

From the last 100 years to the next 100 years: What has changed in the climate of European mountains?

Evidence and scenarios

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Content

- Climate change in the Alps – the past 100 years
- How well do we understand these changes?
(do mountains/the Alps react more sensitive?)
- Impacts of climate change in the Alps
- The coming 100 years – where we are going to?
- Take home messages

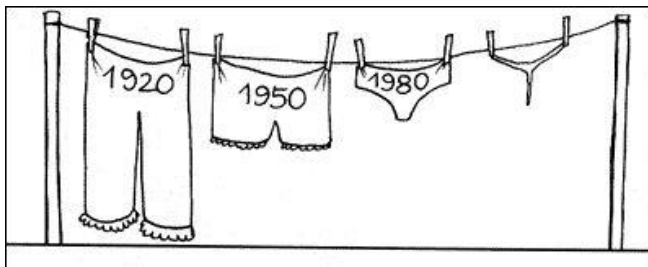
Key evidences



Glacier area of Würtenkees Glacier,
Hohe Tauern, Austrian Alps

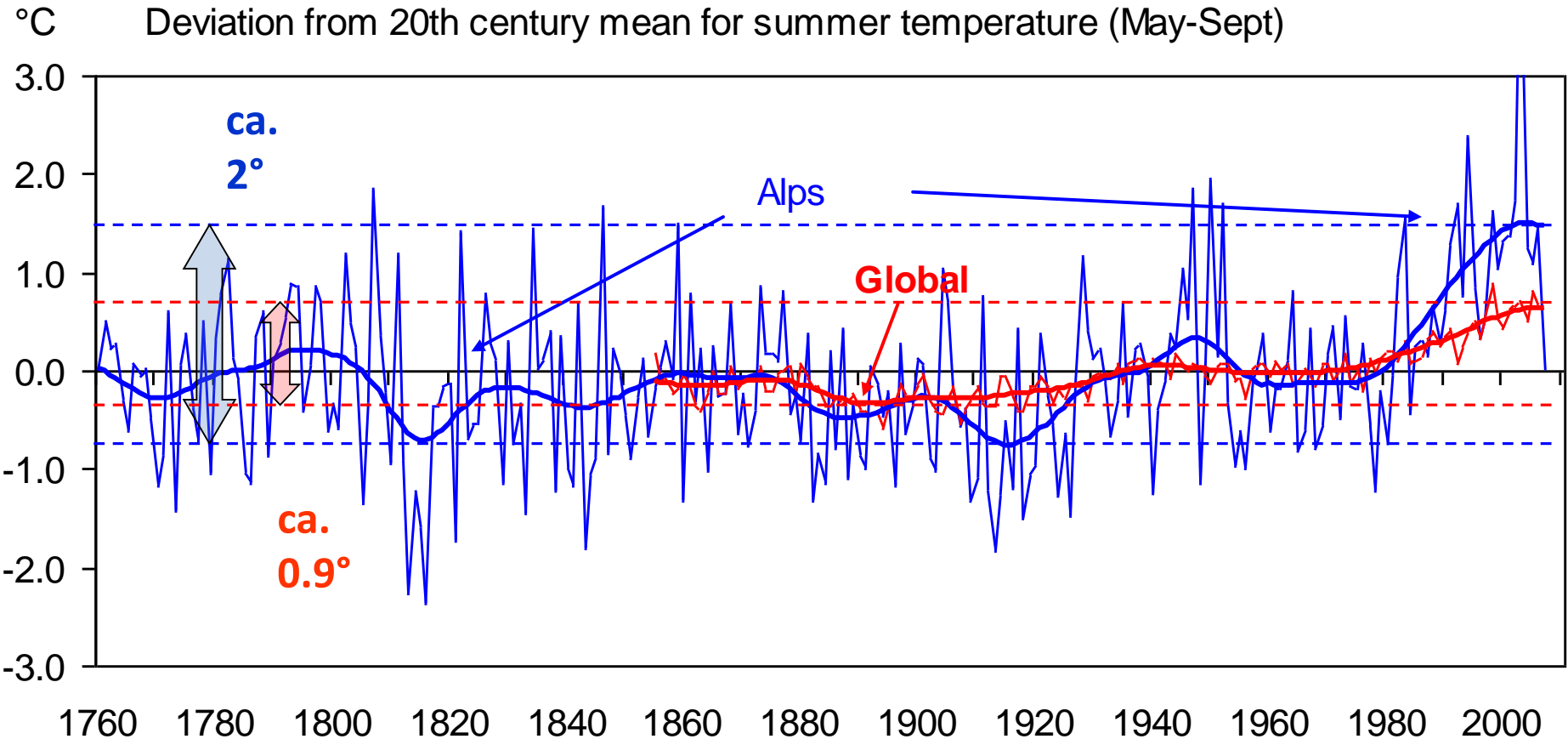
1896 and „today“

Quelle: Archiv Sonnblick Verein



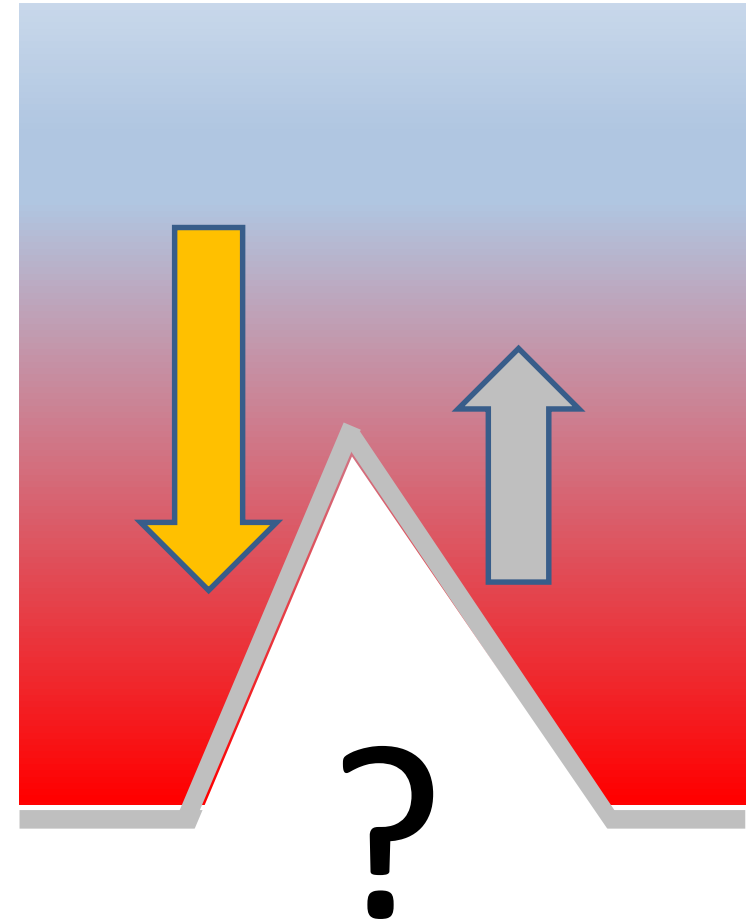
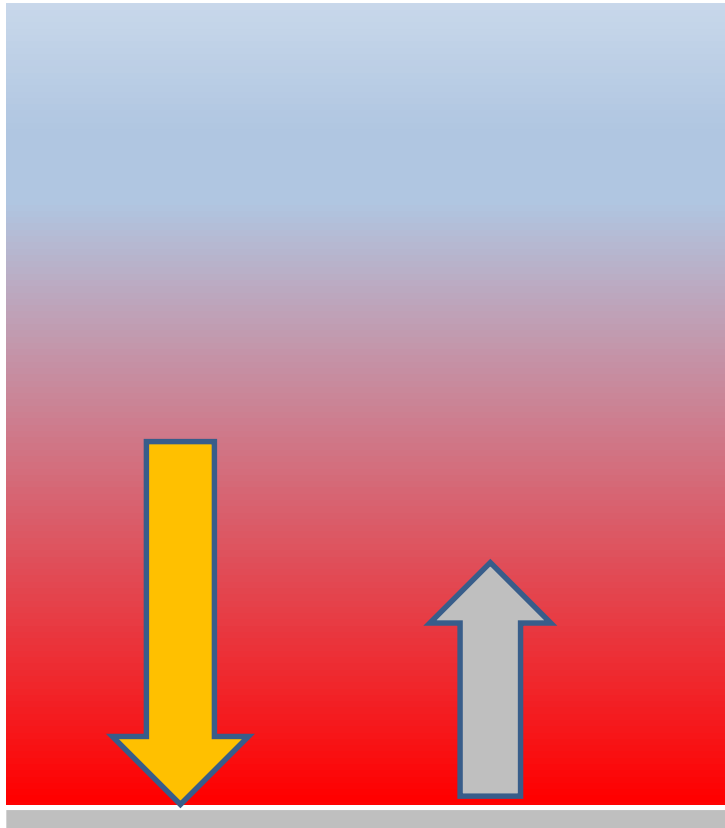
Temperature change

Summer (May-Sept)



