Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
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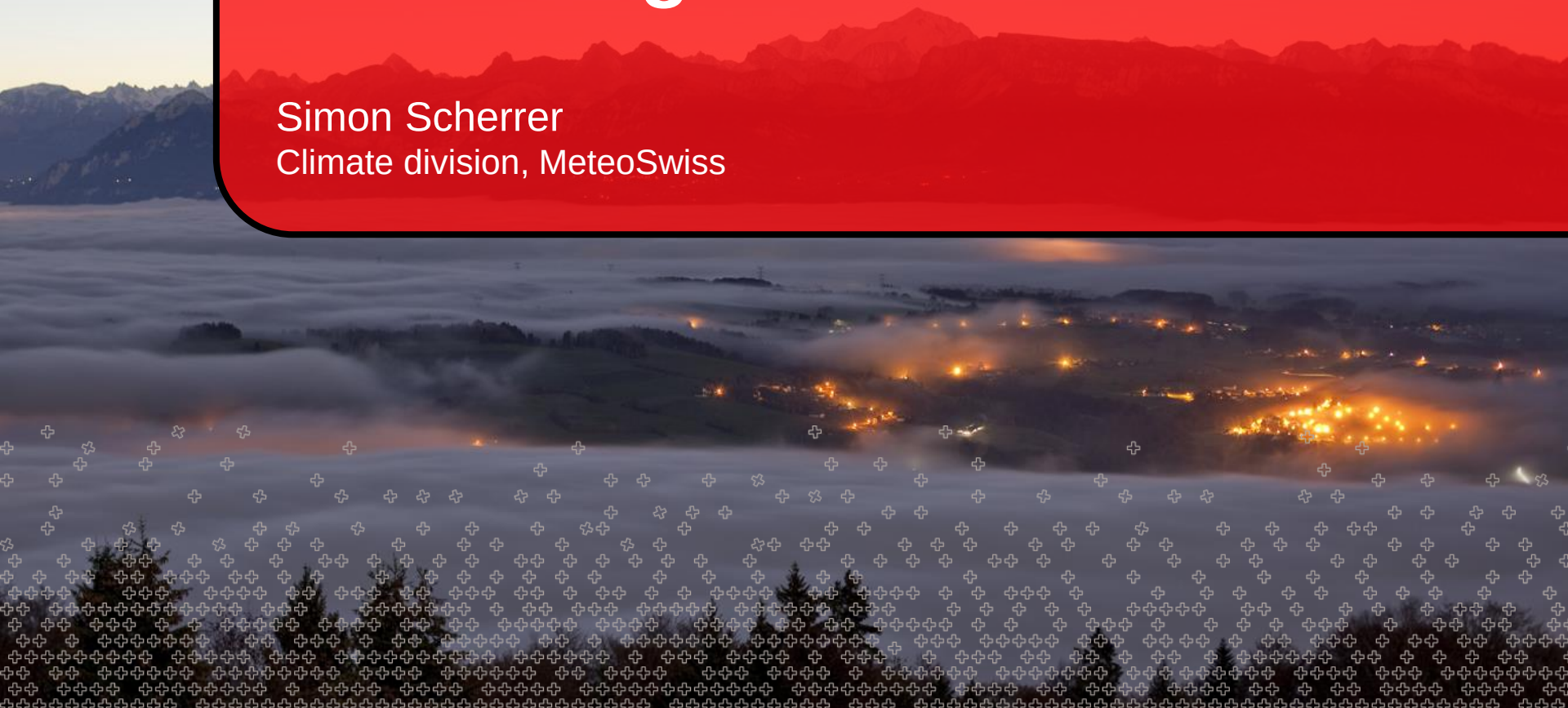
Federal Departement of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

A glimpse on climate variability and change in Switzerland

Simon Scherrer
Climate division, MeteoSwiss



Contents

(1) observed
climate variability & trends


temperature


precipitation


sunshine


snow


fog

Extremes?

(2) future climate change


temperature

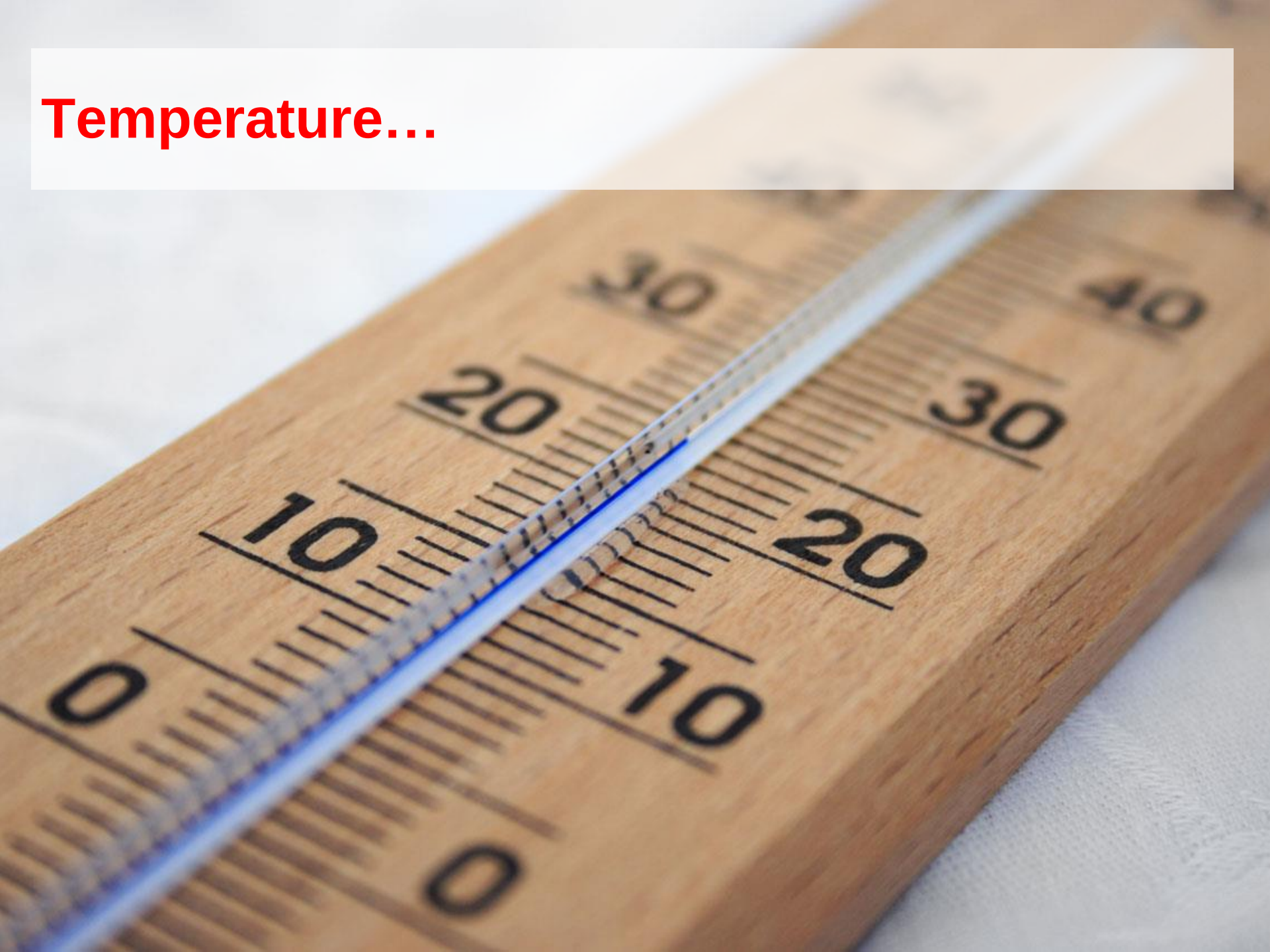

precipitation


snow

Extremes?

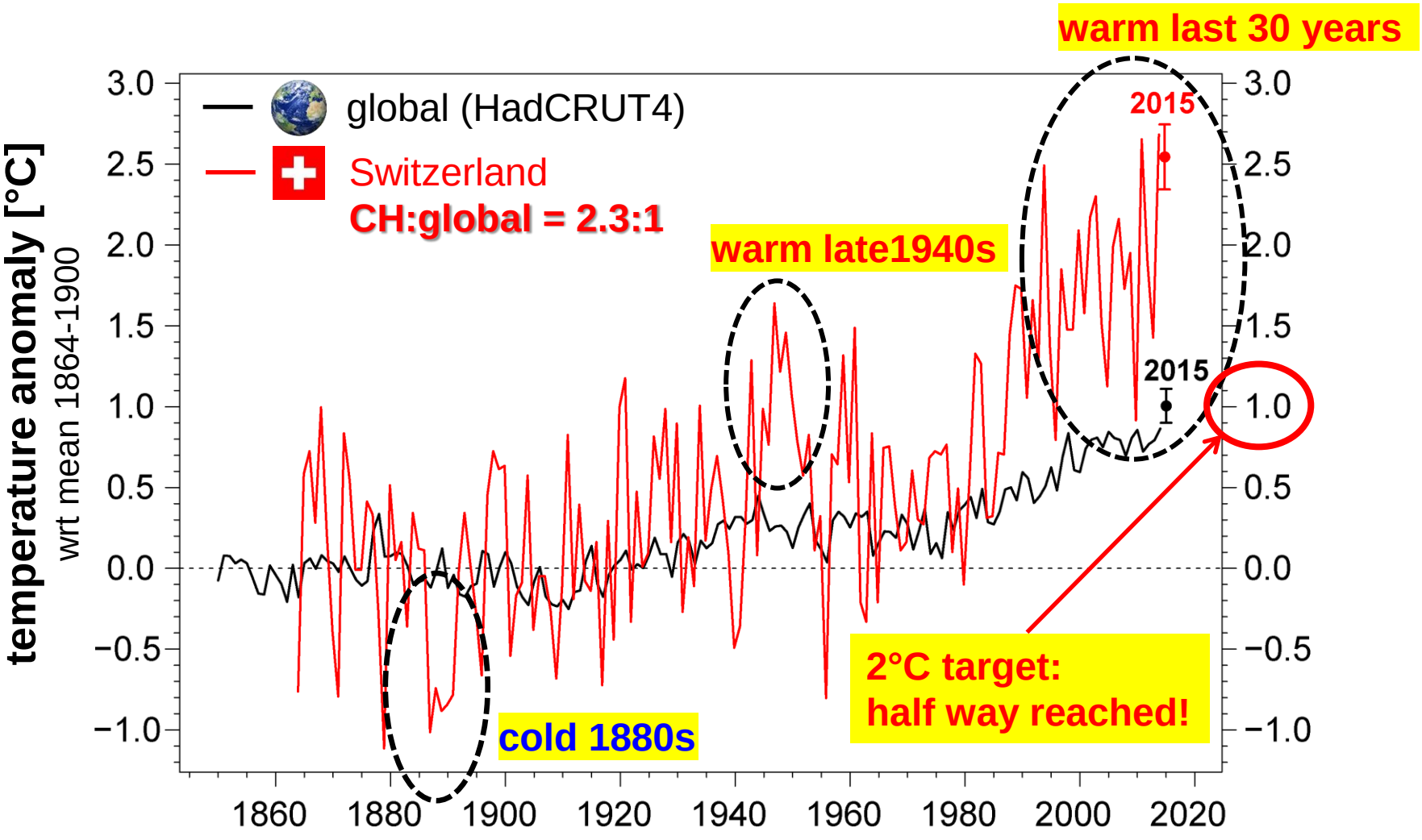
(3) Climate Services: National Centre for Climate Services (NCCS)

Temperature…



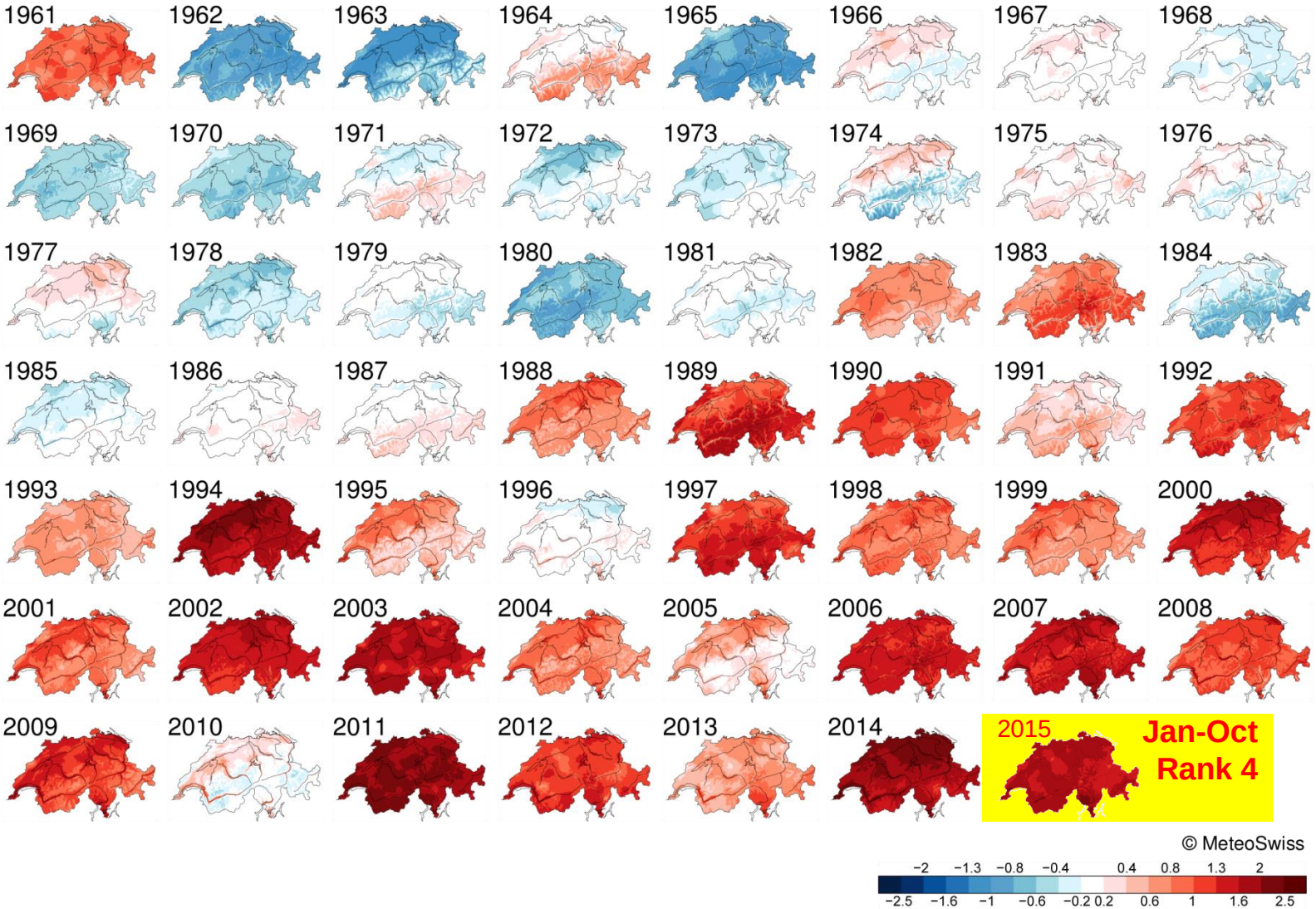
Temperature change CH & global

time series, changes 1864-2014 and outlook 2015 [°C]



