

Glaciers as indicators of climatic change

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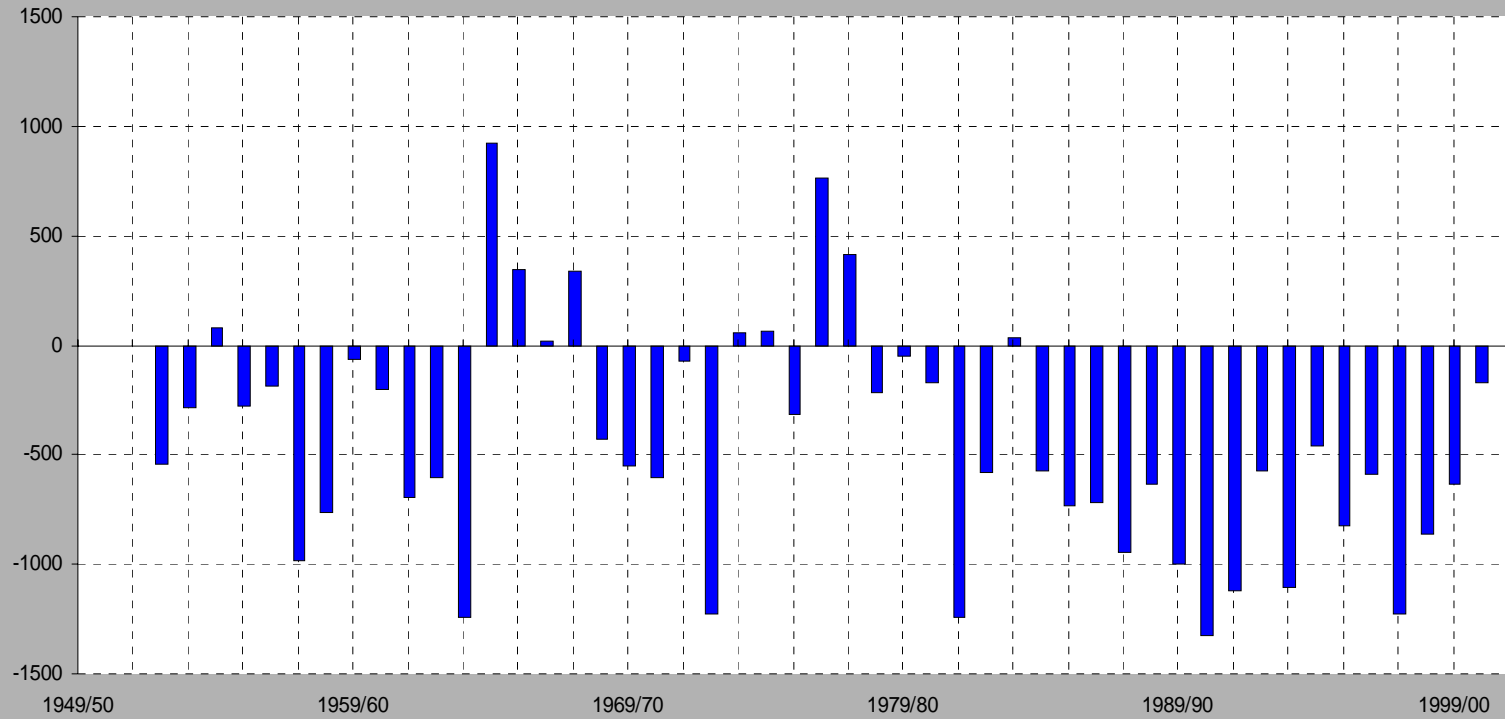


