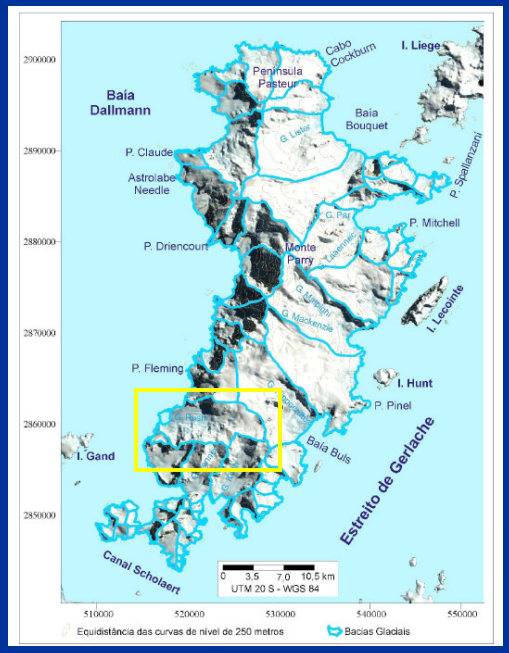
from 1956 to 2000 lost only 4,1 km² of 1477 km²!



Brabant Island

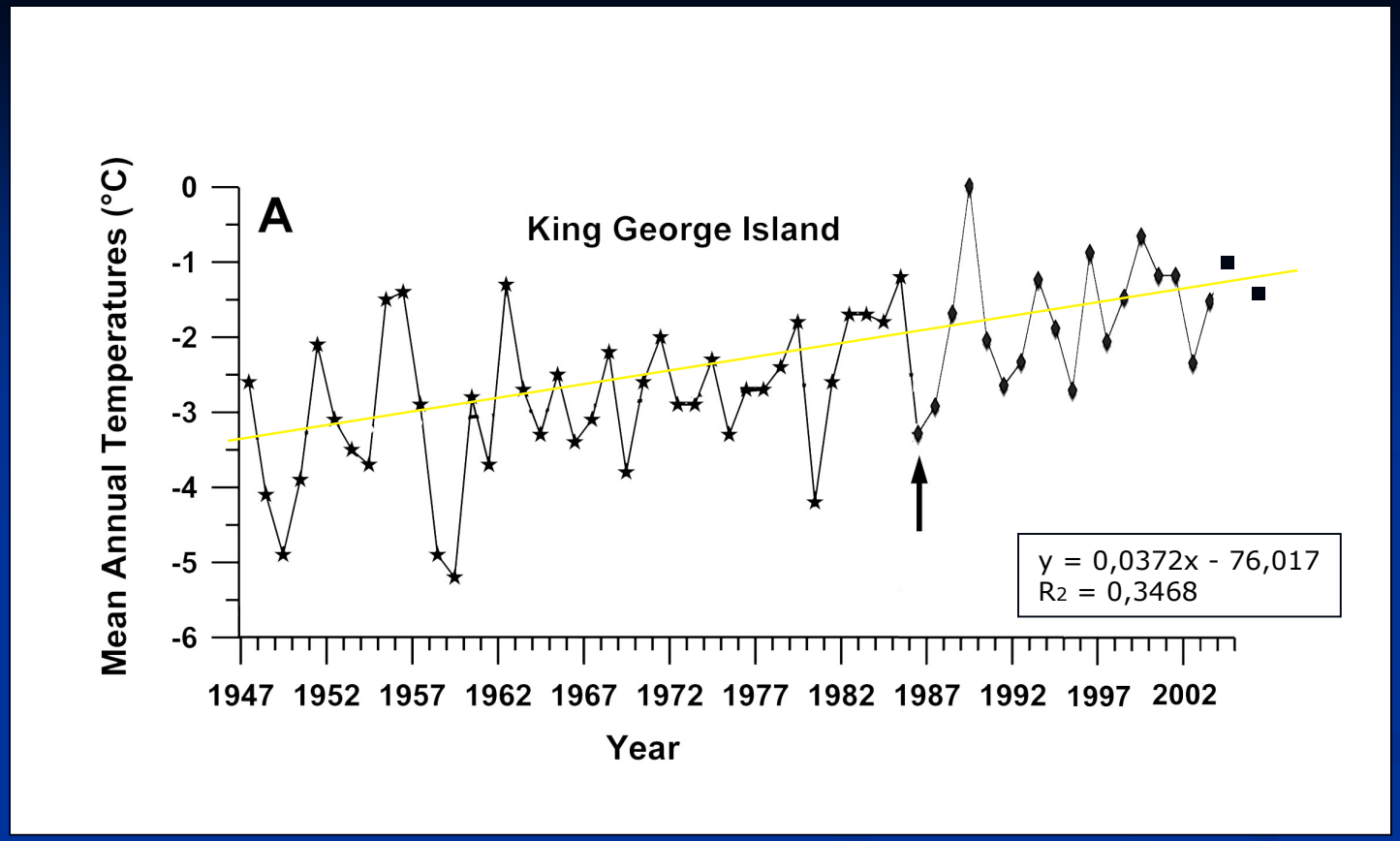


Rush Glacier 1989-2001



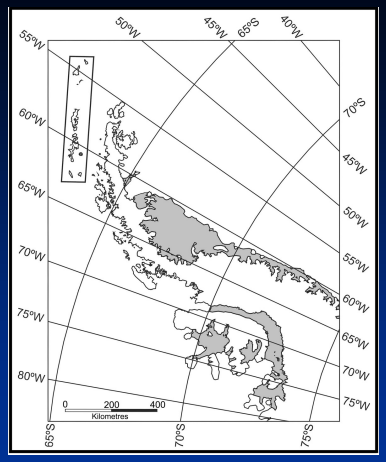