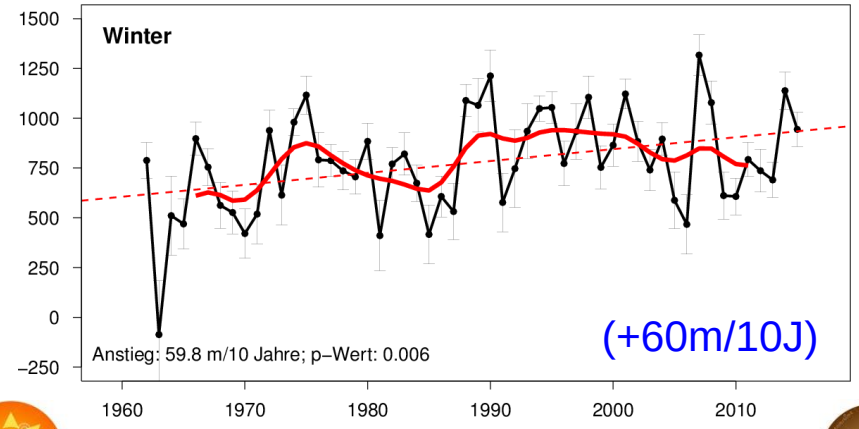
Temperature change Switzerland

deviations from norm 1961-1990 (°C) (1961-2014; 2015: 1.1.-31.10.)

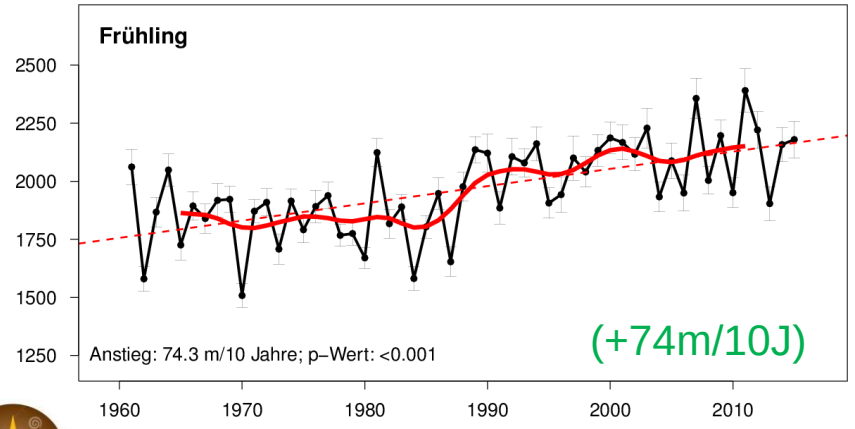


0°C-line 1961-2015

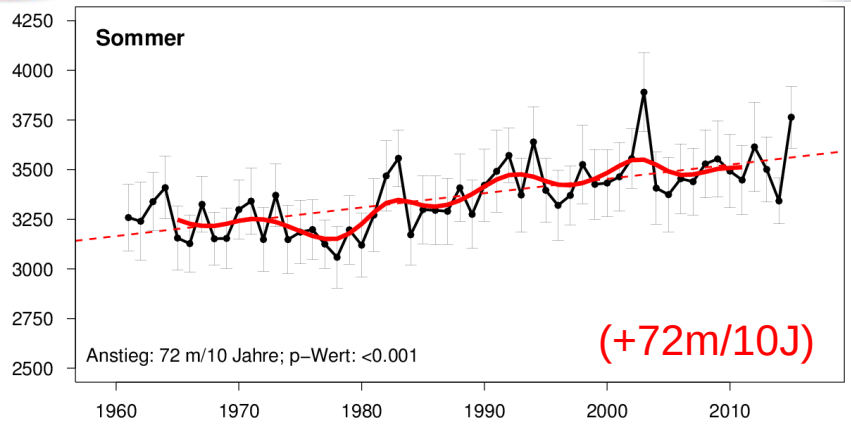
winter: +325m (600 → 825m)



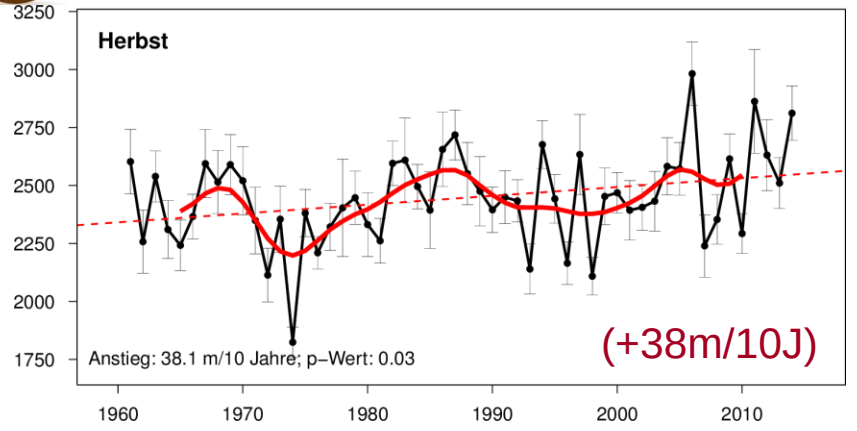
spring: +400m (1750 → 2150m)



summer: +375m (3200 → 3575m



autumn: +200m (2325 → 2525m)

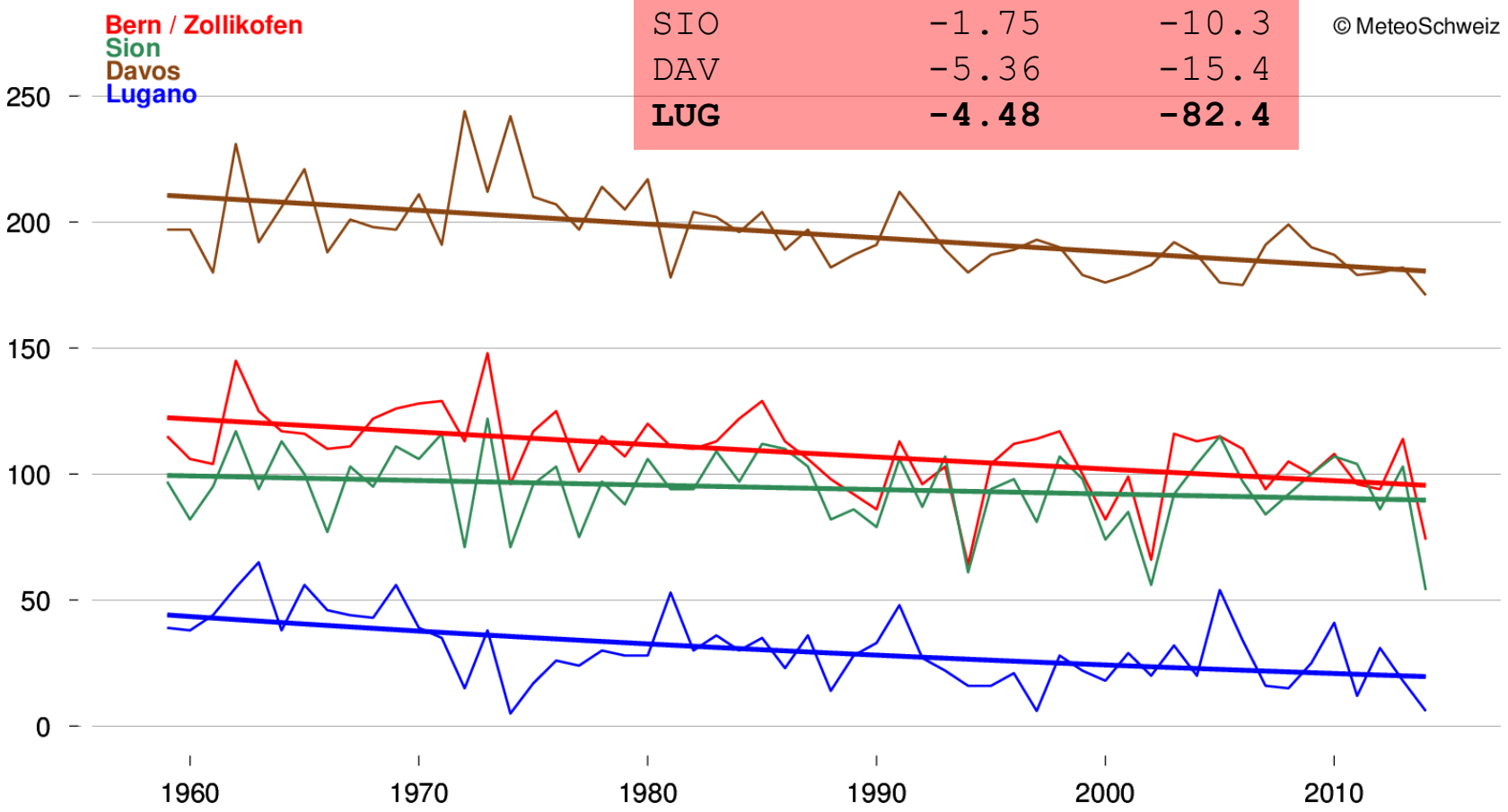


150-200m increase per °C warming

Frost days

1959-2014

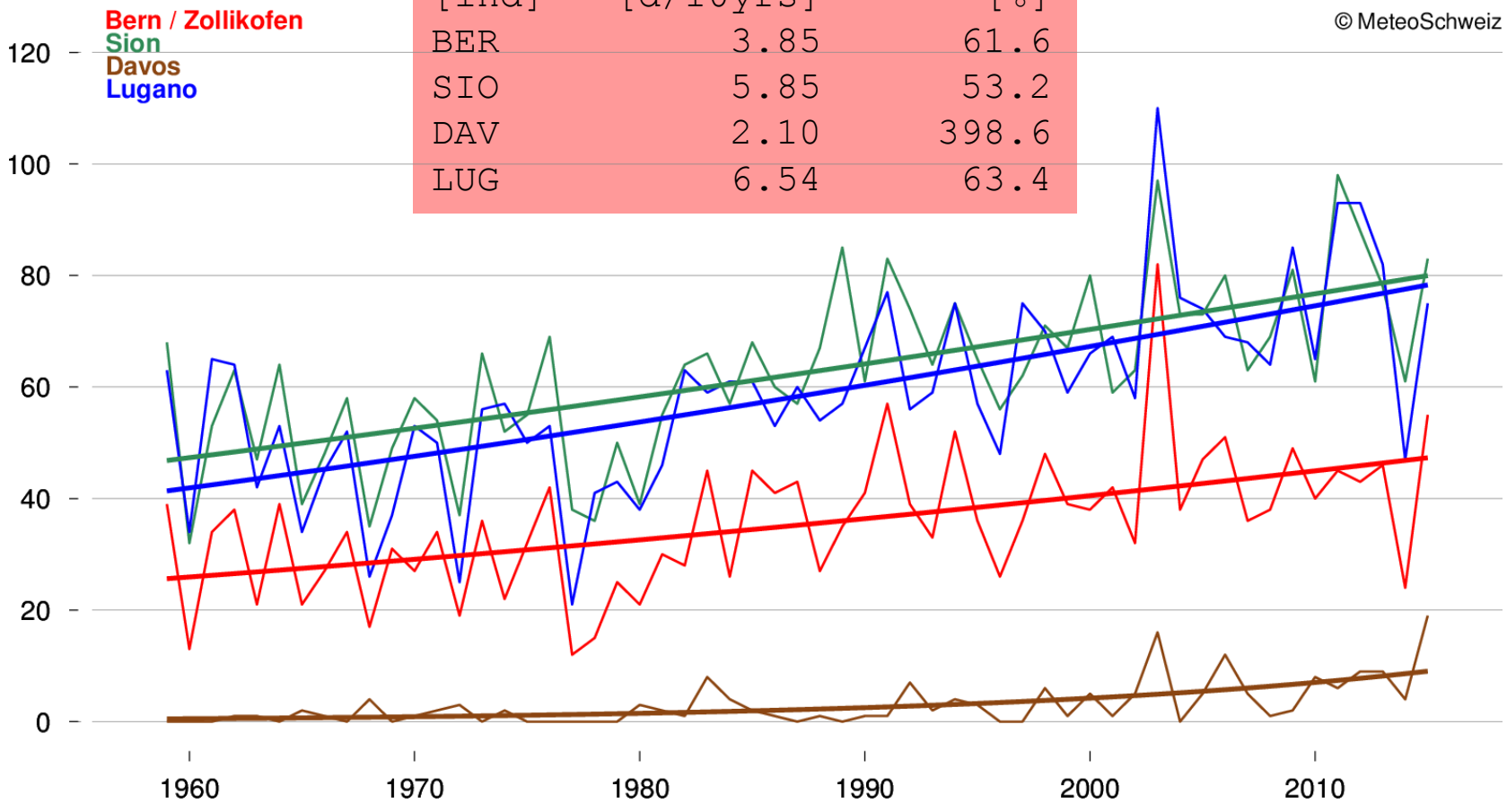
station	abs.Trend	rel.Trend
[ind]	[u/10yrs]	[%]
BER	-4.80	-24.7
SIO	-1.75	-10.3
DAV	-5.36	-15.4
LUG	**-4.48**	**-82.4**