Ex – Glacier

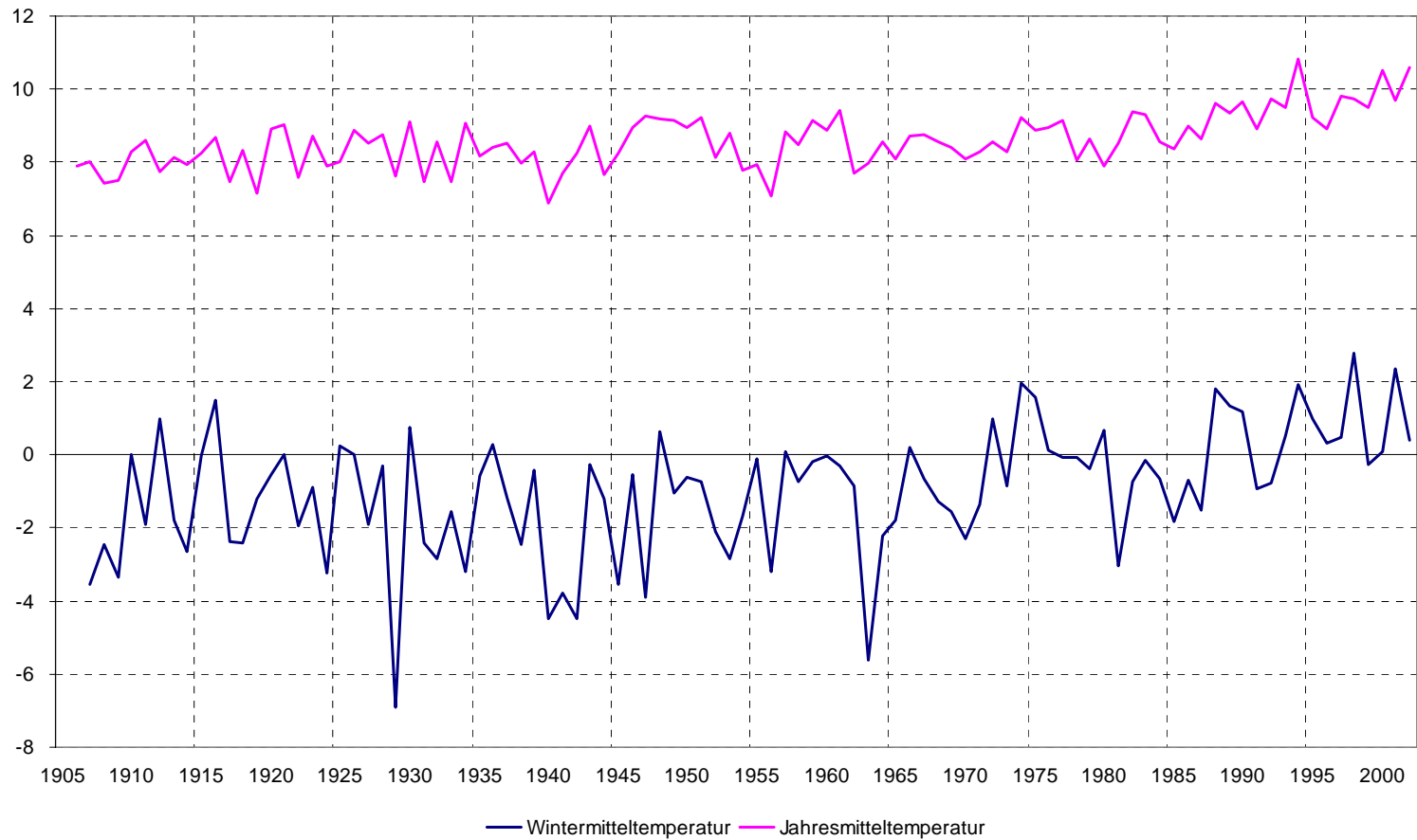
Disappeared since 1969

Massenhaushalt des Hintereisferners

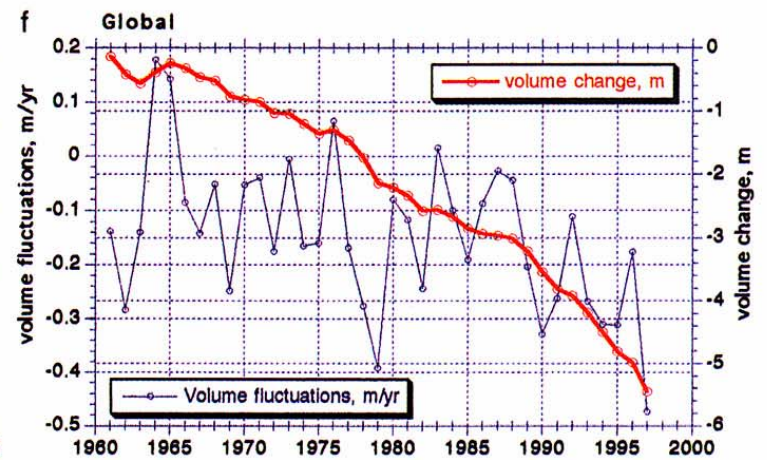
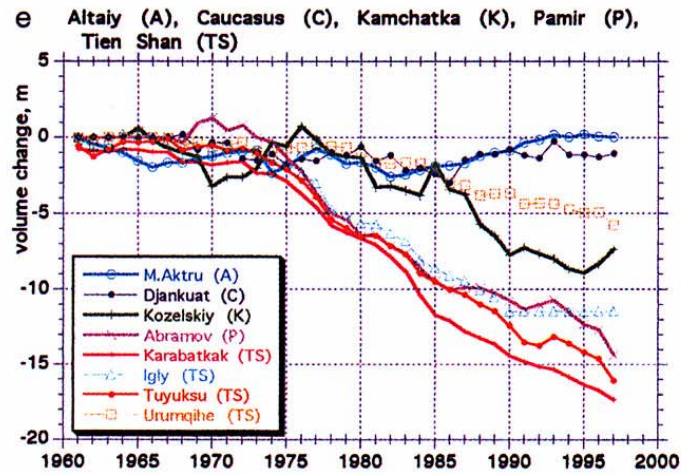
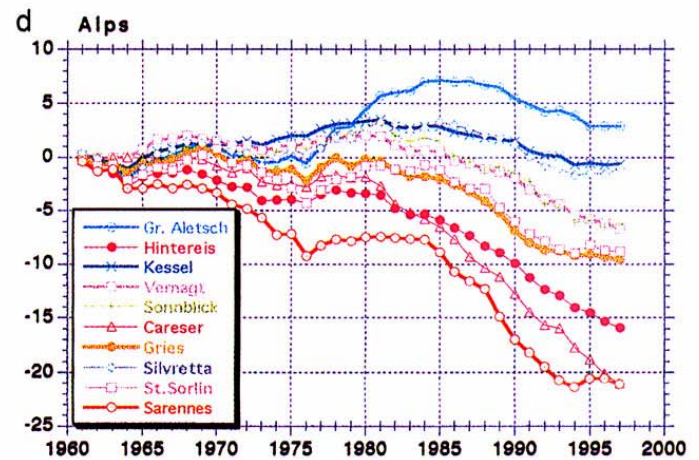
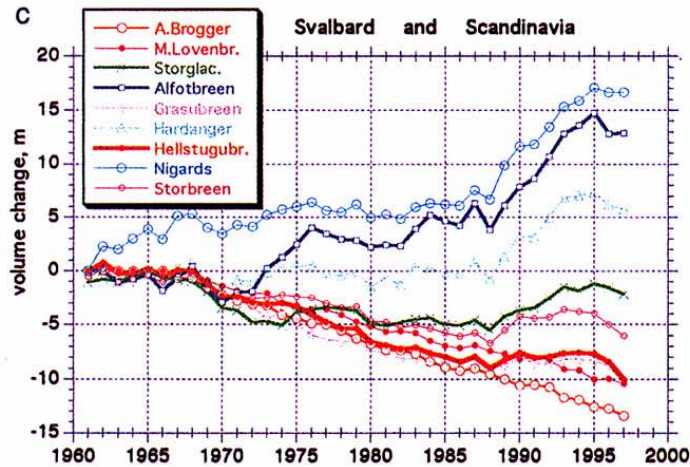
spezifische Massenbilanz
Hintereisferner
[kg/qm]