Datenquelle: CRU, HISTALP

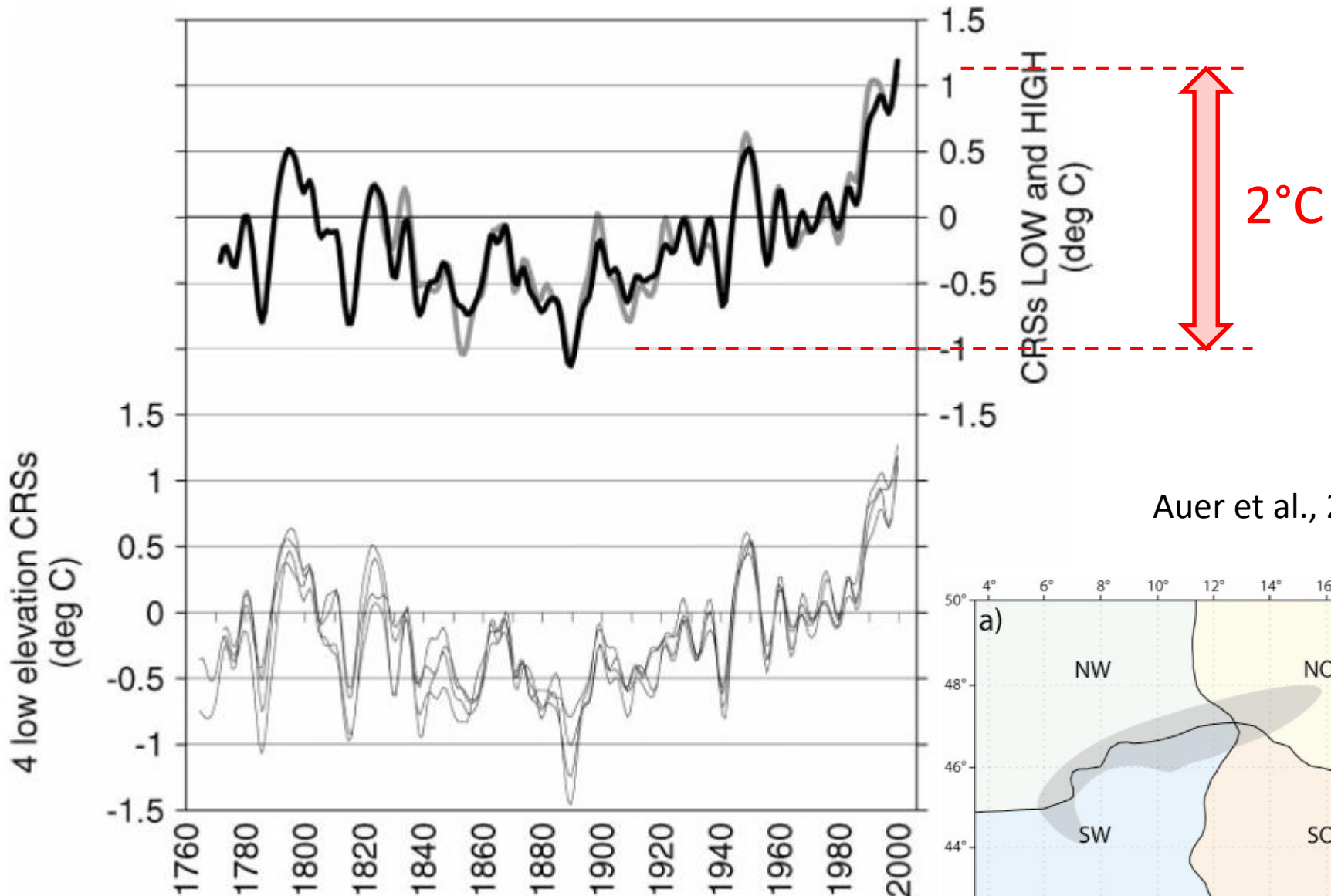
Impact of mountains on Climate Change



Energy exchange
at the surface

Temperature change

Alps (HISTALP)