Summer days

1959-2015

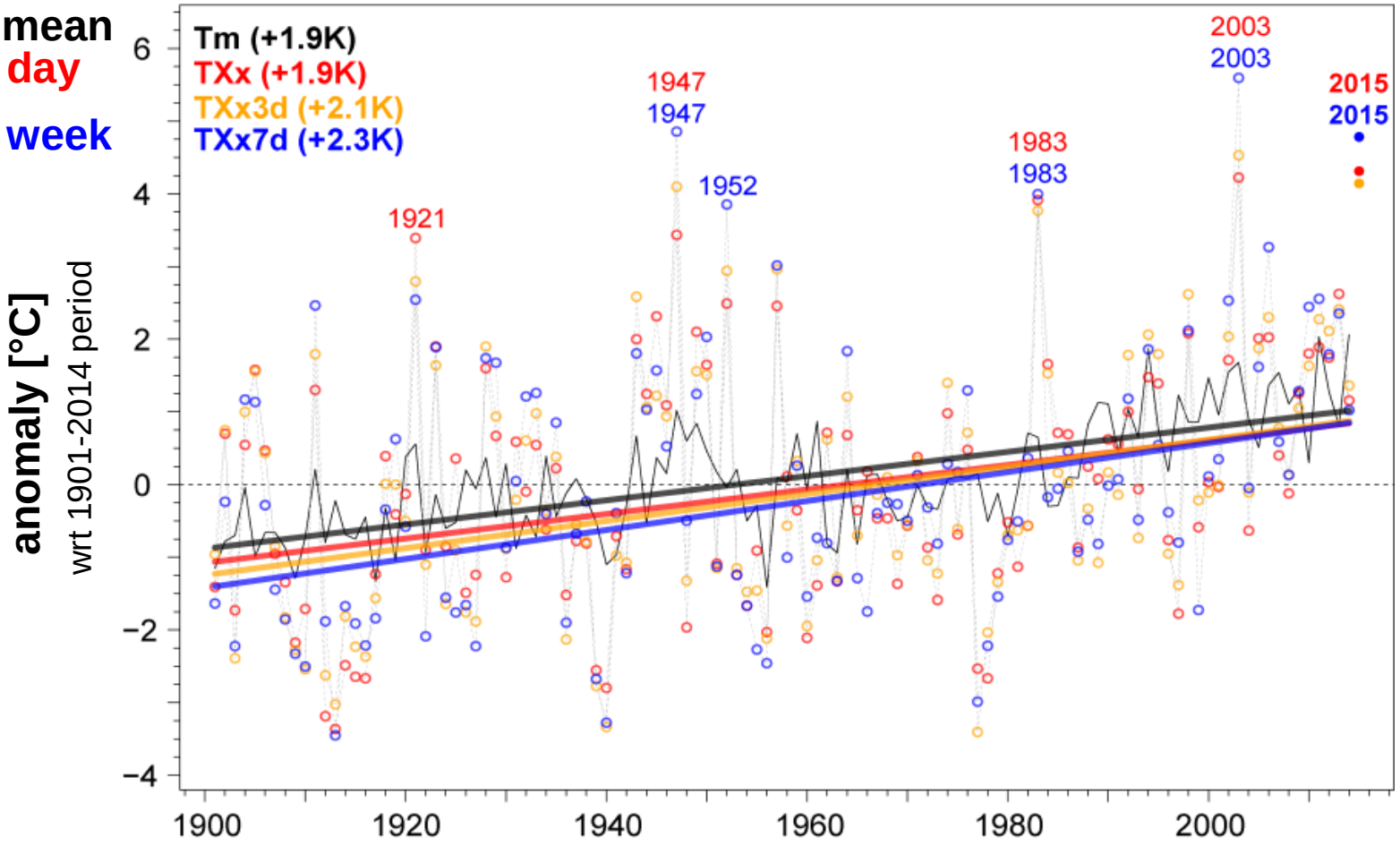
station	abs.Trend	rel.Trend
[ind]	[d/10yrs]	[%]
BER	3.85	61.6
SIO	5.85	53.2
DAV	2.10	398.6
LUG	6.54	63.4



Hot temperature extremes (1)

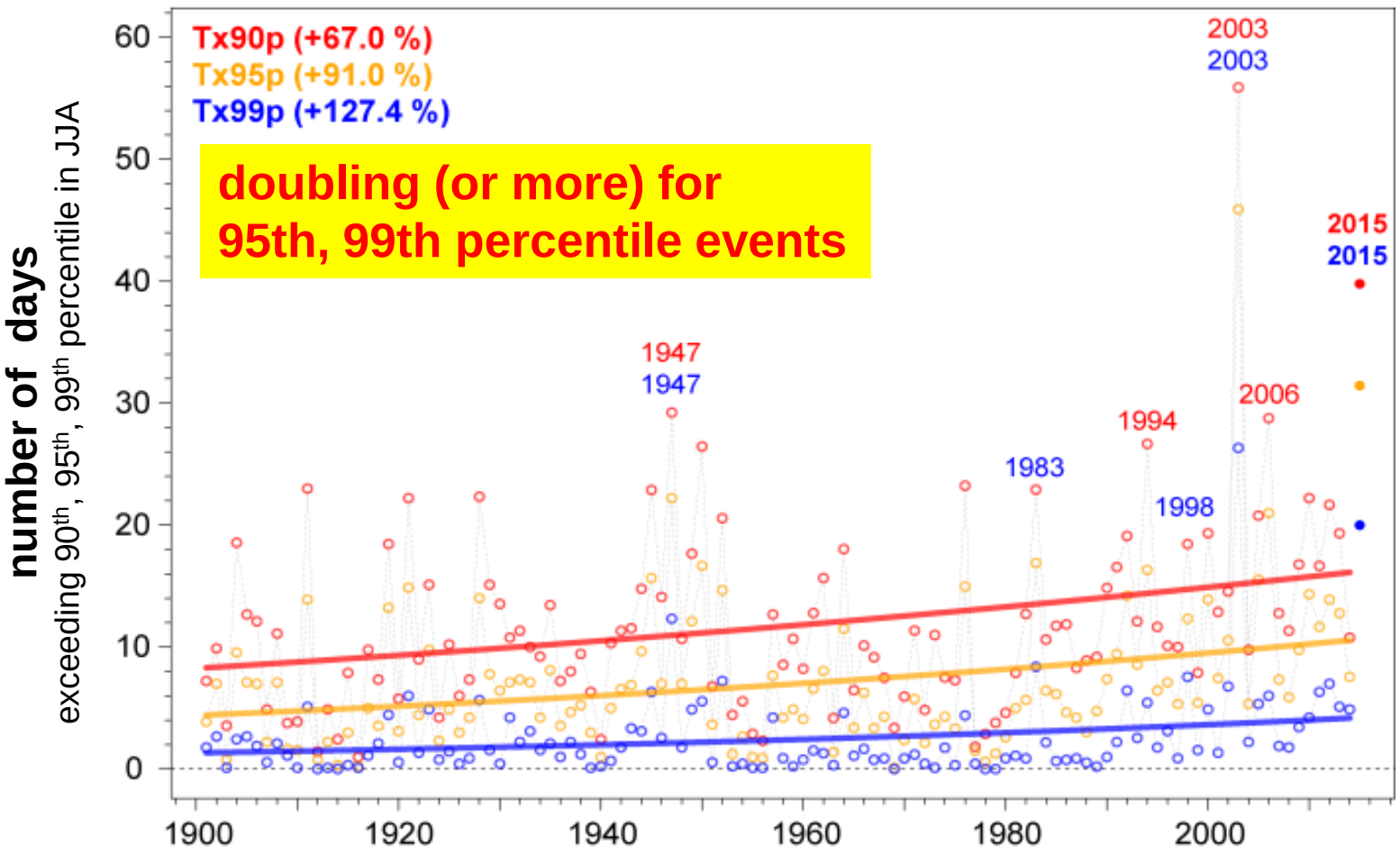
«Intensities» Swiss mean from 9 stations [°C], 1901-2015

annual mean
hottest day
hottest week



Hot temperature extremes (2)

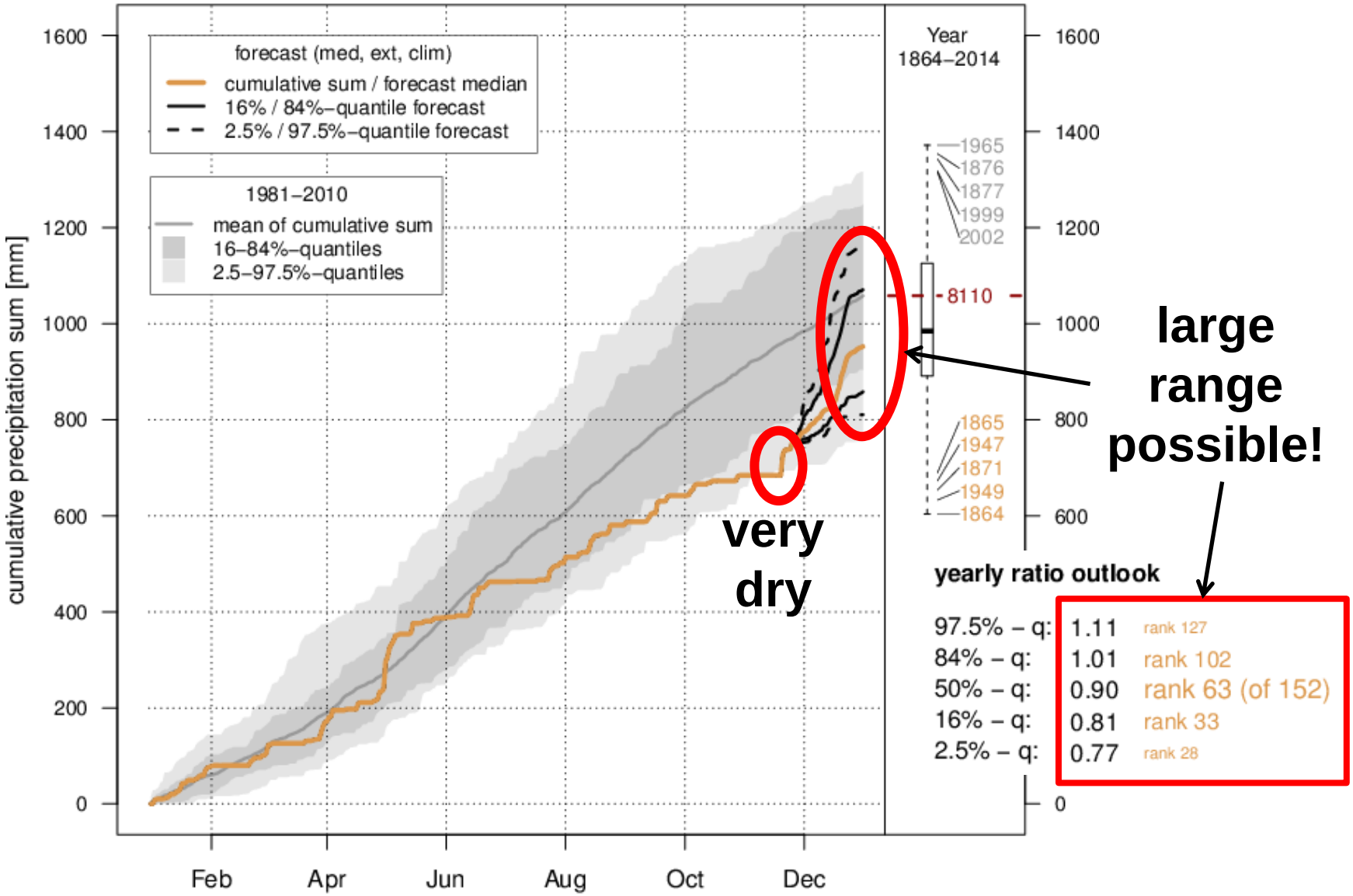
«Frequency» Swiss mean from 9 stations [°C], 1901-2015



precipitation…

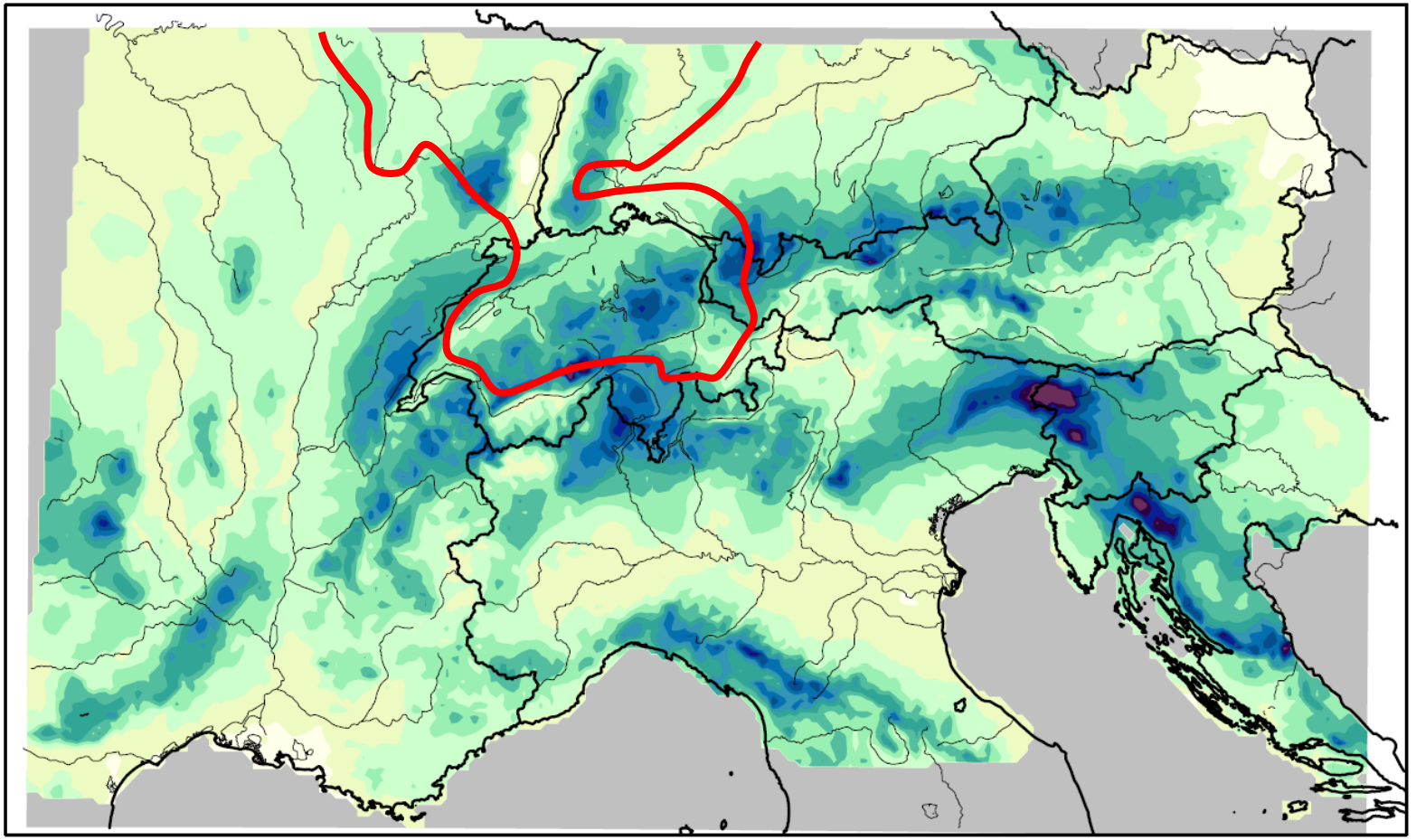
2015: a dry year on the Plateau?