Jahres- und Wintermitteltemperaturen in Innsbruck 1906-99

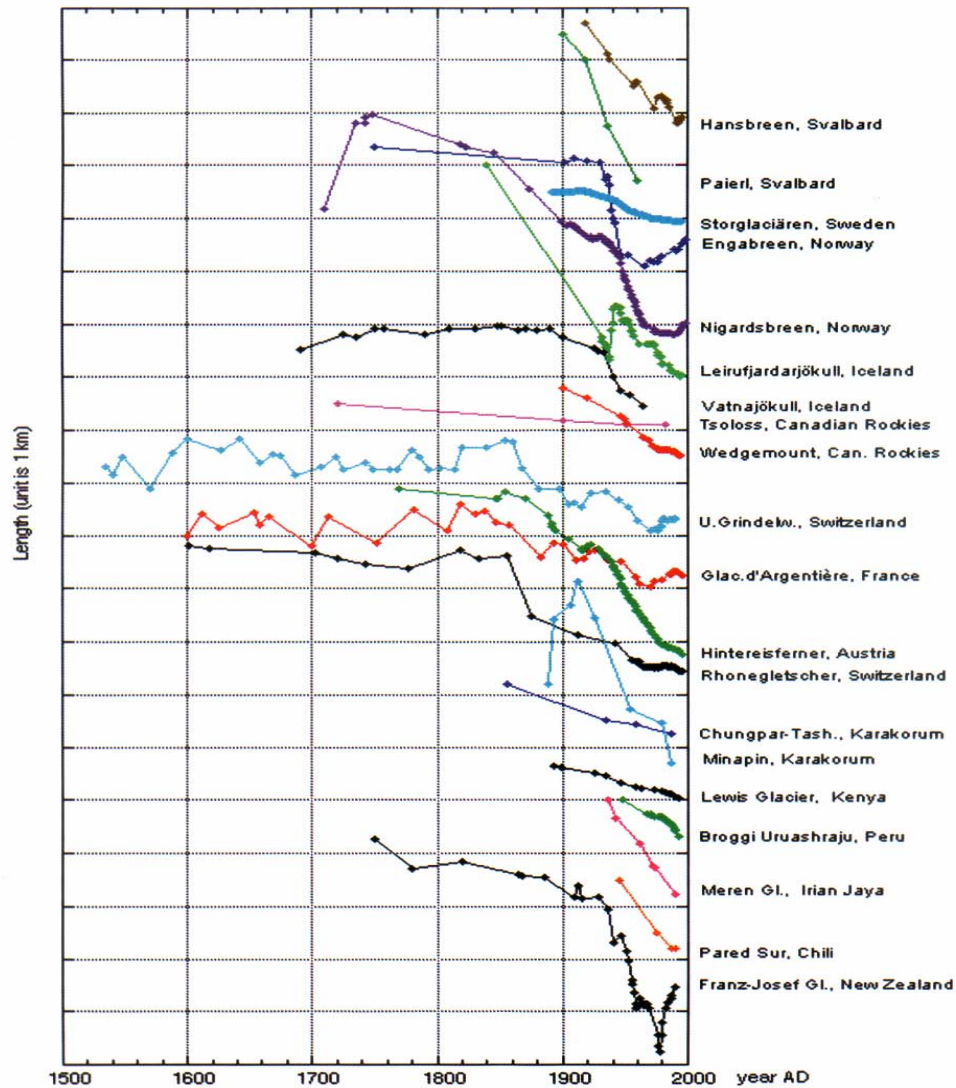


Cumulative mass balance changes since 1960

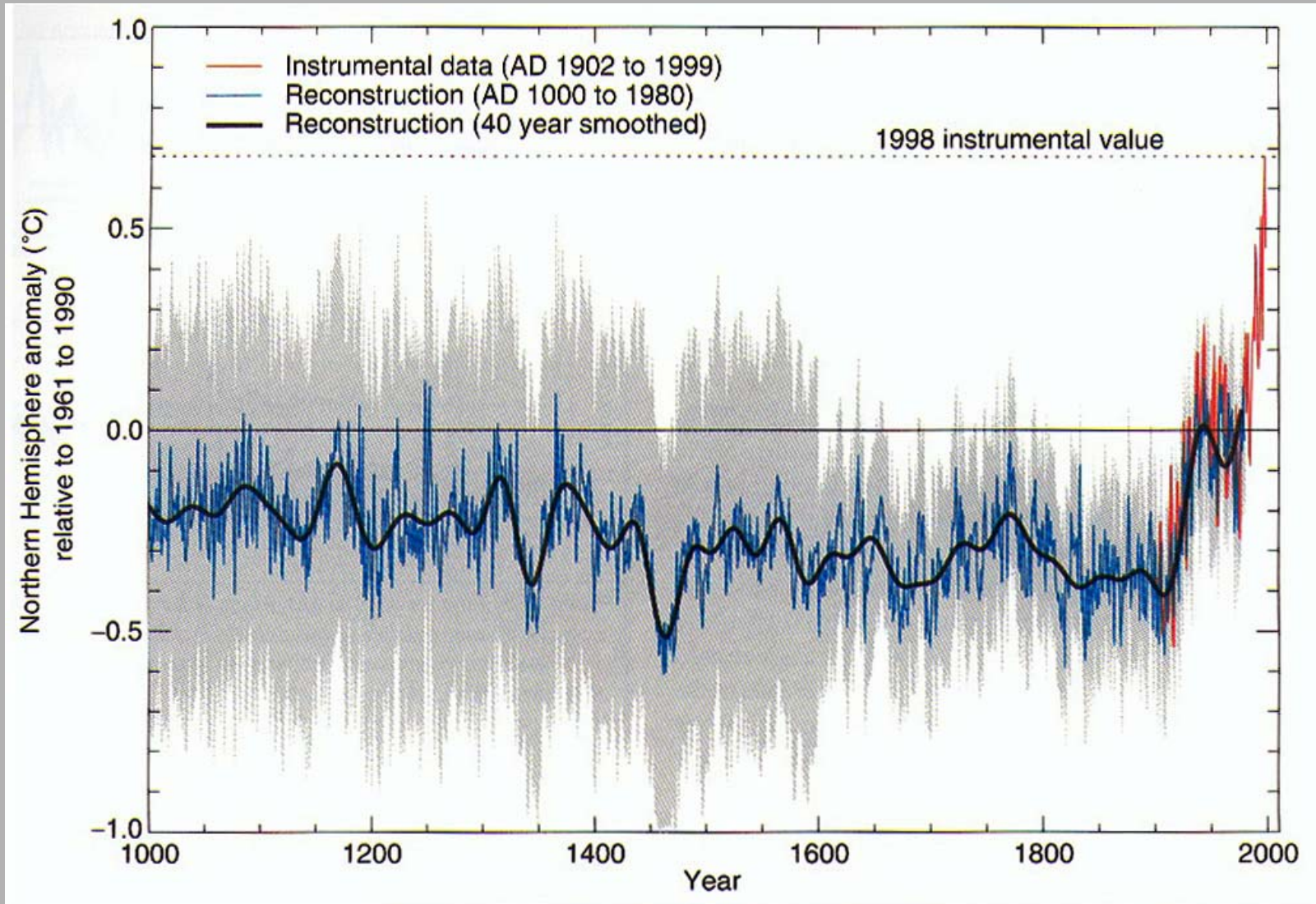


Changes of glacier length