No substantial changes!

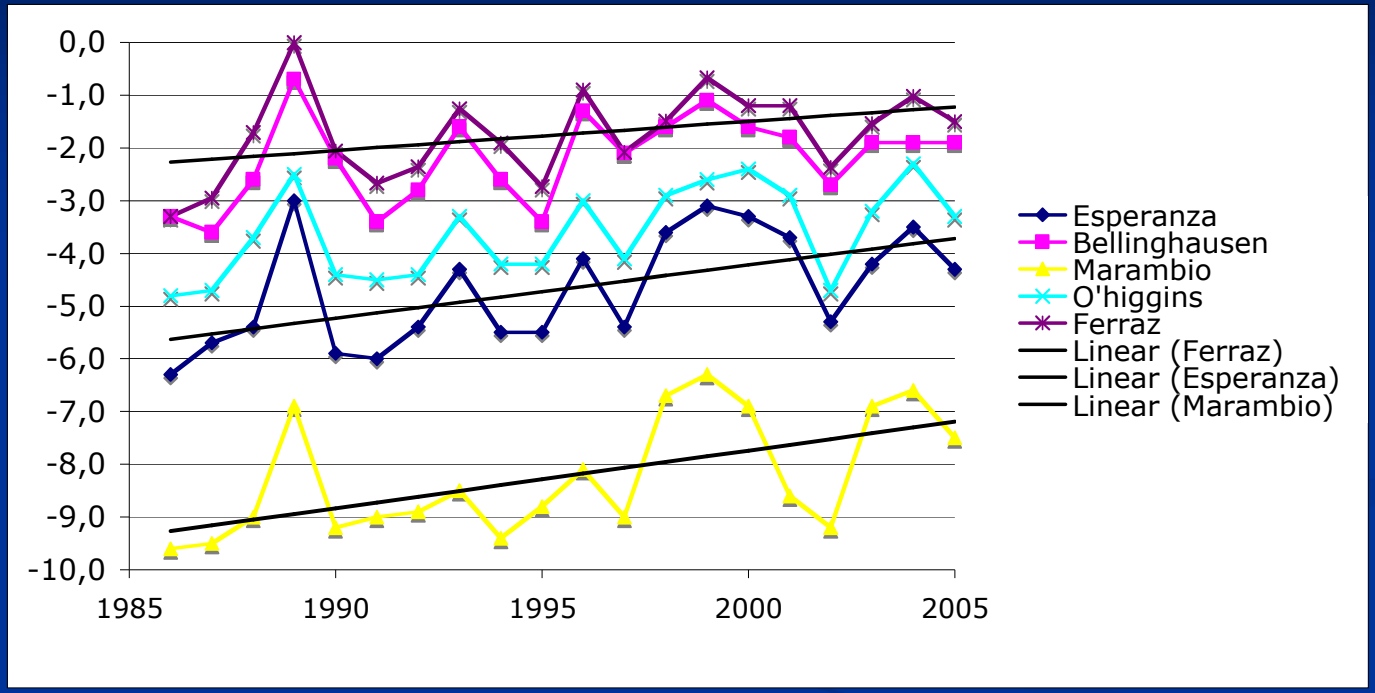
Conclusion: glaciers with fronts above sea level did not retreat!



An increase of 2.1°C from 1947 to 2005

1947-1995 went up 1,1°C.