Bern / Zollikofen



Mean annual precipitation

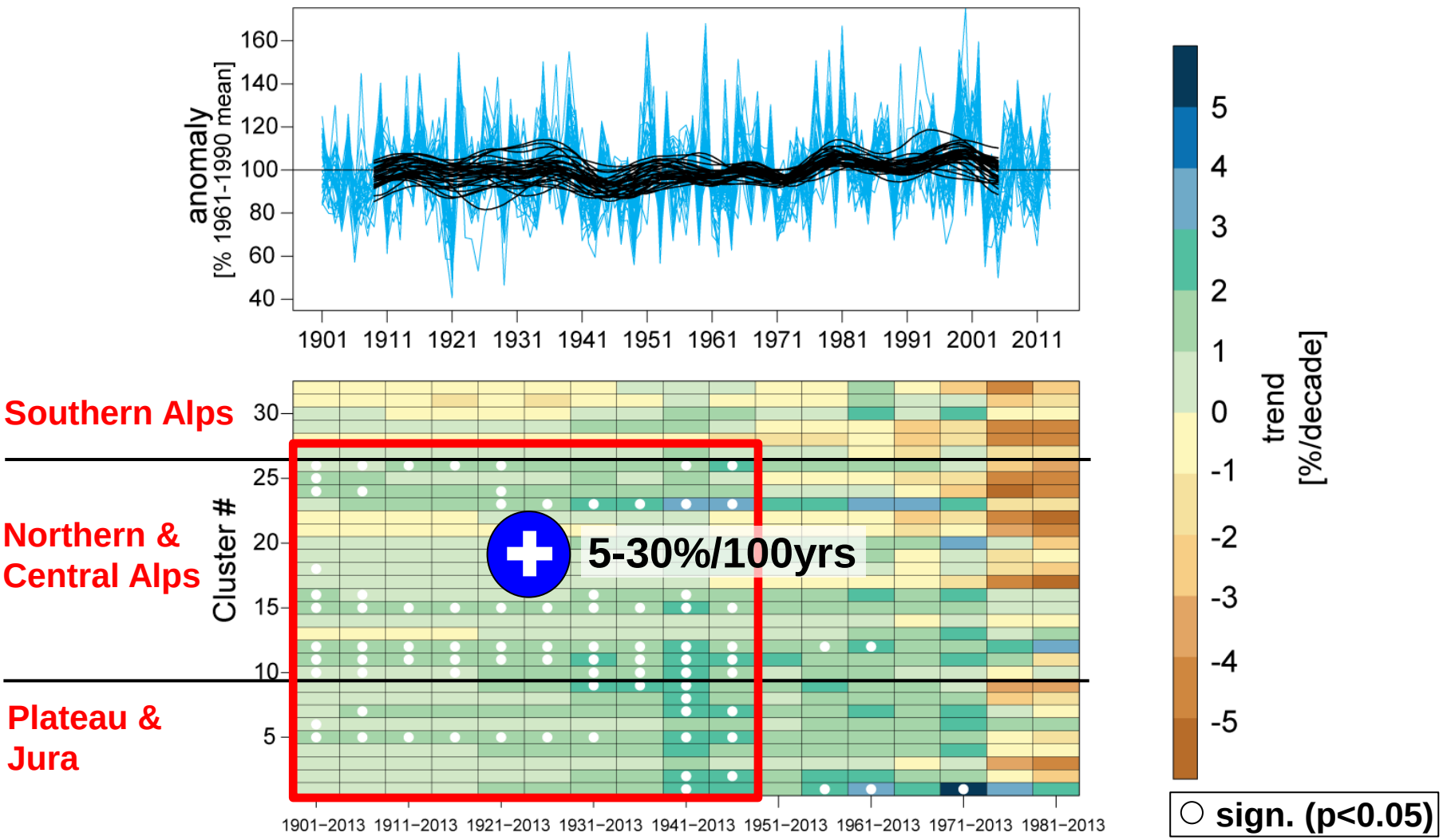
1971-2008



Isotta et al. (2013)

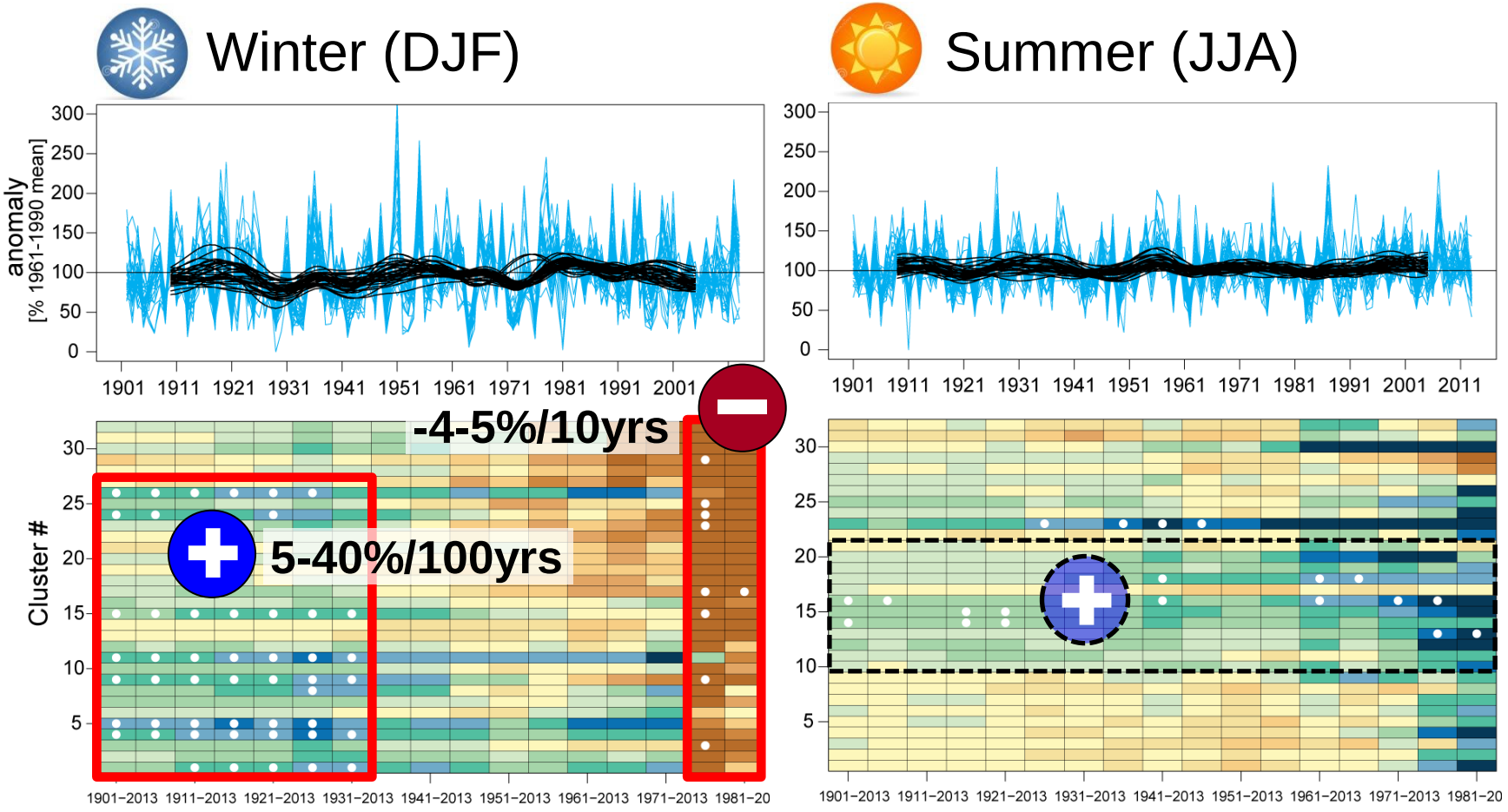
boundaries
Rhine catchment

Revisiting annual precipitation trends



Scherrer et al. (IntJClim, 2016)

Winter- & summer trends



Scherrer et al. (IntJClim, 2016)

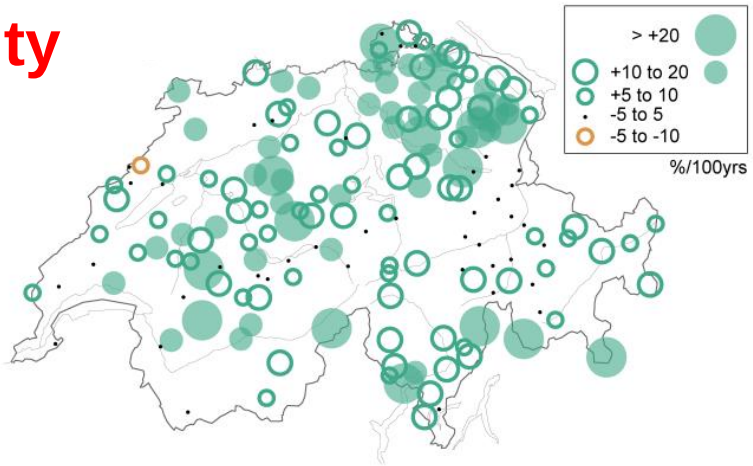
Changes heavy daily precipitation

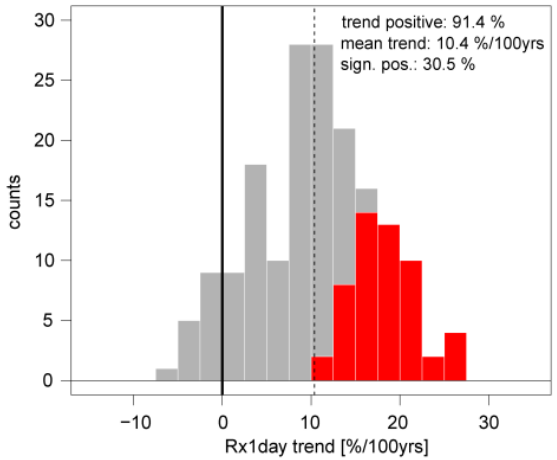
Intensity and frequency, 1901-2014 (annual)

91% show pos. trend

intensity

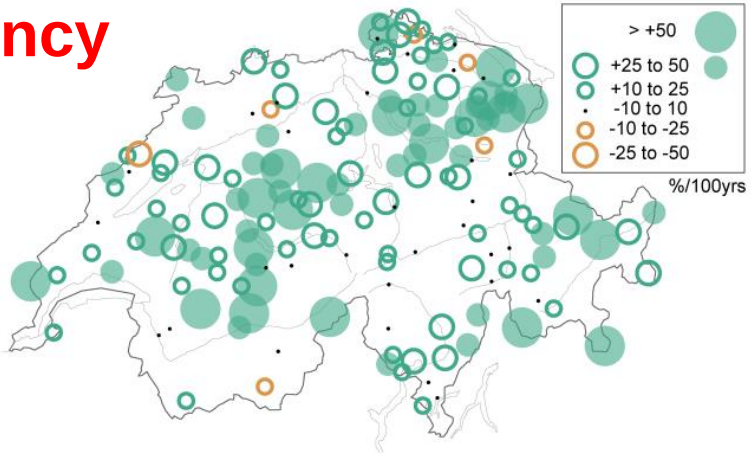
max. daily sum per year (Rx1day)