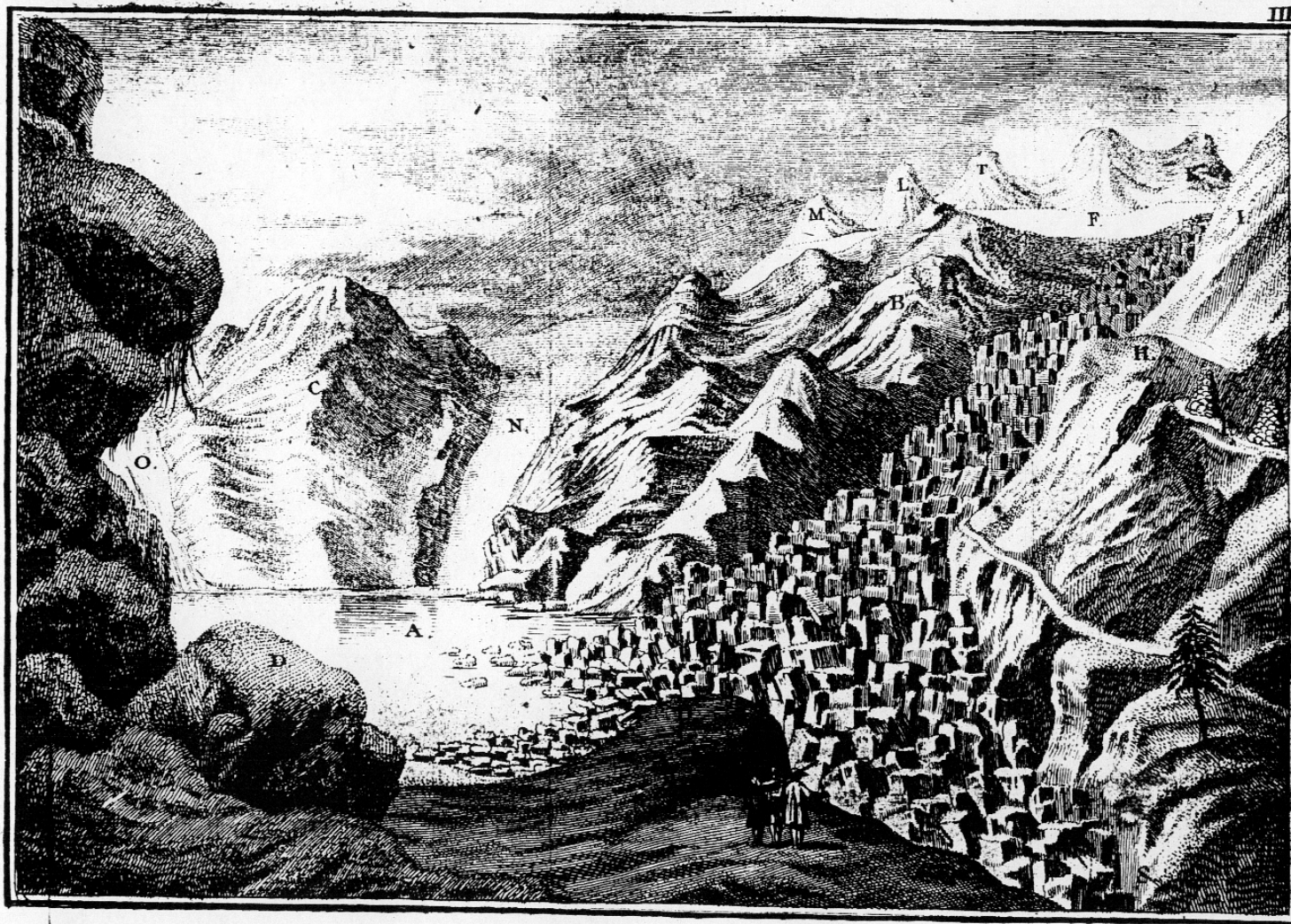
Oerlemans 2001



Northern Hemisphere Temperatures, deviation from 1961-1990



Glacier advances since the Little Ice Age



1980
1920
1850
1820
1770
1680
1600
?
?