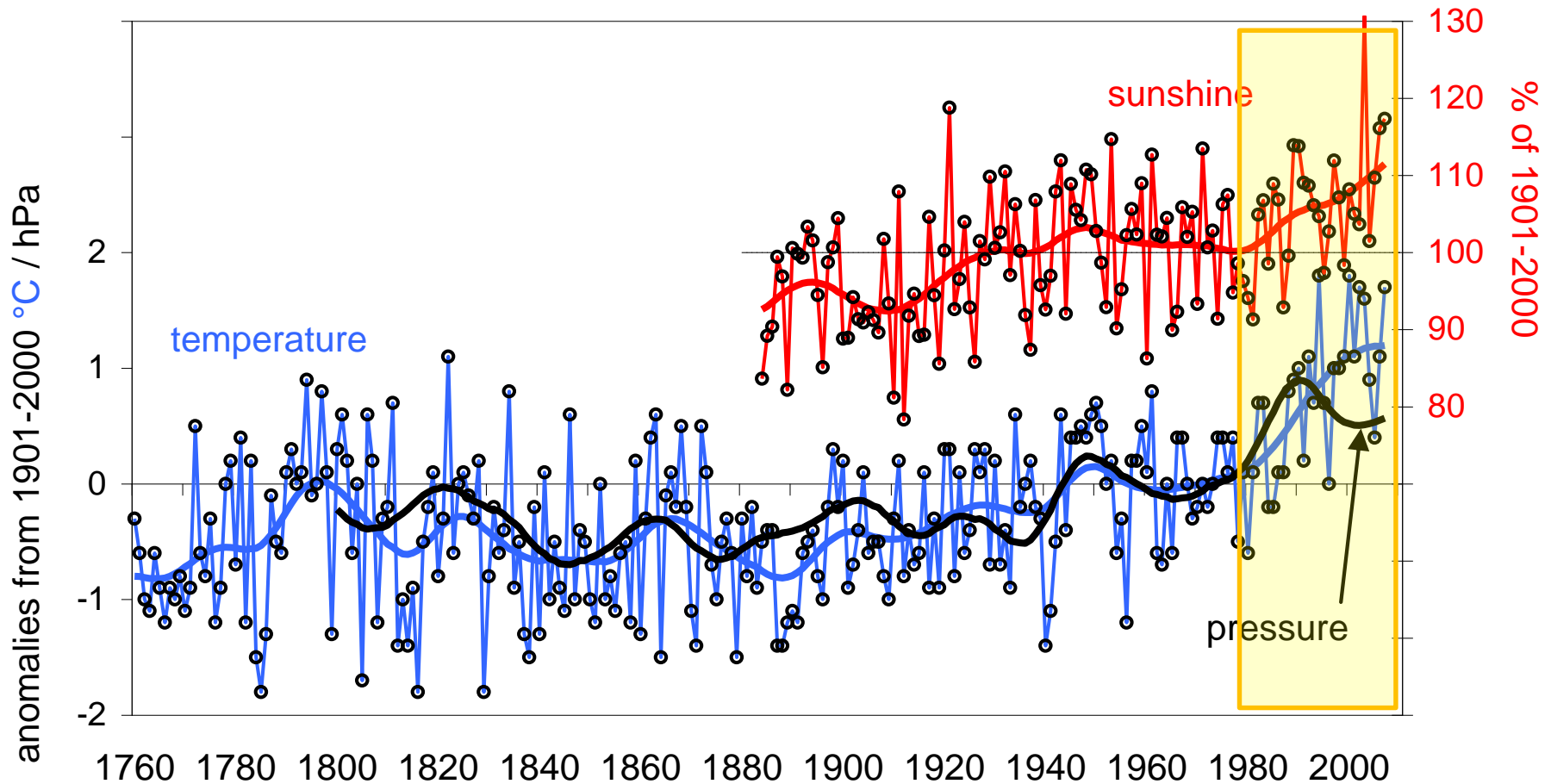


How well do we understand the changes?

Average for:

GAR sunshine HIGH

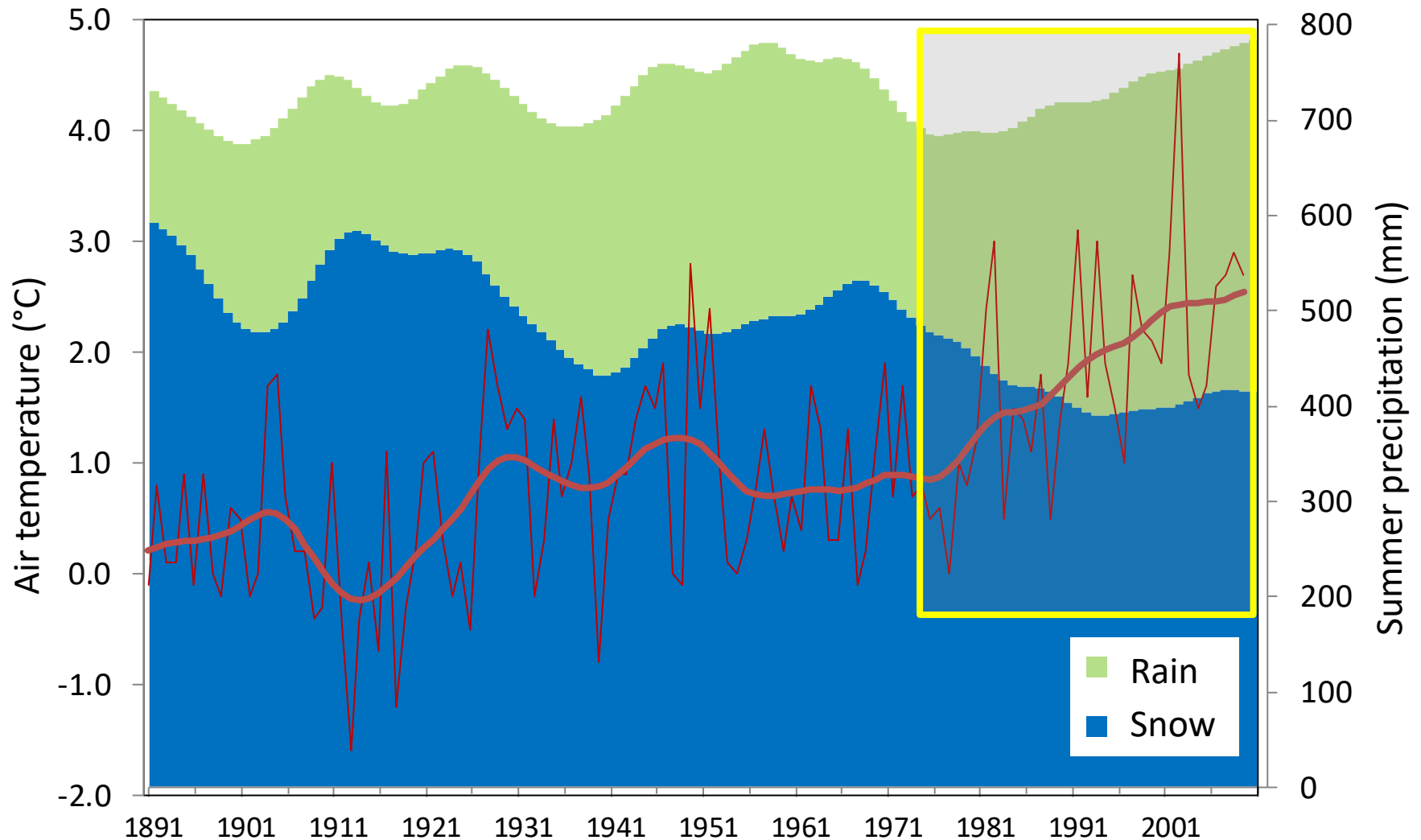
GAR temperature LOW



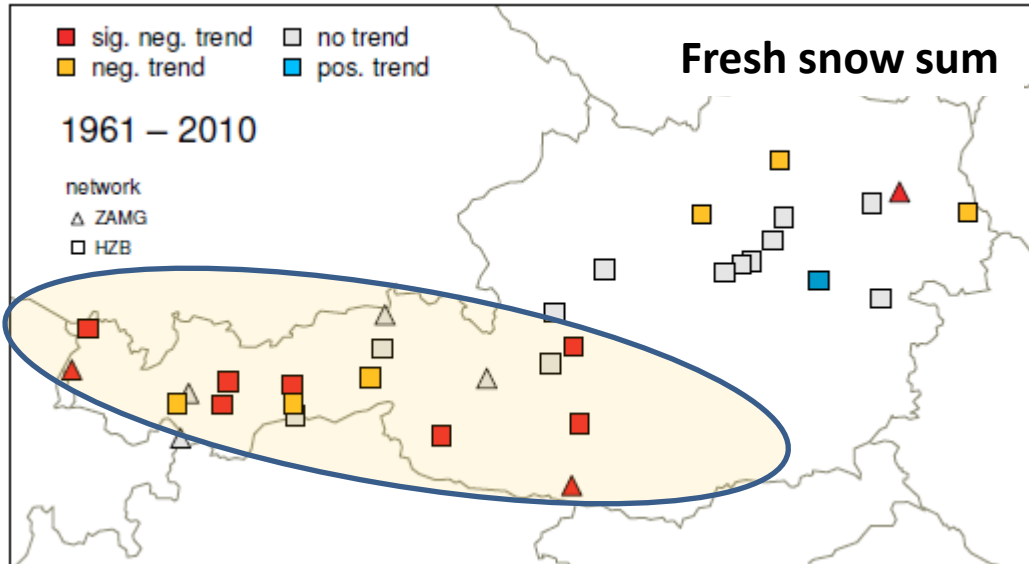
Datenquelle: HISTALP

Impacts of climate change in the Alps #1

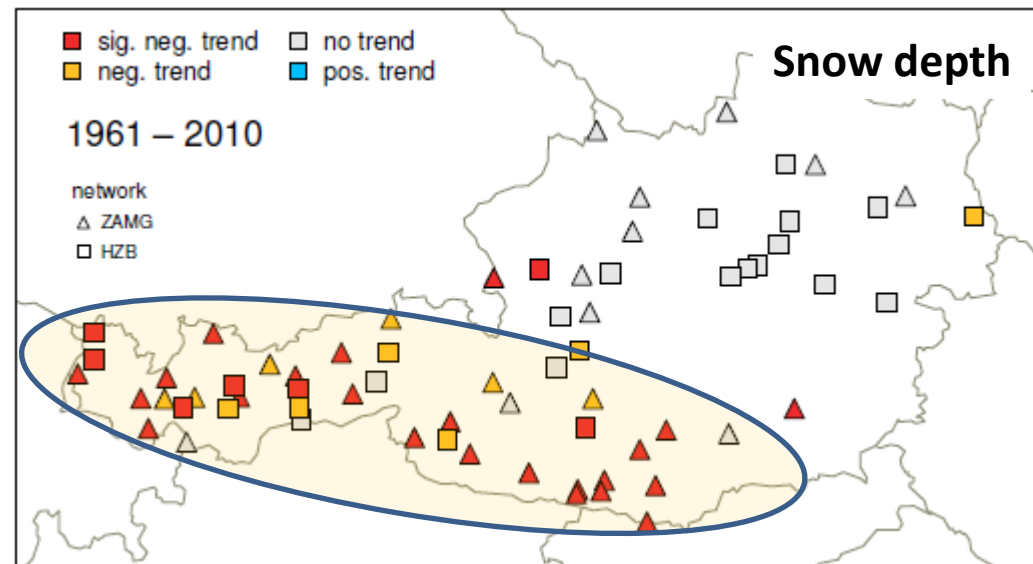
Precipitation change solid/liquid at Sonnblick