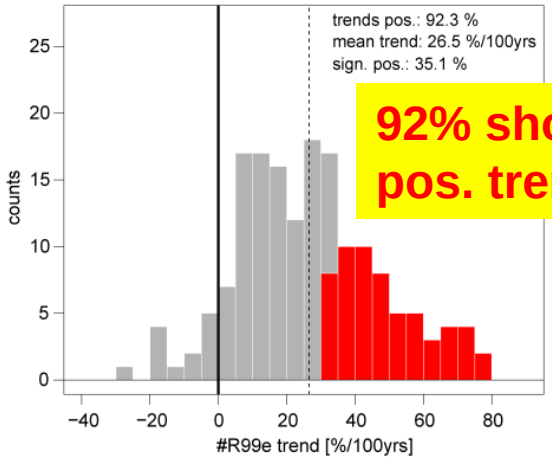




frequency

 # q99 events per year

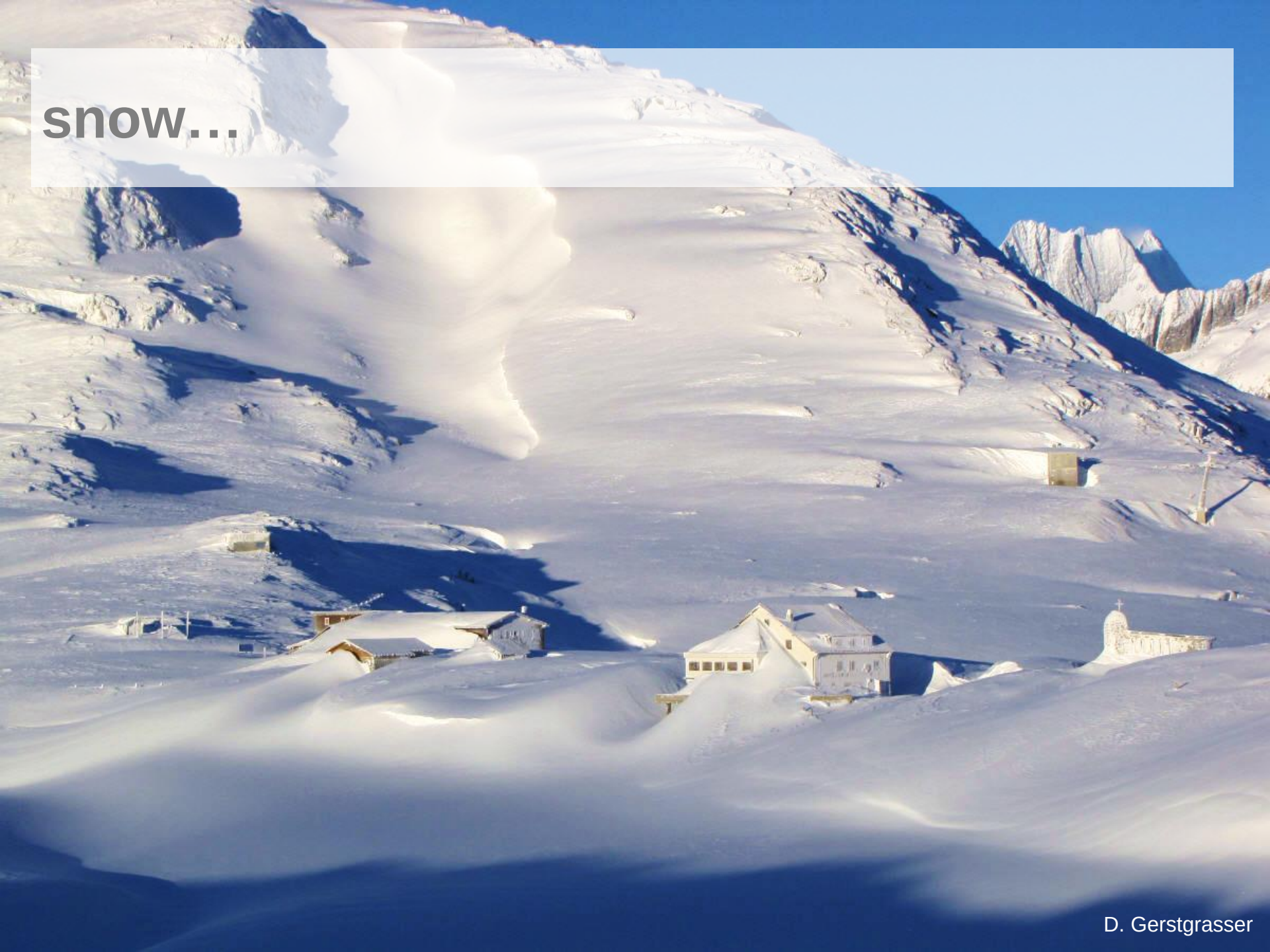




92% show pos. trend

Scherrer et al. (JGR, in revision)

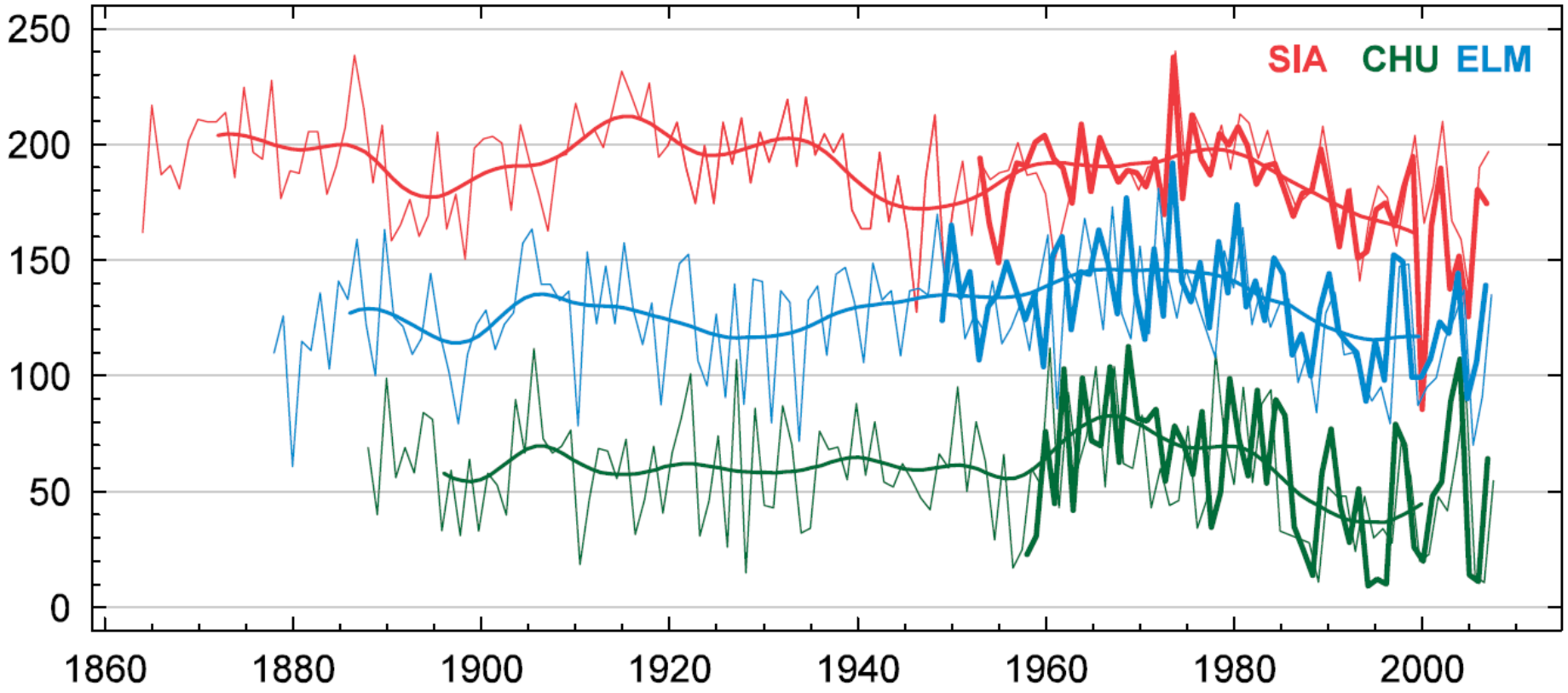
snow…



D. Gerstgrasser

Days with snow pack

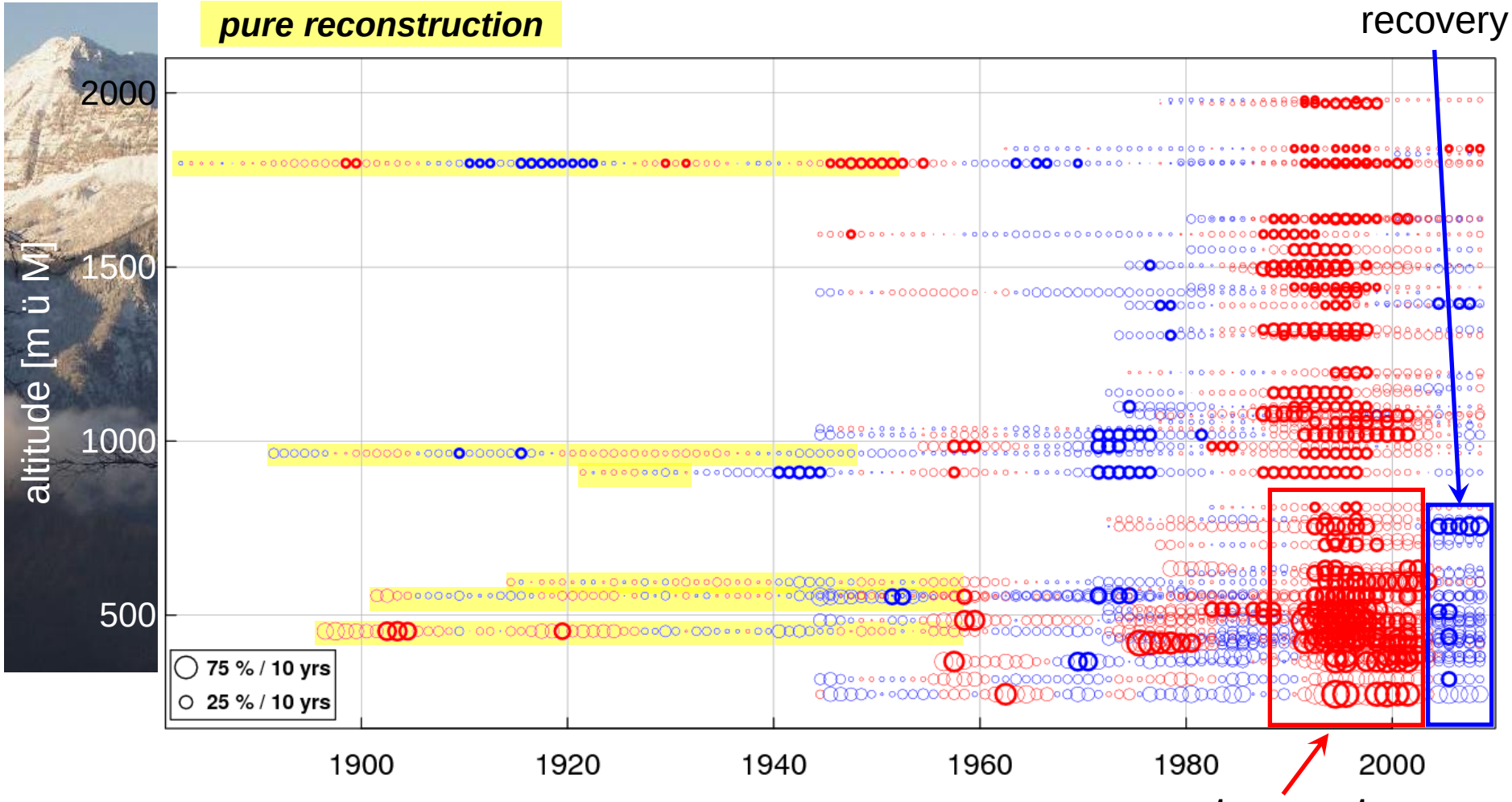
measurement data (**bold**) and reconstruction (thin lines)



Scherrer et al. (2013)

Trends: Days with snow pack

relative 20-yr running trends [% / 10J], **bold**: sign. 5% level



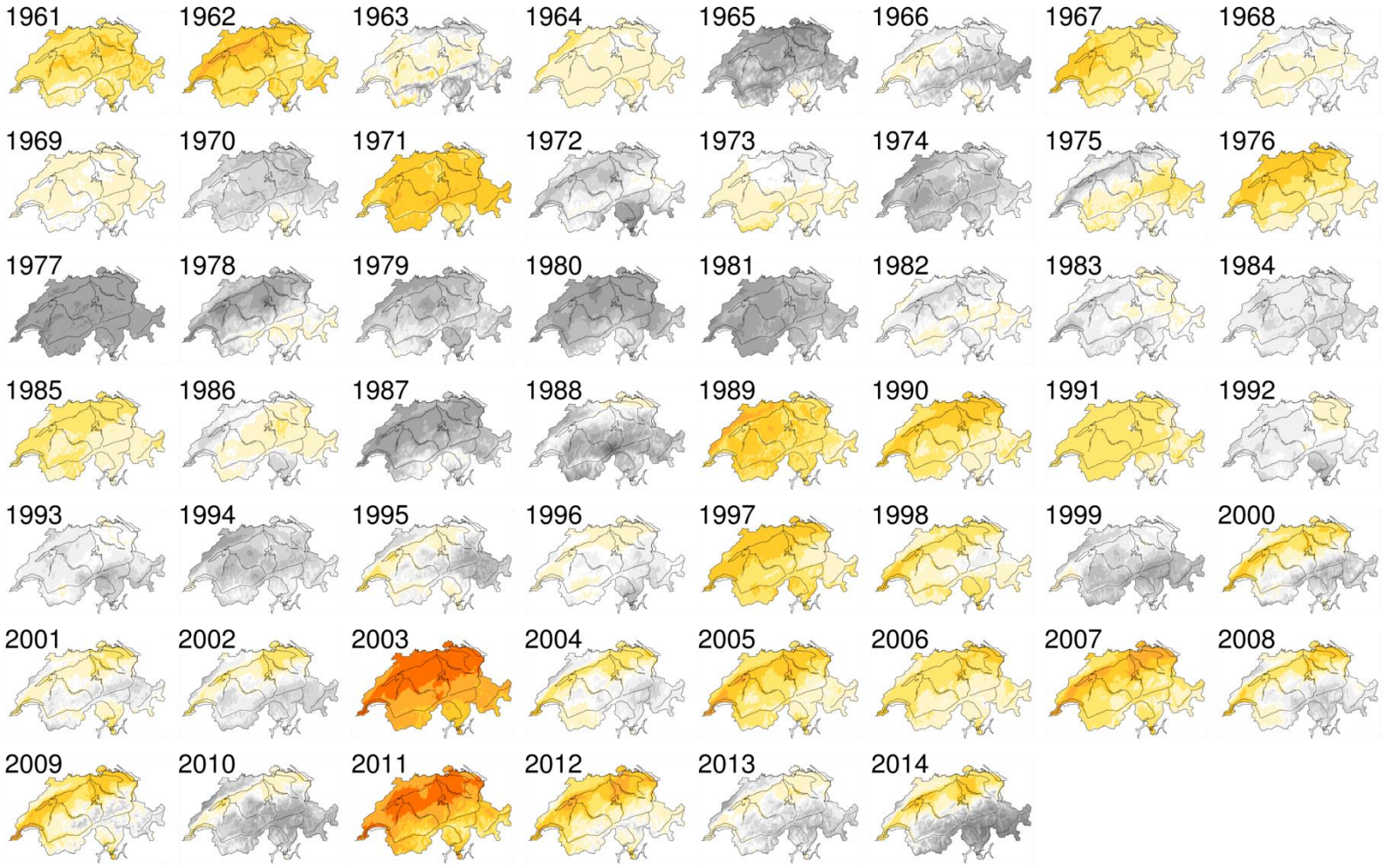
Scherrer et al. (2013)