Gaisbergferner





Thinning of Nigardsbreen

1748 - 1974

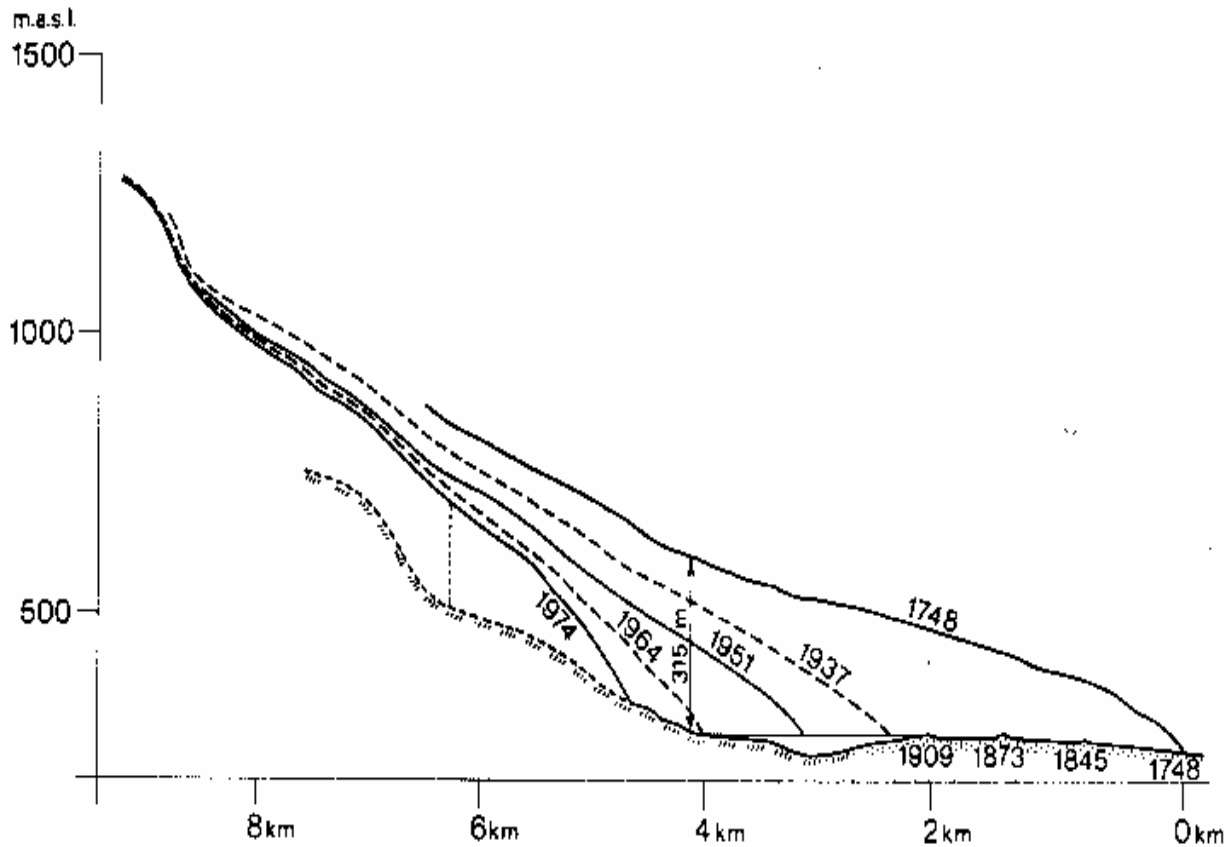
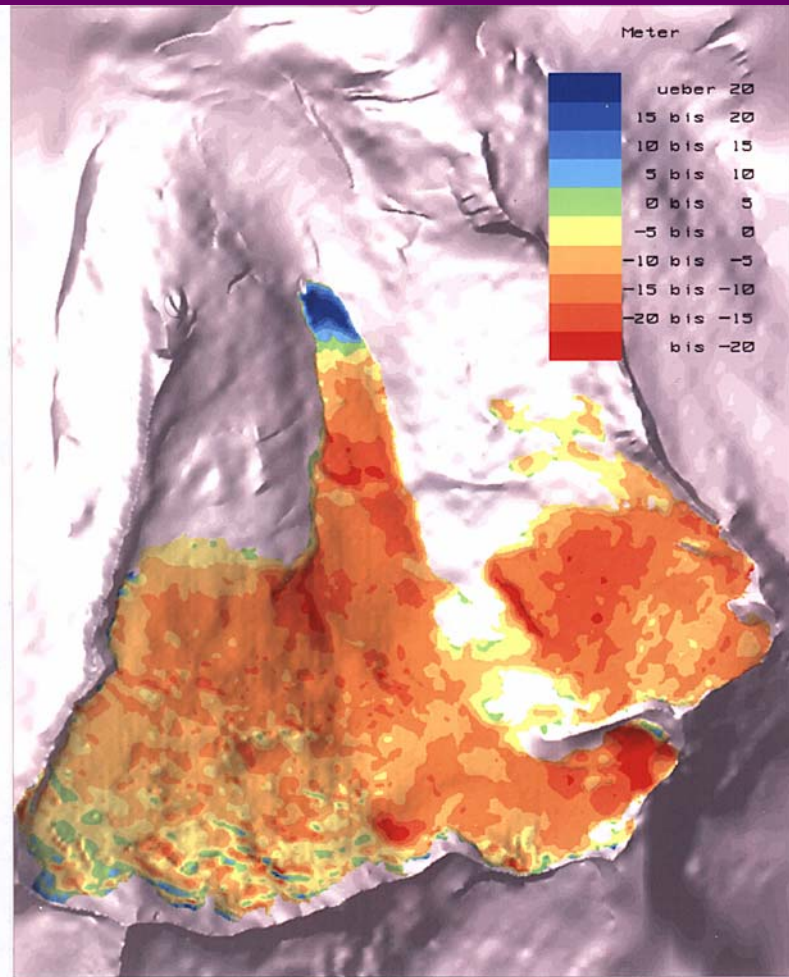