Impacts of climate change in the Alps #2



Snow trends in Austria

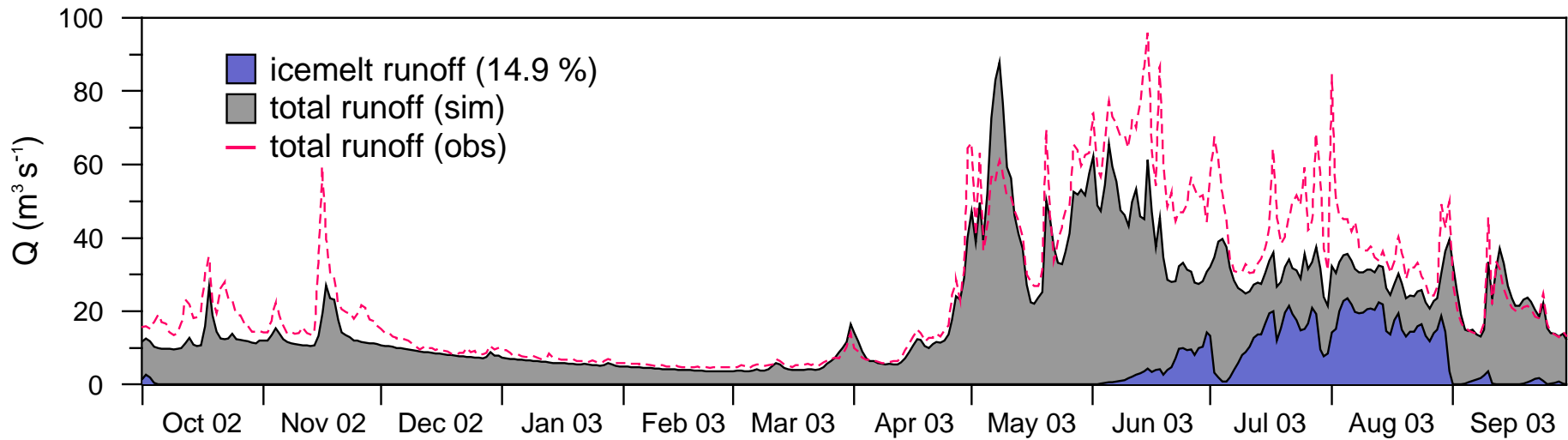


Schöner et al., 2016

Impacts of climate change in the Alps #3

Glacier melt

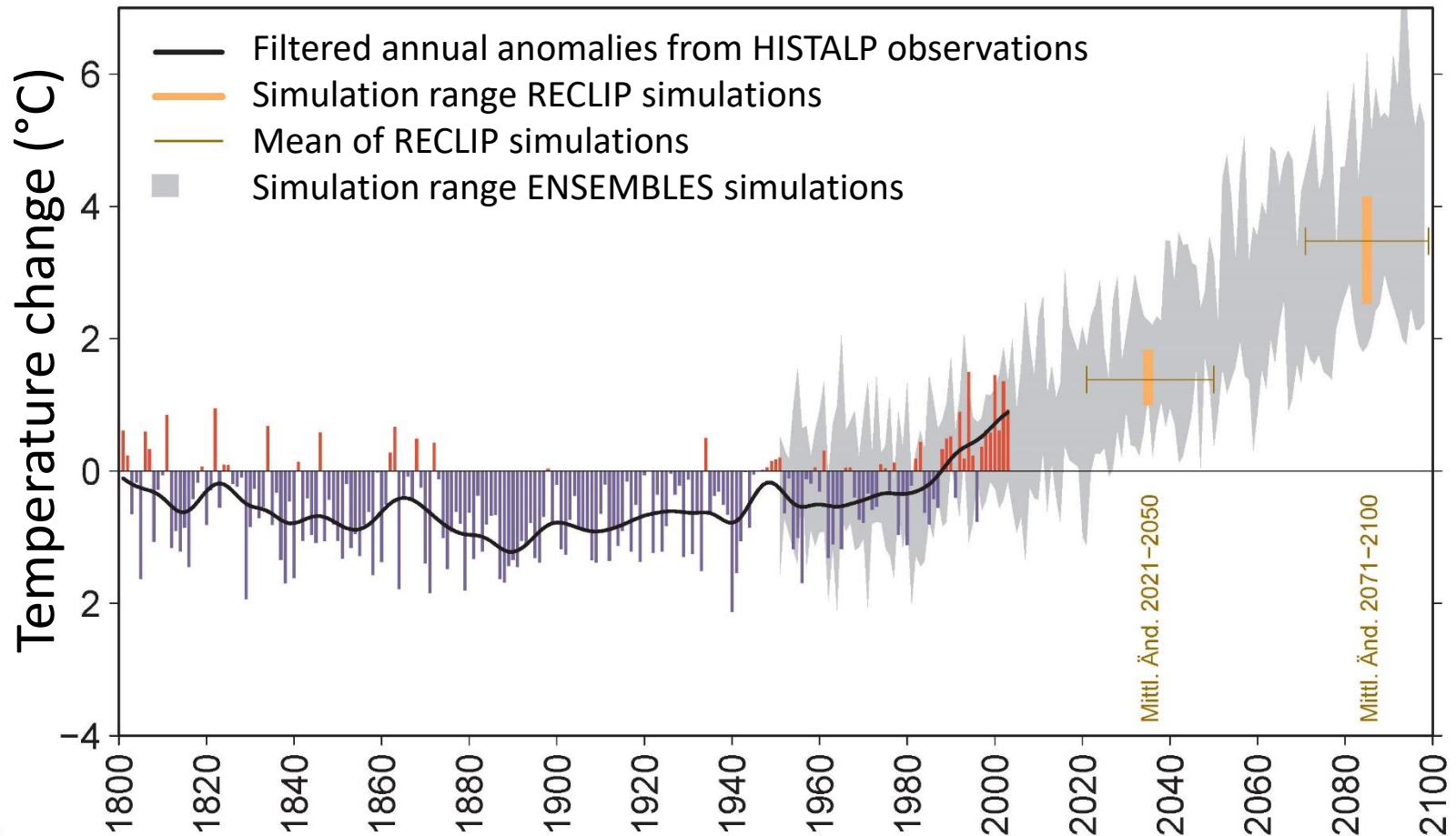
Proportion of glacier melt at discharge for
the Upper Salzach catchment (Austria)
(approx. 500km²)
in 2003