sunshine duration…

Internet

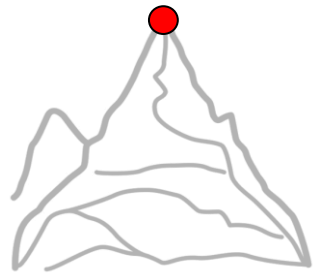
Sunshine duration Switzerland

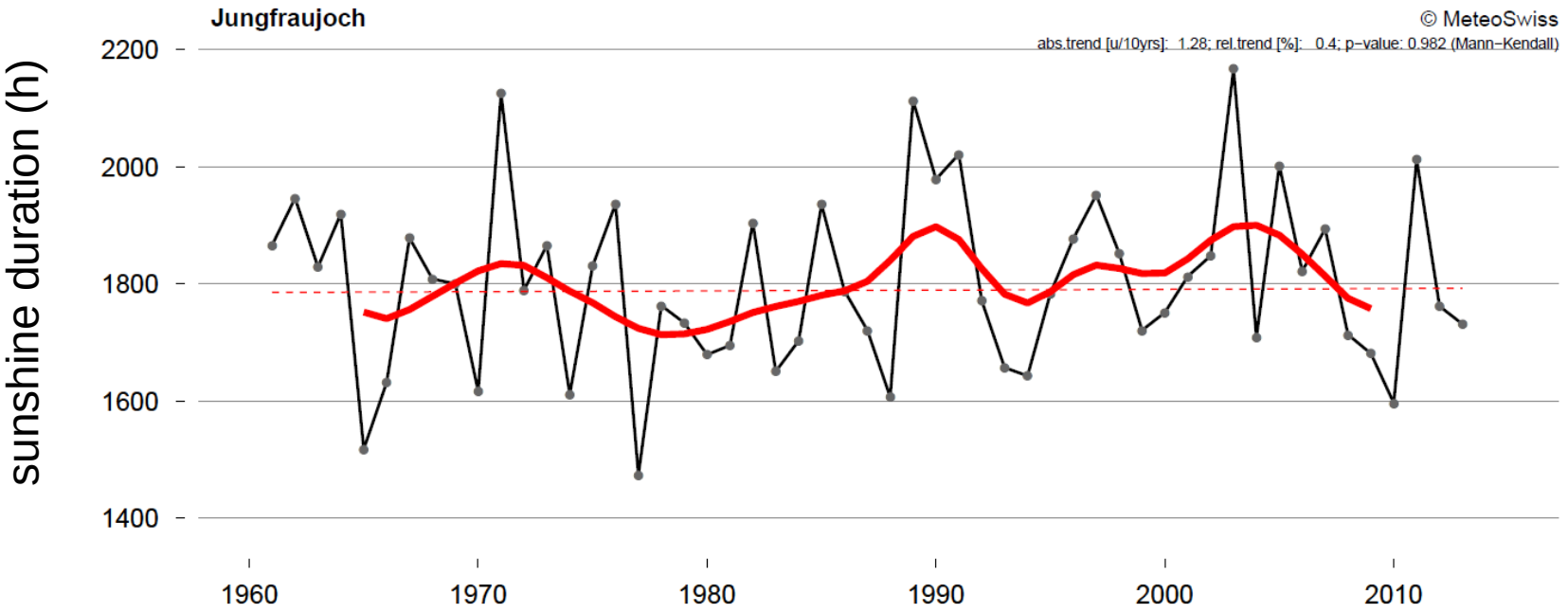
Deviations (% from norm 1961-1990) (1961-2014)



Sunshine duration

high altitude: Jungfraujoch

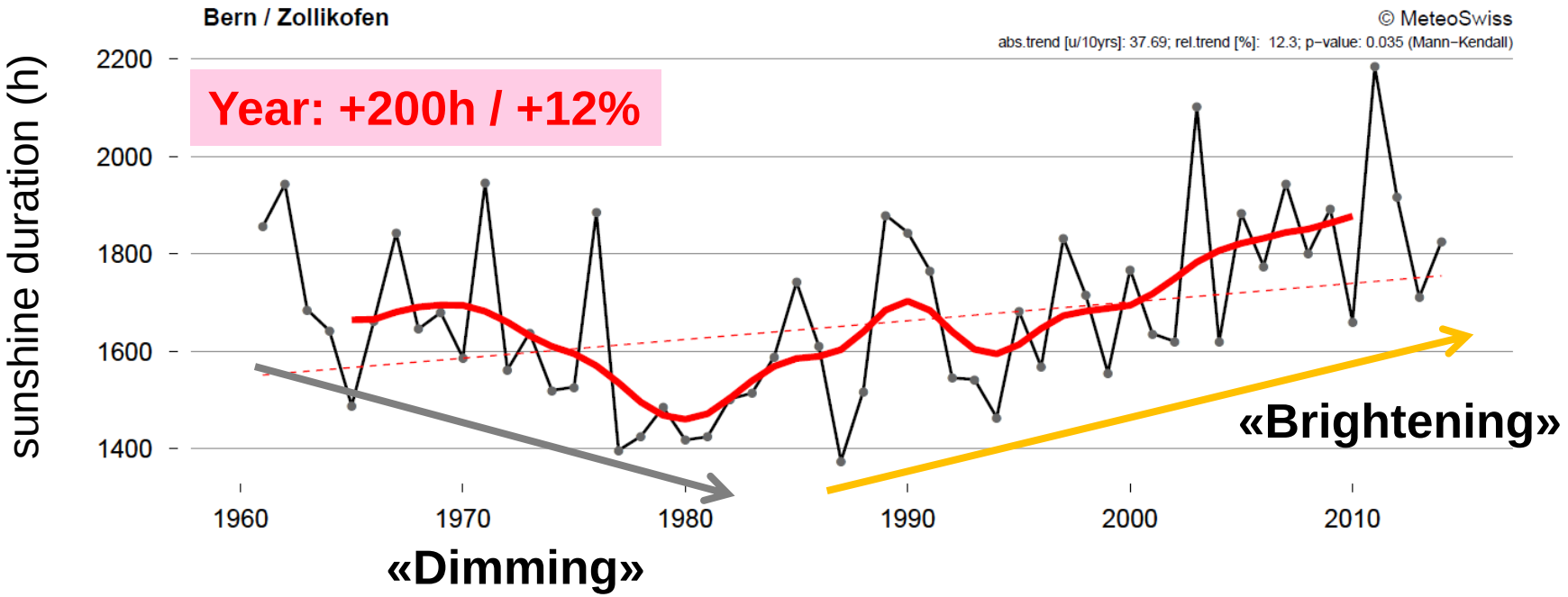




Year: ±0h / ±0% (no dimming/brightening)

Sunshine duration

Swiss Plateau: Bern

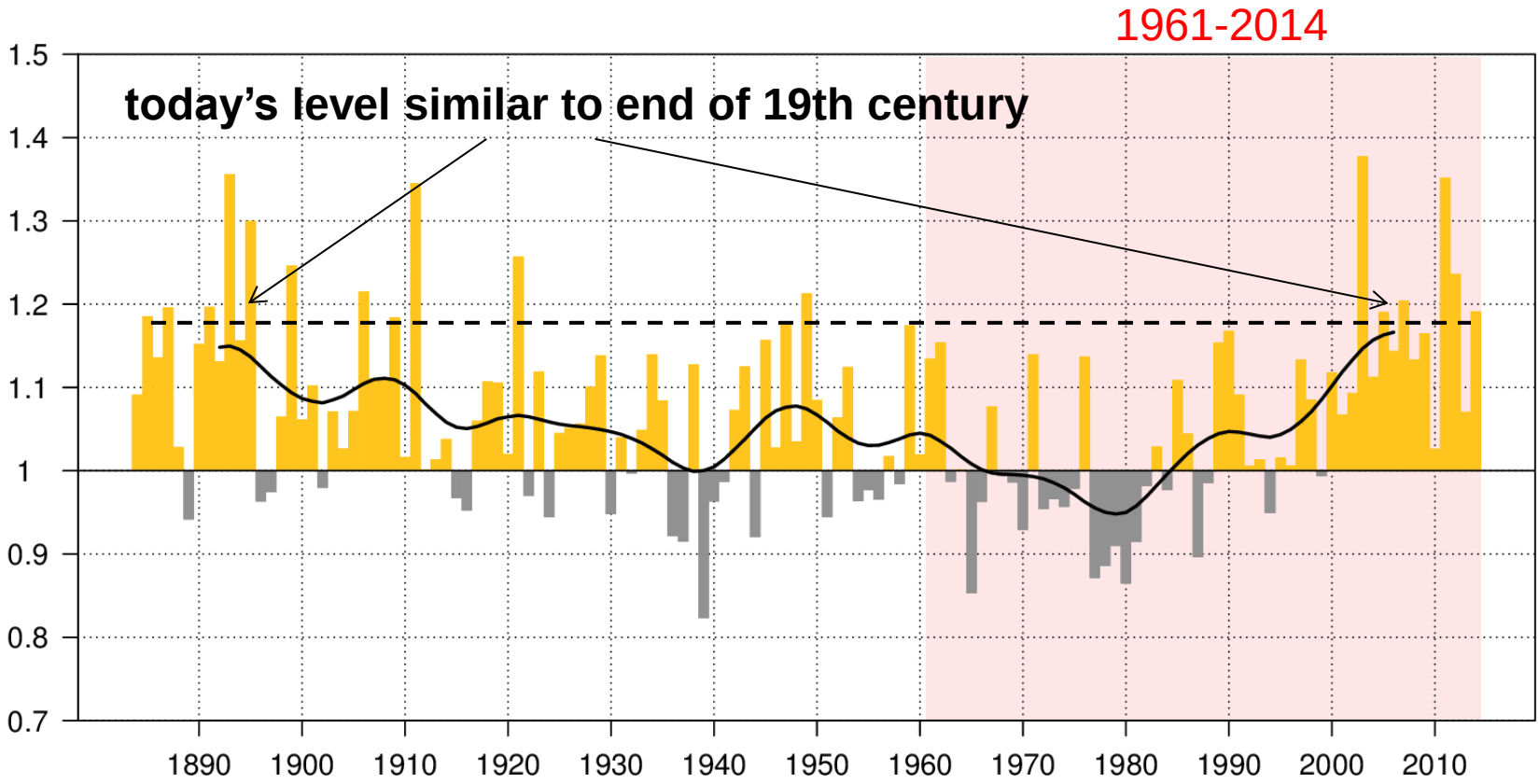


DJF: +42h / +22% (p=0.03) **MAM: +79h / +17% (p=0.07)**

JJA: +35h / +5% (p=0.33) SON: +23h / +6% (p=0.52)

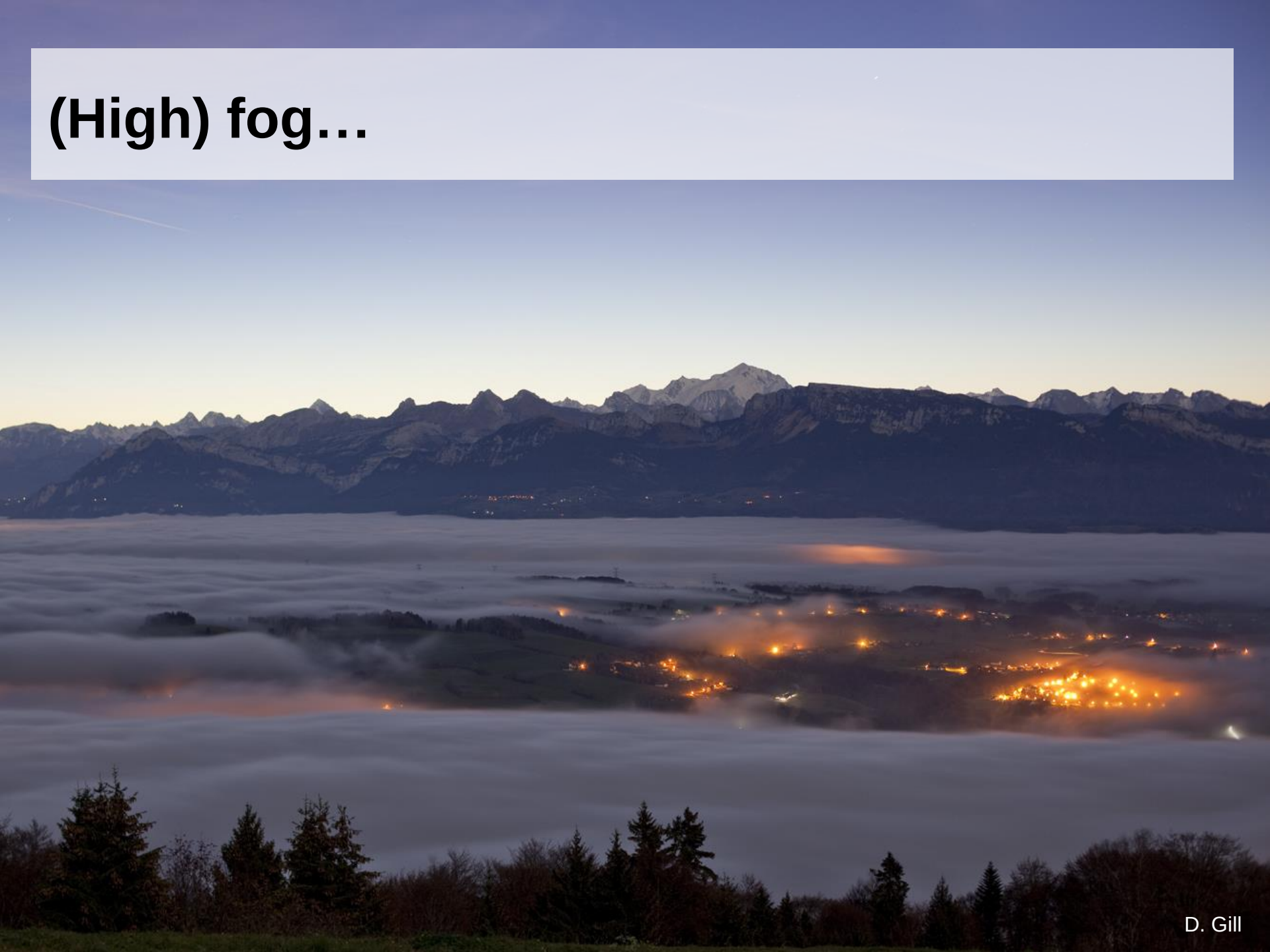
Sunshine duration 1884-2014

Zürich/Fluntern, ratio wrt. norm 1961-1990



(courtesy of M. Begert)