Figure 3.10 Thinning of Nigardsbreen since the mid-eighteenth century. (From Østrem *et al.*, 1976)

Change of surface elevation Hornkees 1969 - 1996



Höhendifferenzen Hornkees zwischen Epoche 1996 und 1969
in der Rasterweite 5m
überlagert mit der digitalen Schummerung aus dem DGM von 1996

Rotmoostal

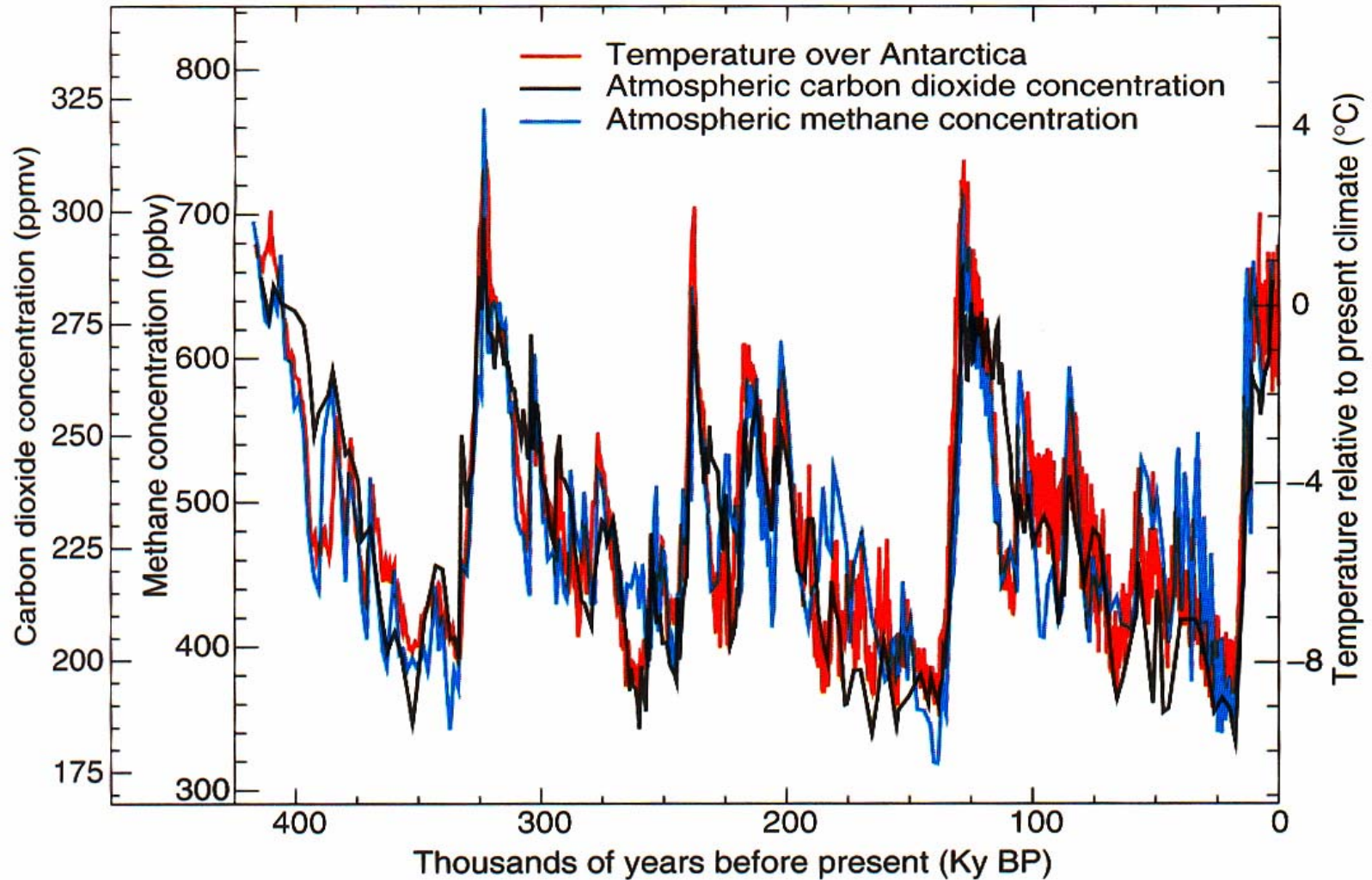




Rotmoos

**10.000 years of
Soil formation**

Temperature, Carbon Dioxide and Methane in the past 400,000 years

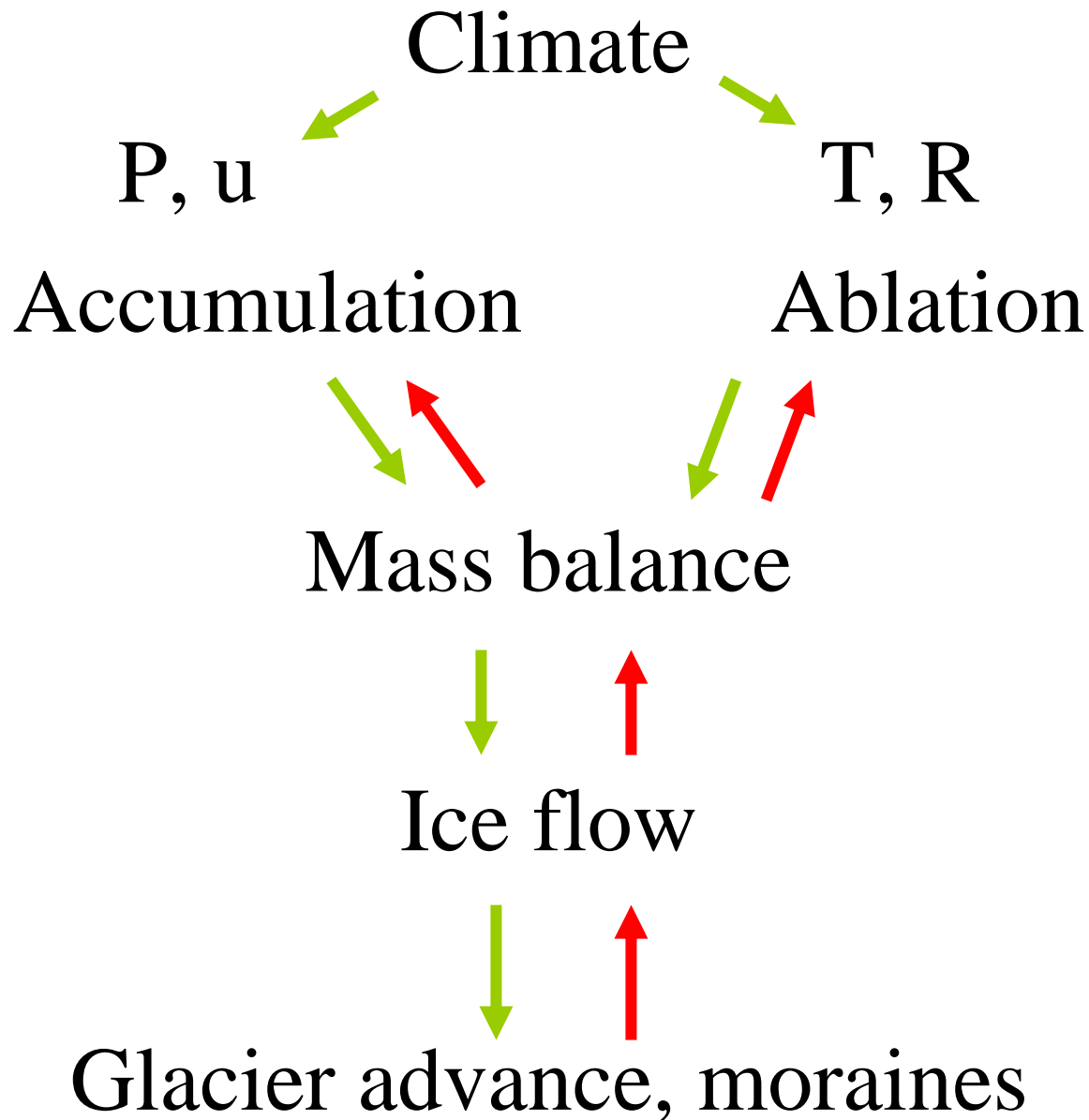




Bird Glacier, Antarctica



An inverse problem