The coming 100 years

Air temperature

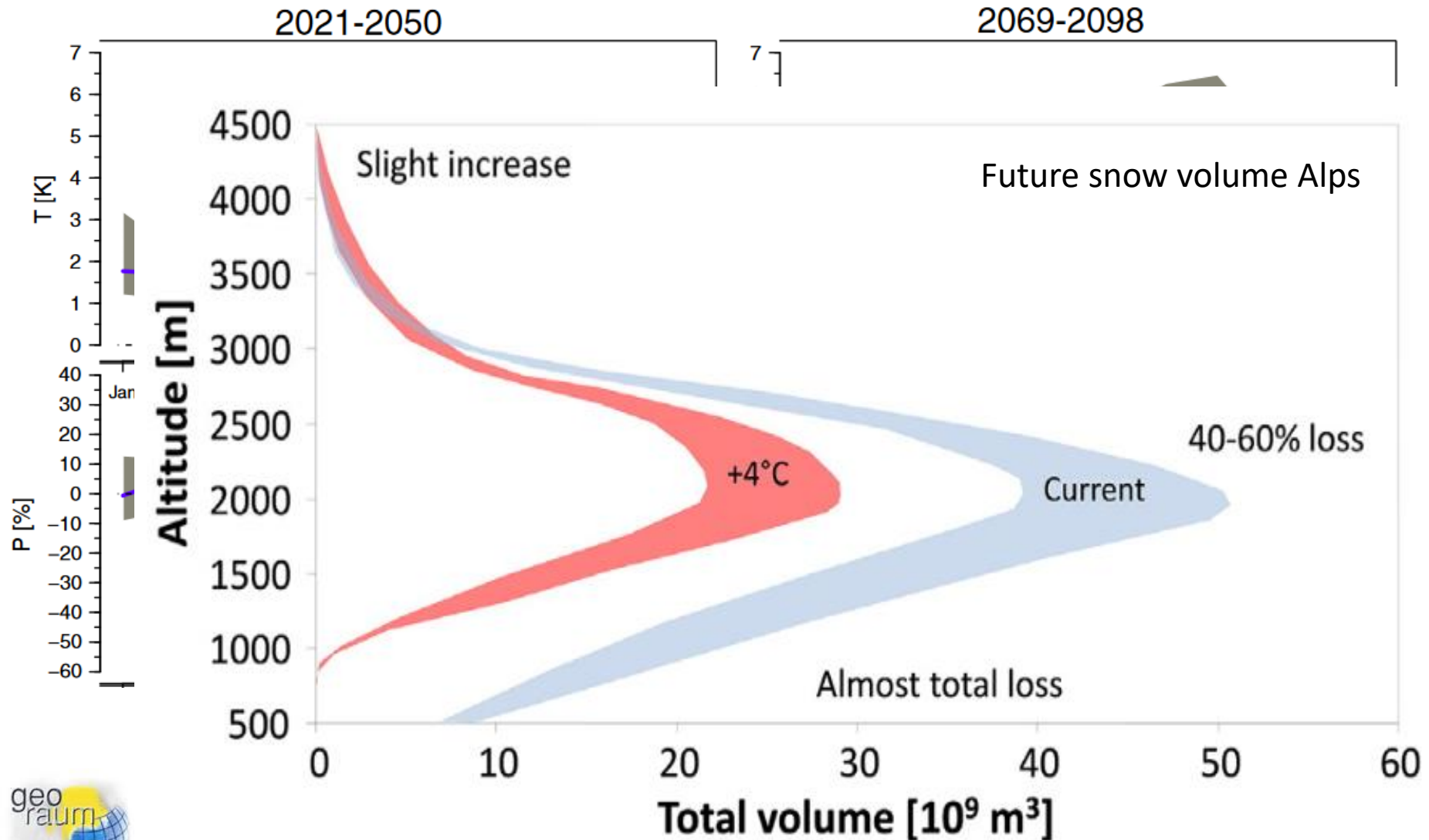
Change of mean annual air temperature (reference period 1971-2000)