(High) fog…

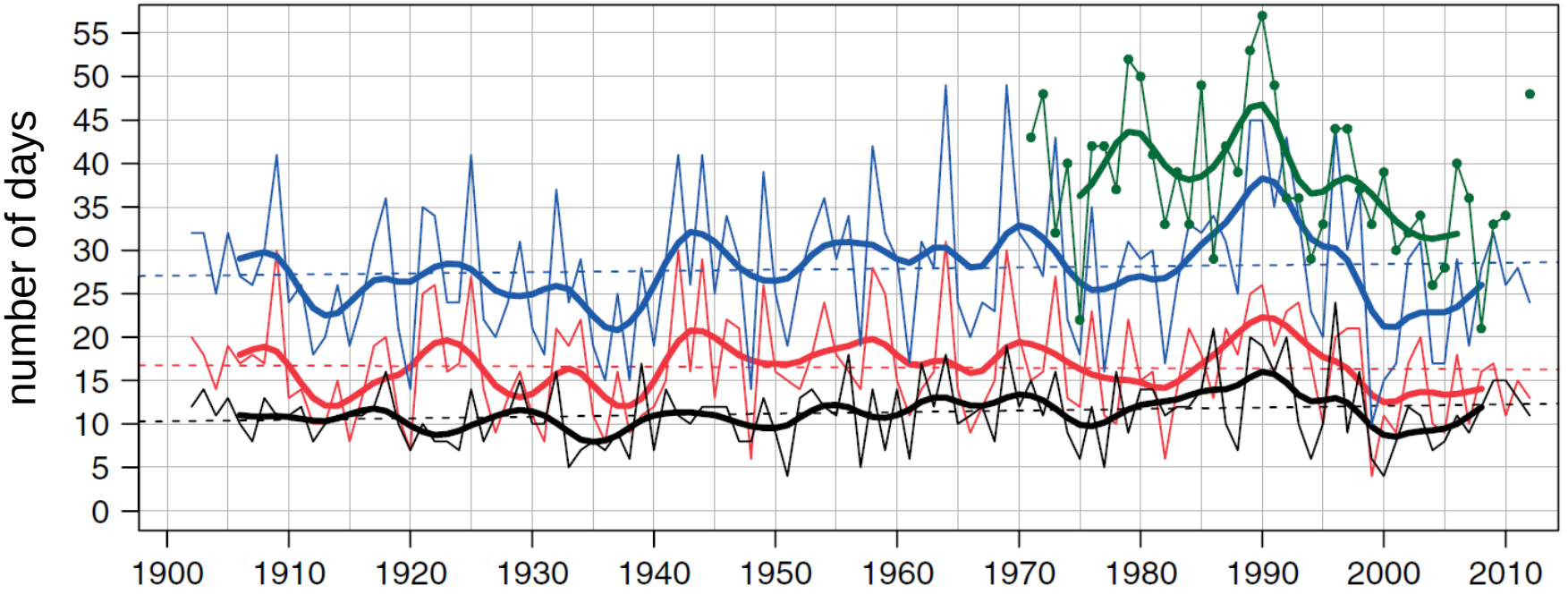


D. Gill

Reconstructed fog series 1902-2012

Zürich/Fluntern, September − March

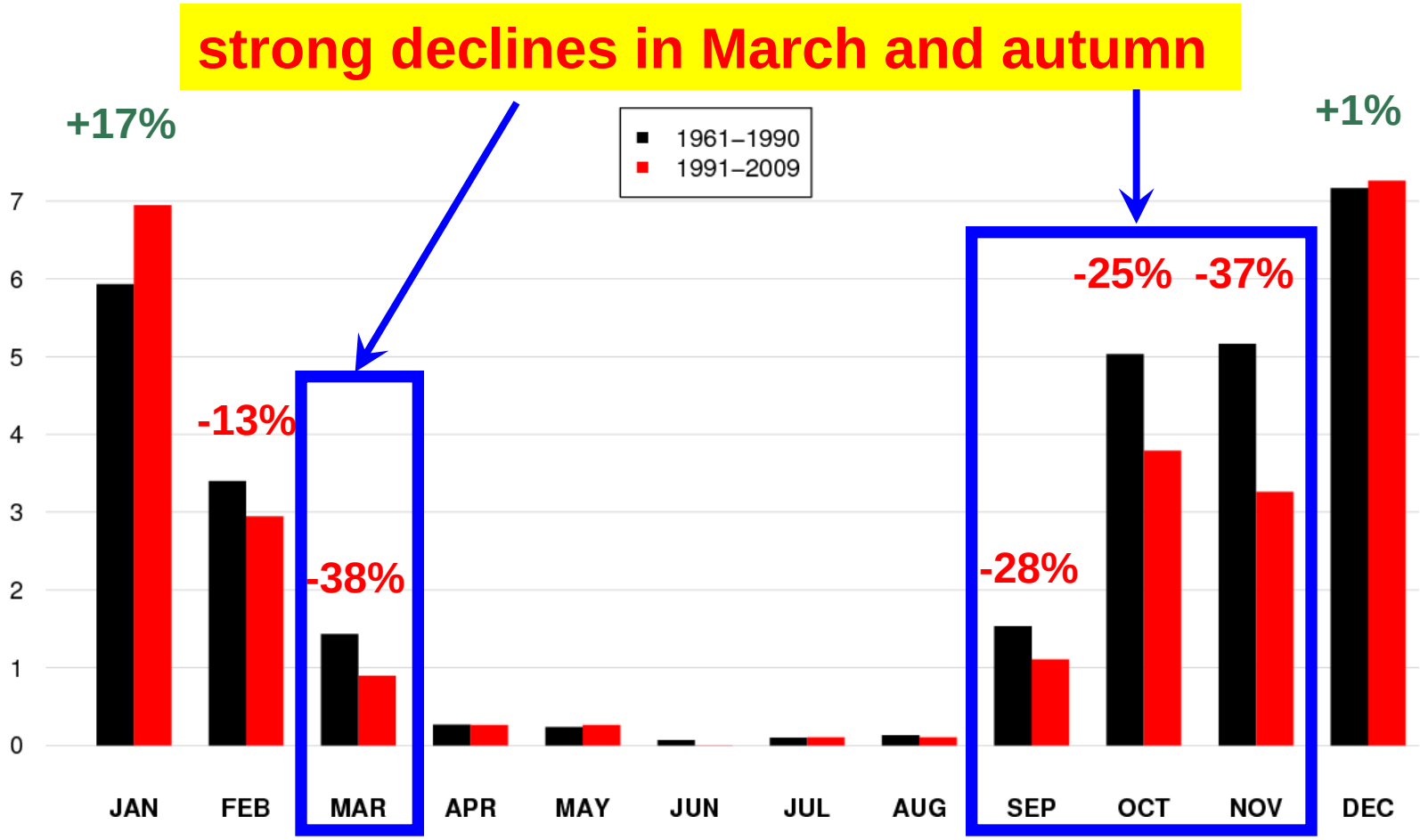
Scherrer et al. (2013)



green: classical fog observation (horiz. visibility <1km)
blue: fog (more than half a day)
rot: fog (full day)
black: fog days (more than half a day) with fog dispersal

«High fog» changes

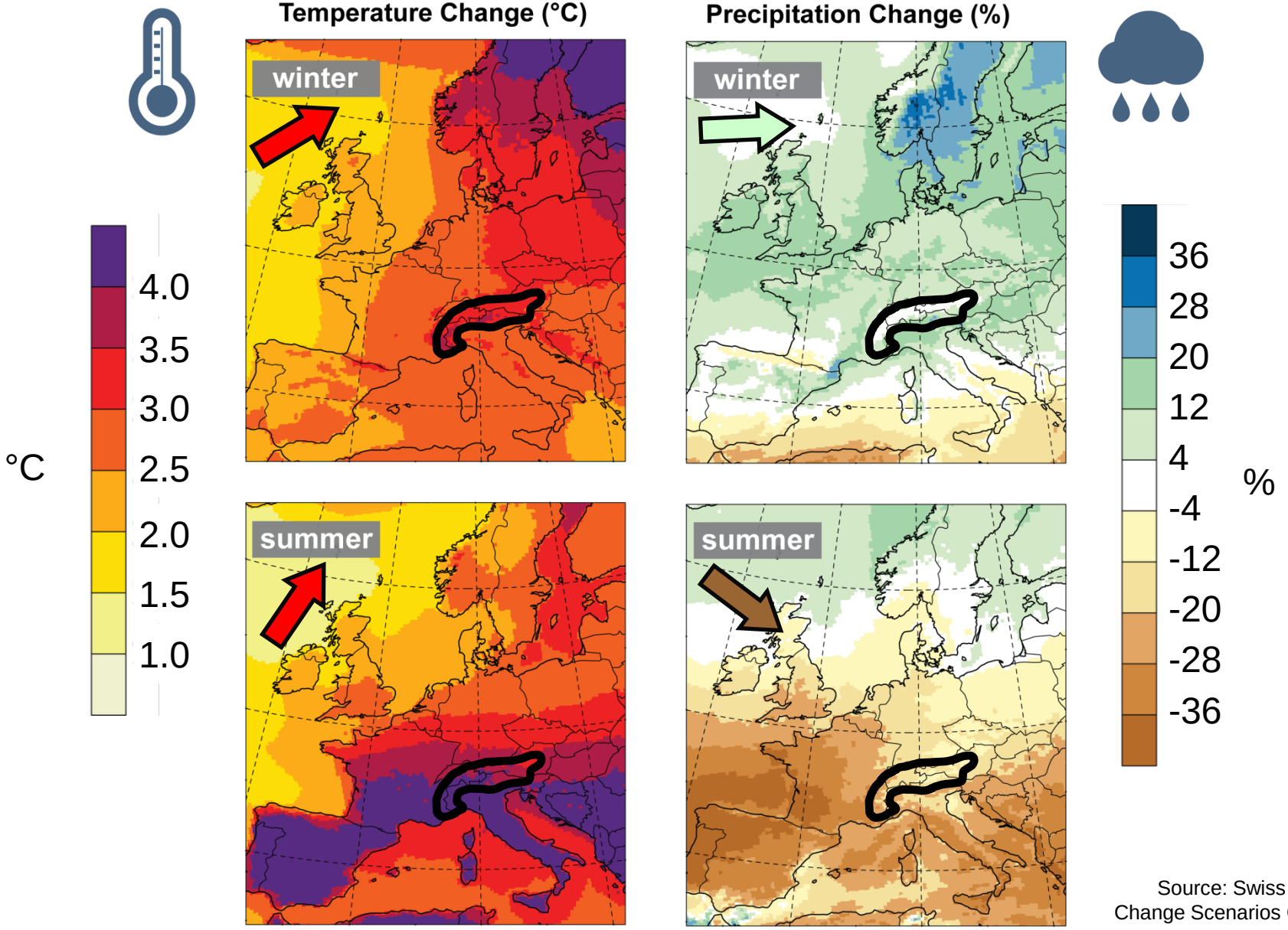
«half day fog» 1991-2009 vs. 1961-1990



Scherrer et al. (2013)


FUTURE

Climate change Europe 2070-2099 (A1B)



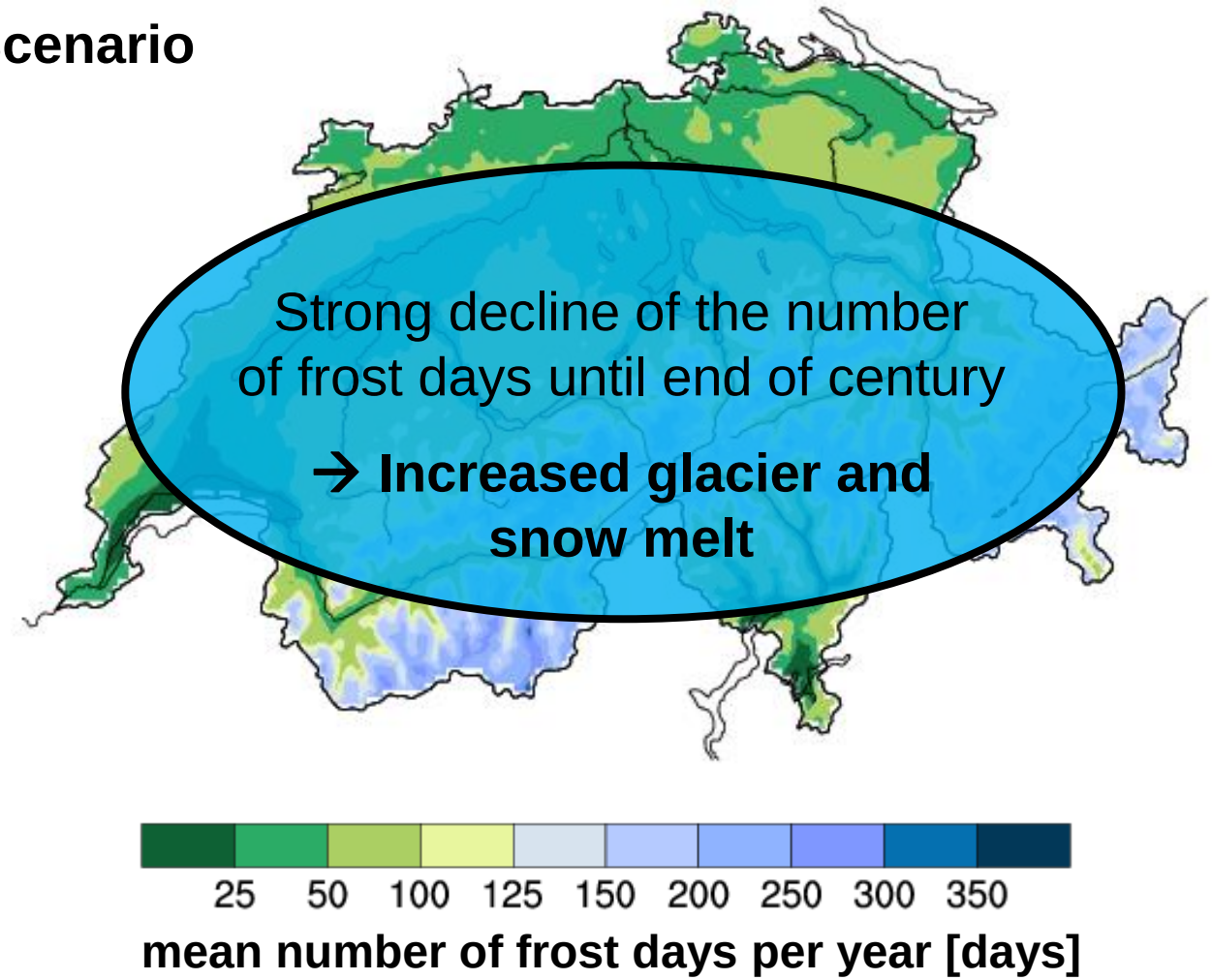
Source: Swiss Climate Change Scenarios CH2011


Less frost days?