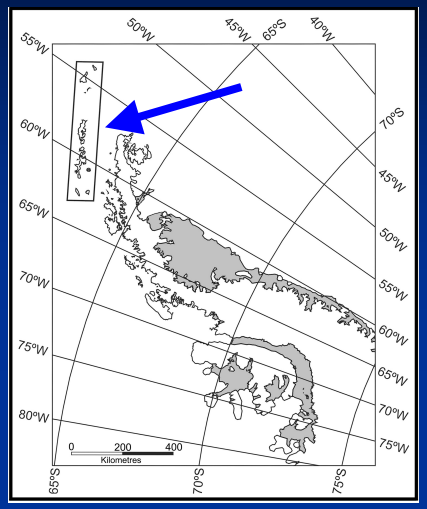




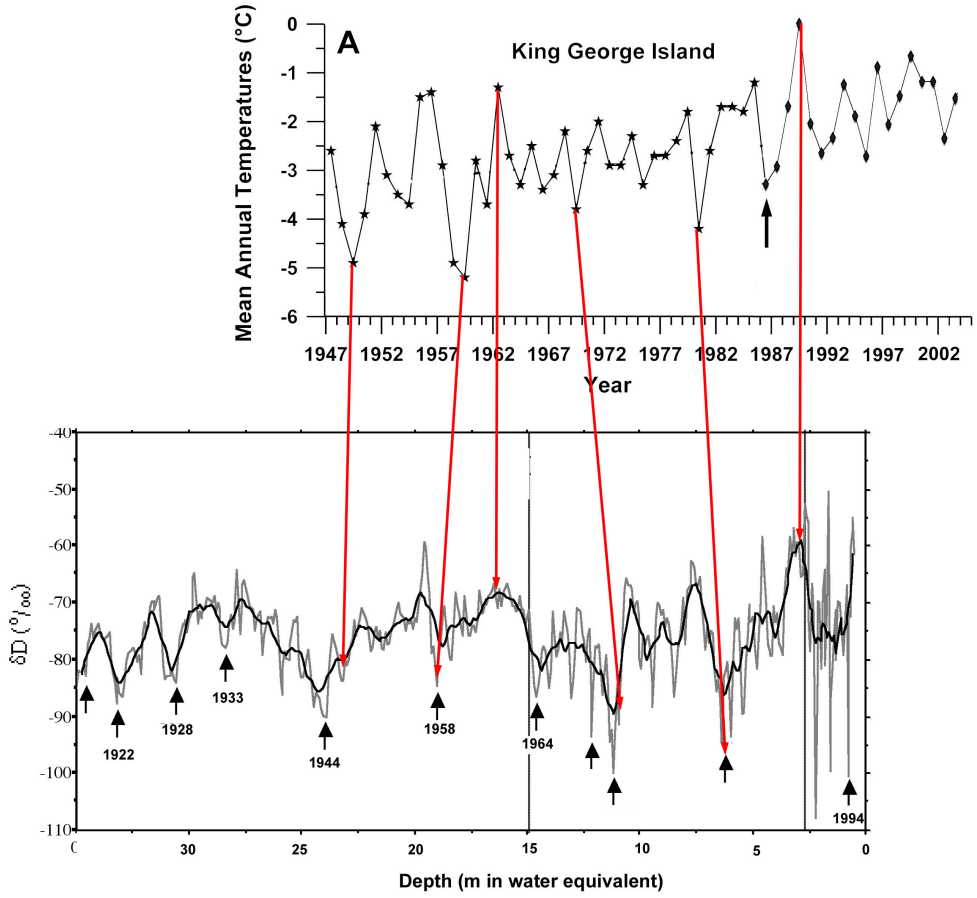
Mean annual T trends

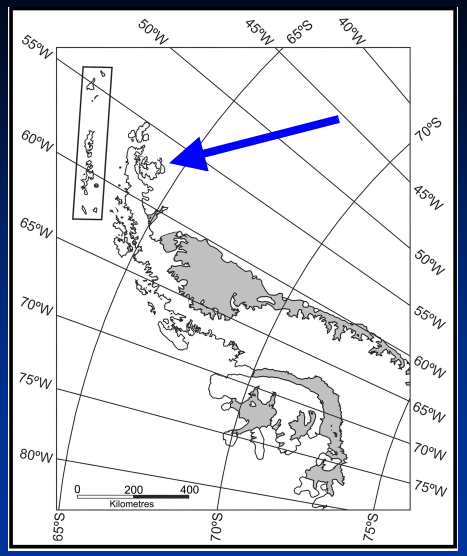
Increase from West to East

Long-term records

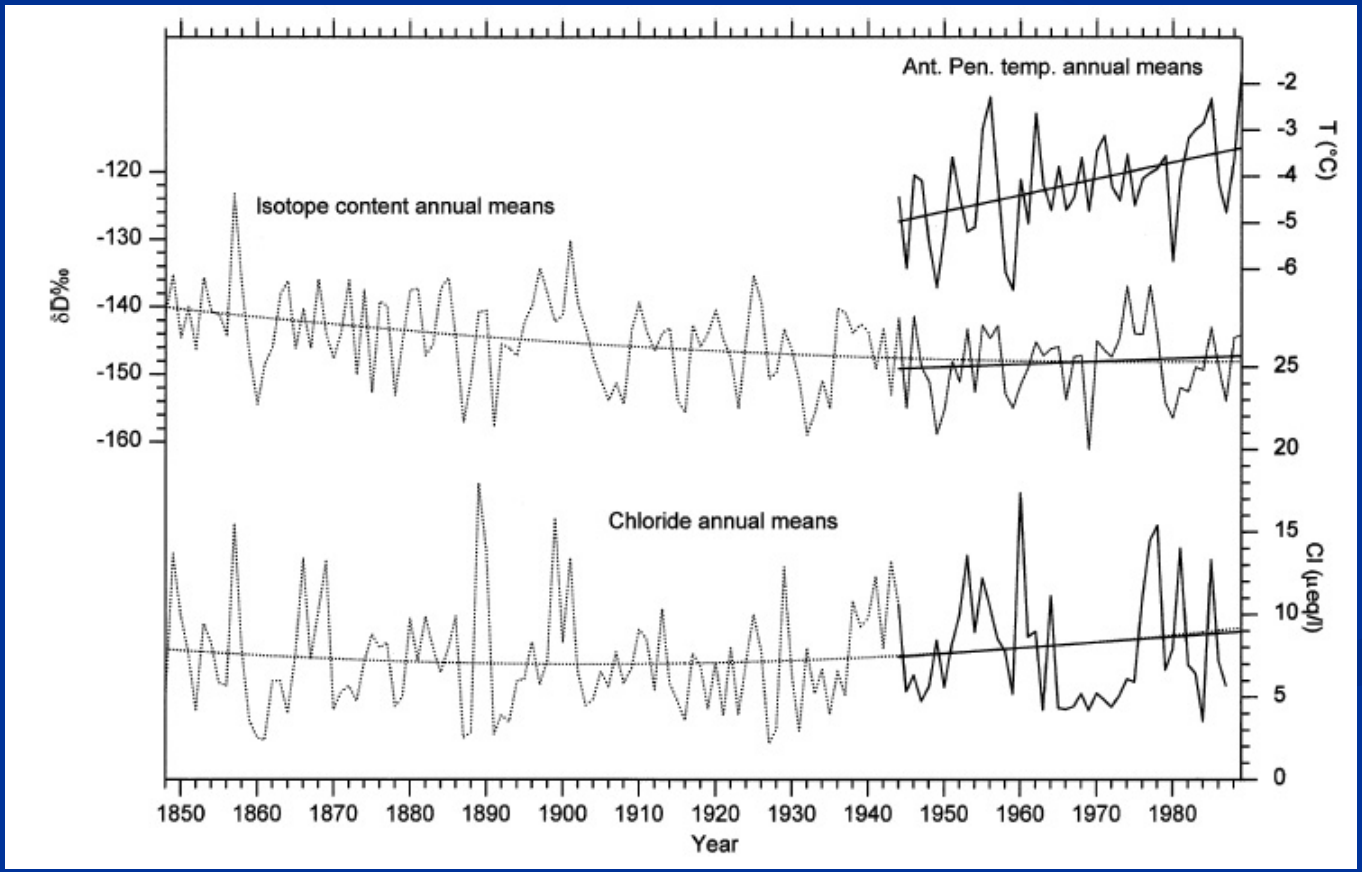


Stable isotopic record from King George Is.





James Ross Island ice core record (Aristarain et al., 2004)



Conclusions

• Fast glaciers retreat from 1960s up to the moment that ice fronts grounded.

• Ice fronts retreat are associated with the sea ice cover duration in well protected bays.

• Mean atmospheric temperature decreased from mid-1800s to 1920s. The regional warming from 1930s left a signal in the stable isotopic record in KGI and James Ross Is. cores.

• Mean atmospheric temperature rise is high, but warming is less than at weather stations further southwest.