Schöner et al., 2013

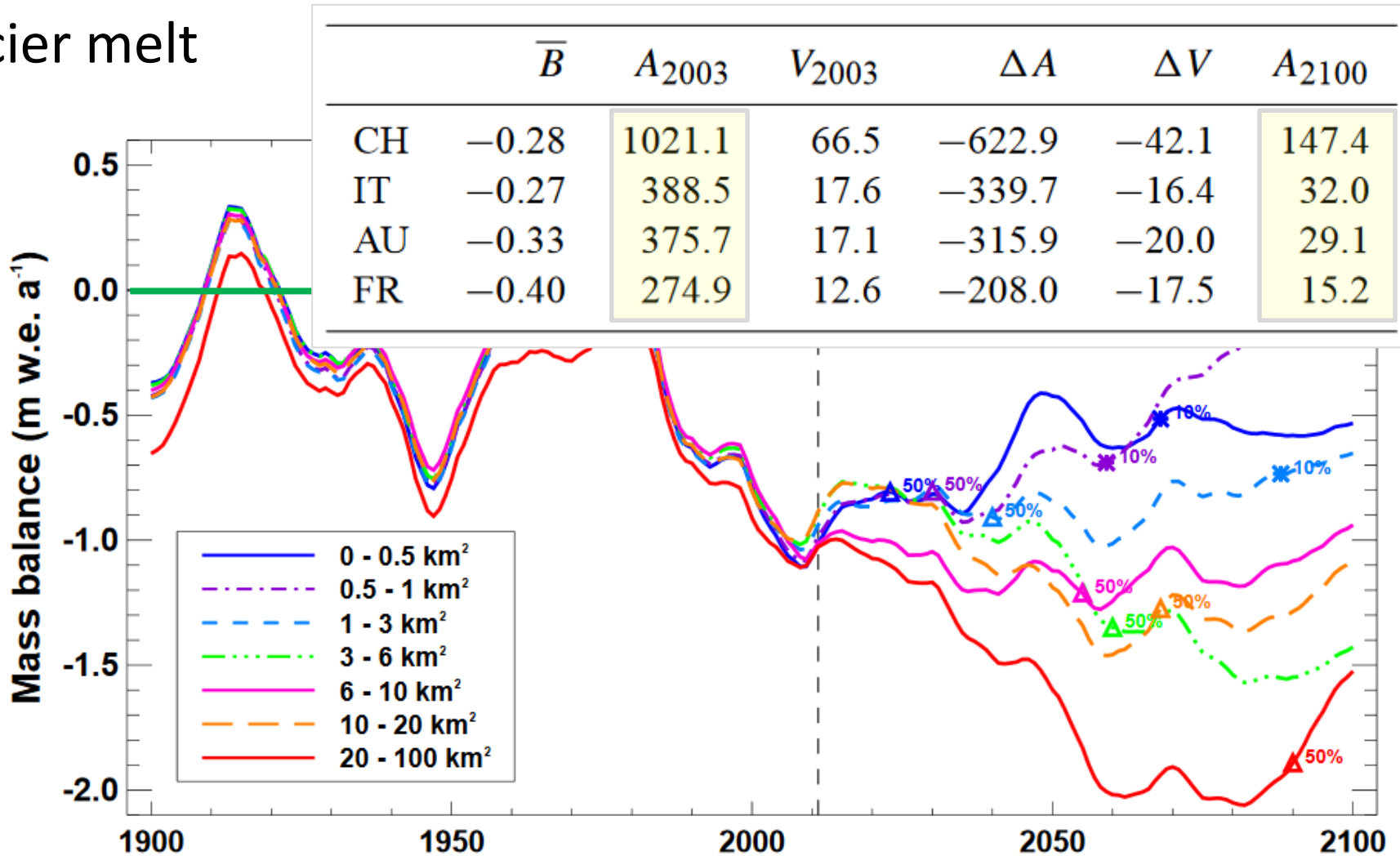
The coming 100 years

Air temperature and precipitation



Impacts of climate change in the Alps (A1B scenario)

Glacier melt



Take home messages

- Over the last 30-40 years climate change in the Alps has been much larger than on the global level. This is, however, not mandatory for other periods in the past and quite unsure for the future. Uncertainty comes from the complex mechanisms causing the **Alpine amplification** of climate change.
- Most obvious and relevant impact of climate change in the Alps is for the cryosphere (glaciers, snow, permafrost) and related changes of Alpine hydrology/water cycle.

Take home messages

- Climate model simulations for the next 100 years generally show larger warming for the Alpine region in comparison to the global level, too. In the light of the Paris treaty a **doubling of the global warming is a preventive assumption**. Scenarios for precipitation are still fighting with high uncertainty of simulations. But increase of extreme precipitation is conclusive.

Thank you!