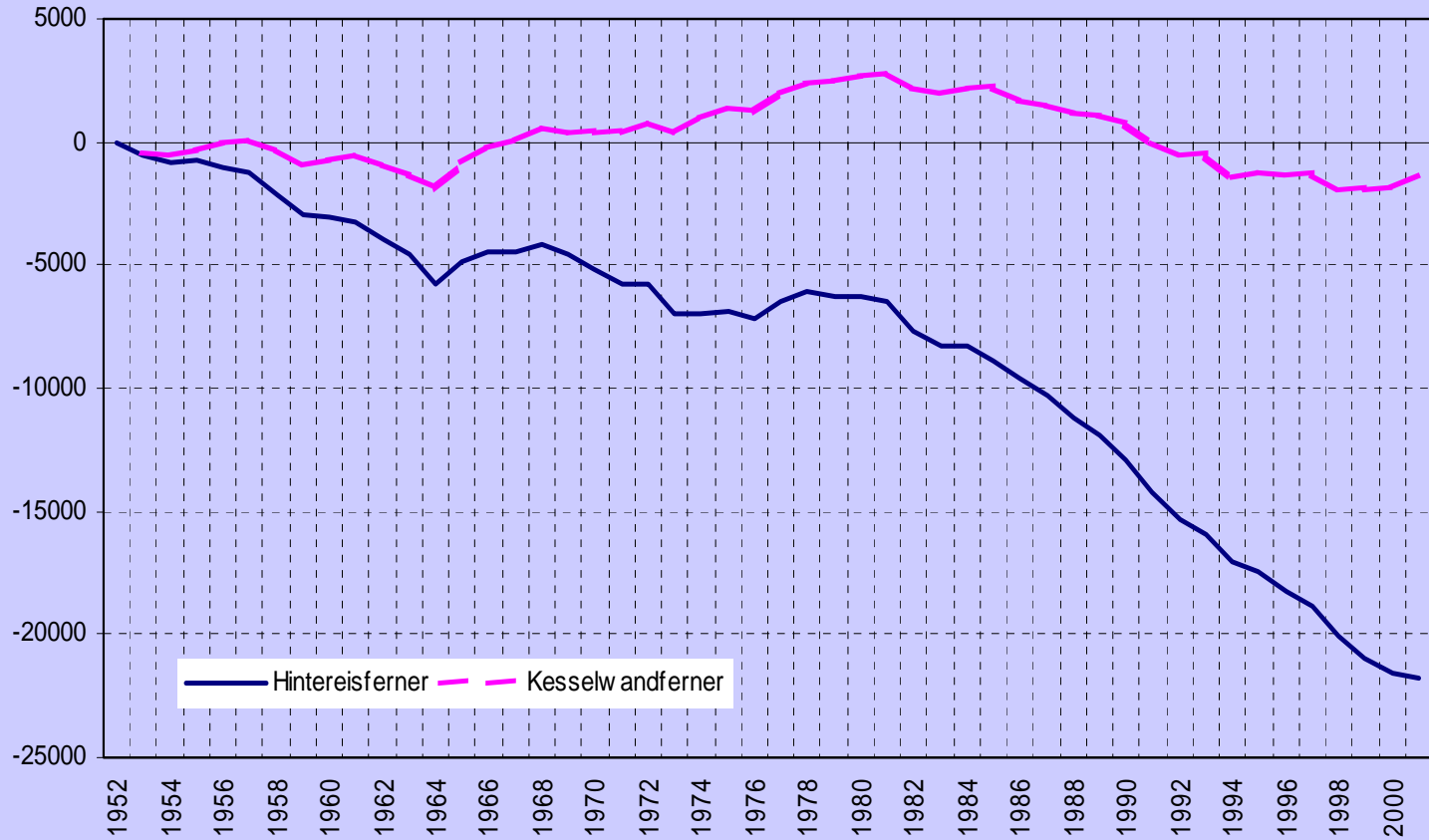


Hintereisferner



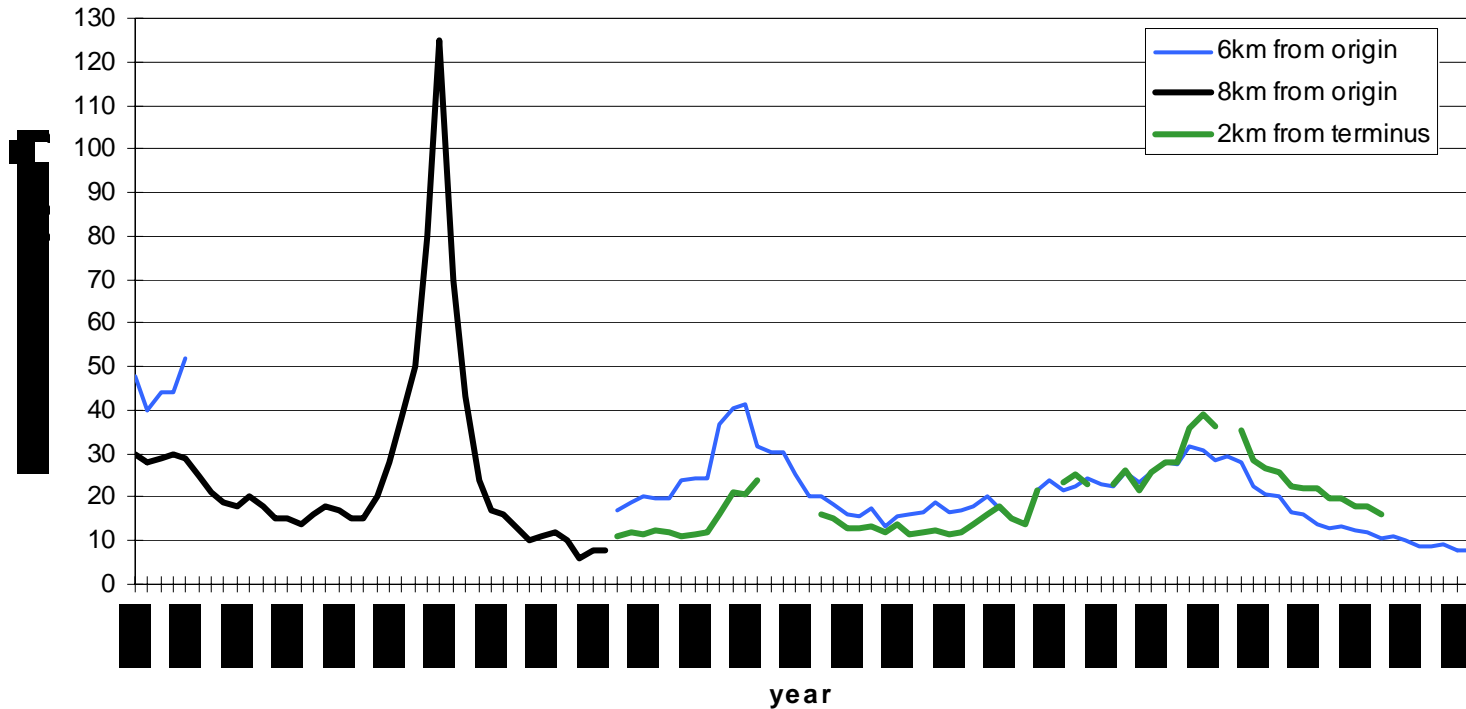
Glaciers are
documents of
global change

Kumulative spez. Massenbilanz



Non-linear flow

100 years of velocity measurements on Hintereisferner



An inverse problem