Frost days

(T_{min} ≤ 0°C)

A1B-Scenario
~2085



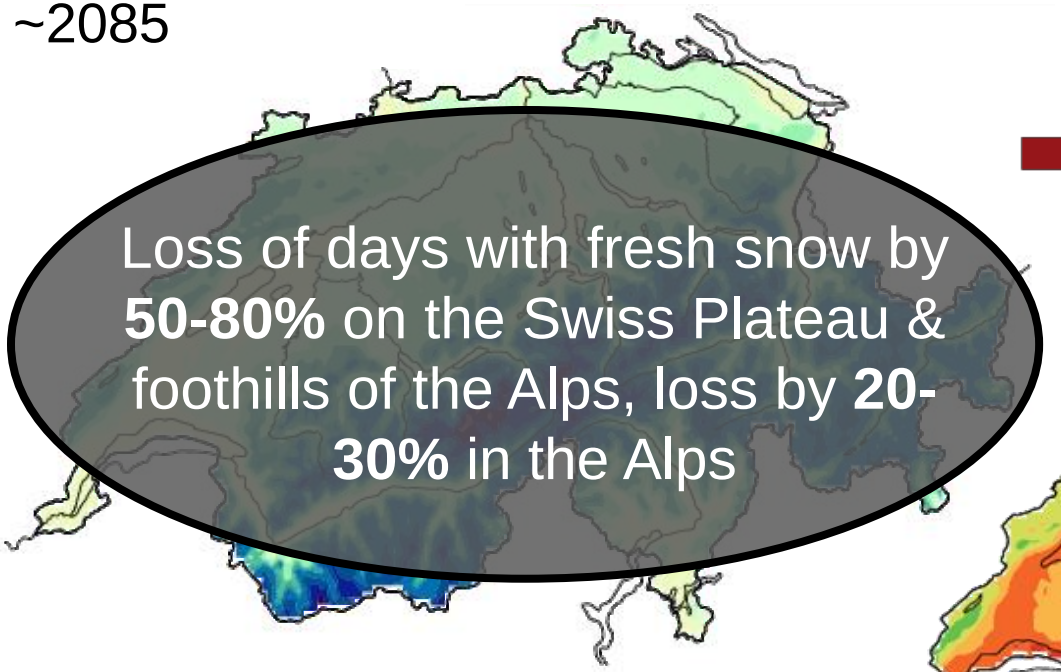
No snow on Swiss Plateau?

Changes in days with fresh snow

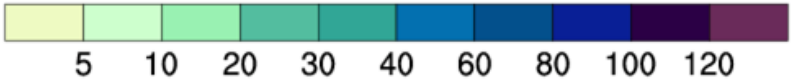
Zubler et al. 2013

A1B-Scenario

~2085

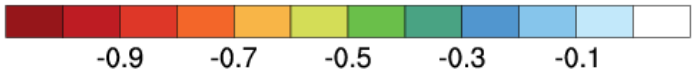


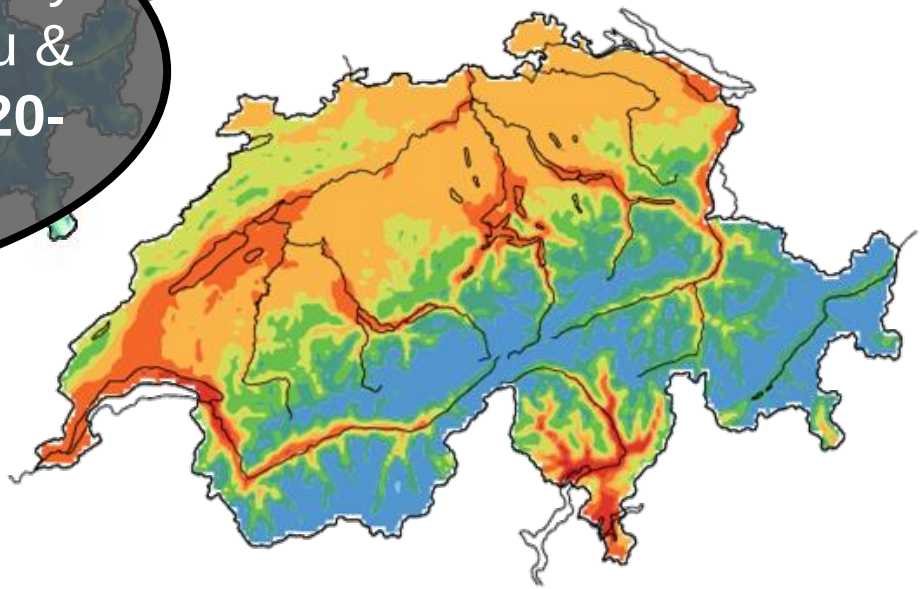
Loss of days with fresh snow by **50-80%** on the Swiss Plateau & foothills of the Alps, loss by **20-30%** in the Alps



mean number of days with fresh snow per year

relative change

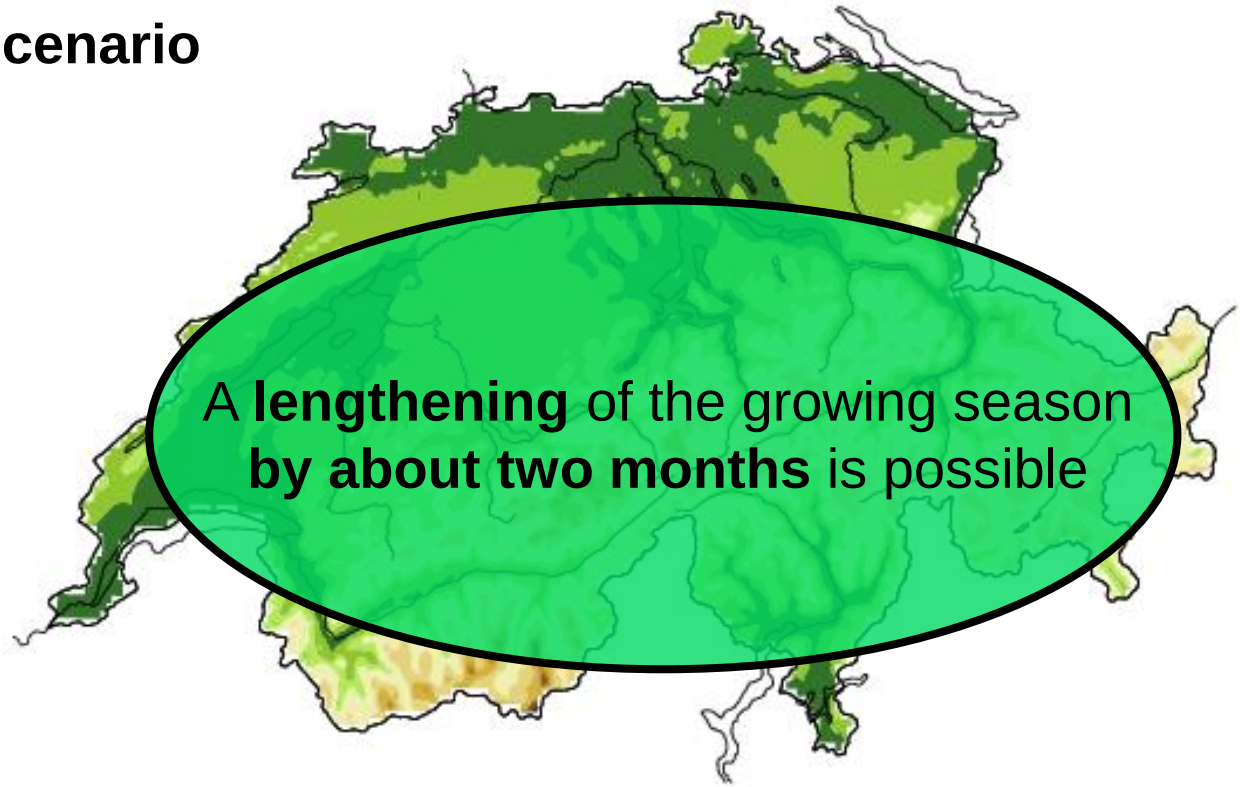


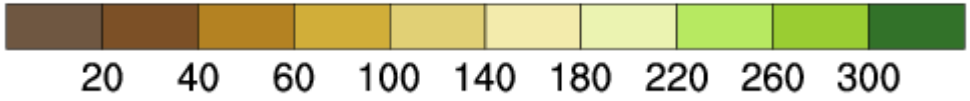



A longer growing season?

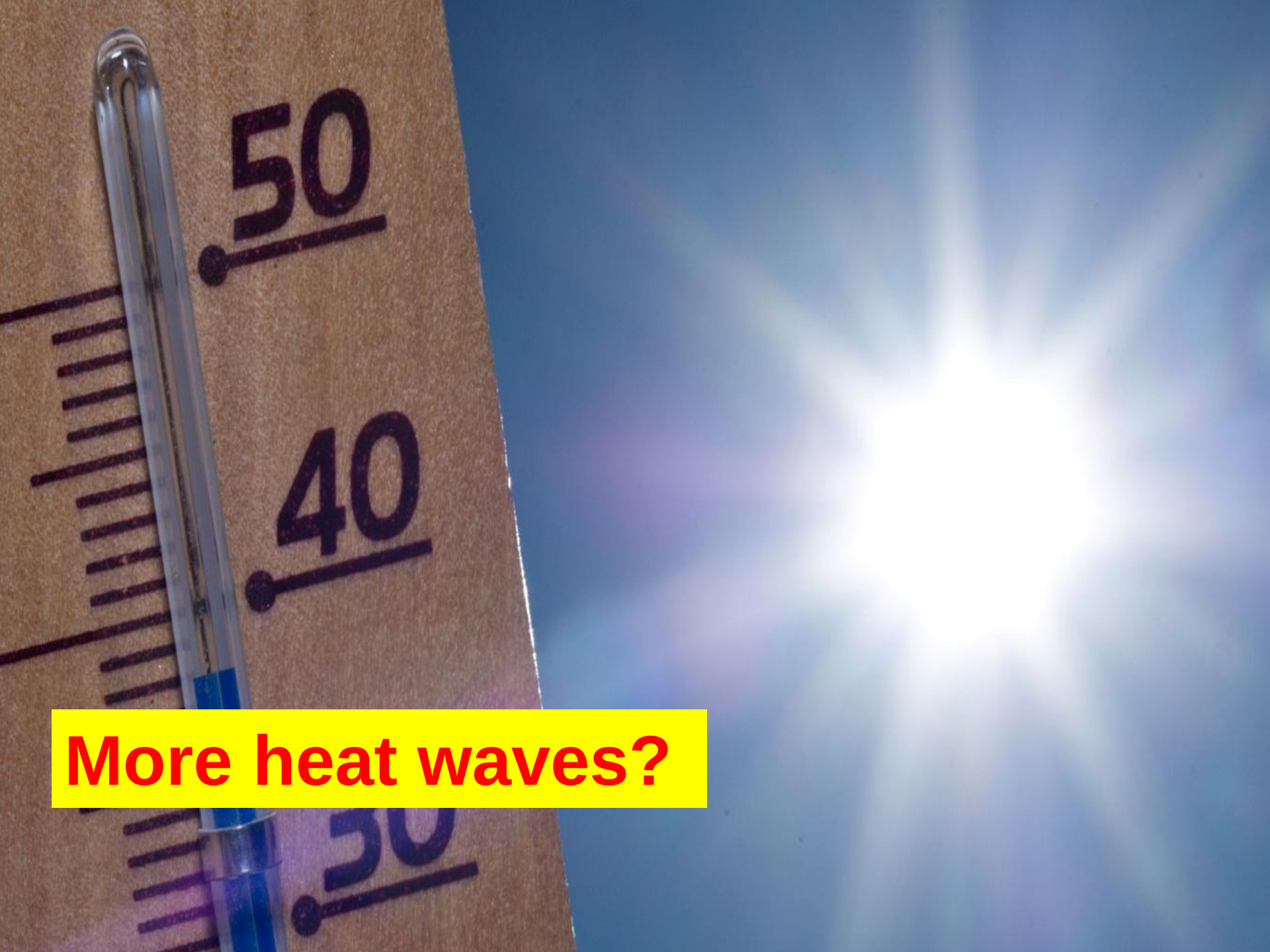
Duration of growing season

A1B-Scenario
~2085





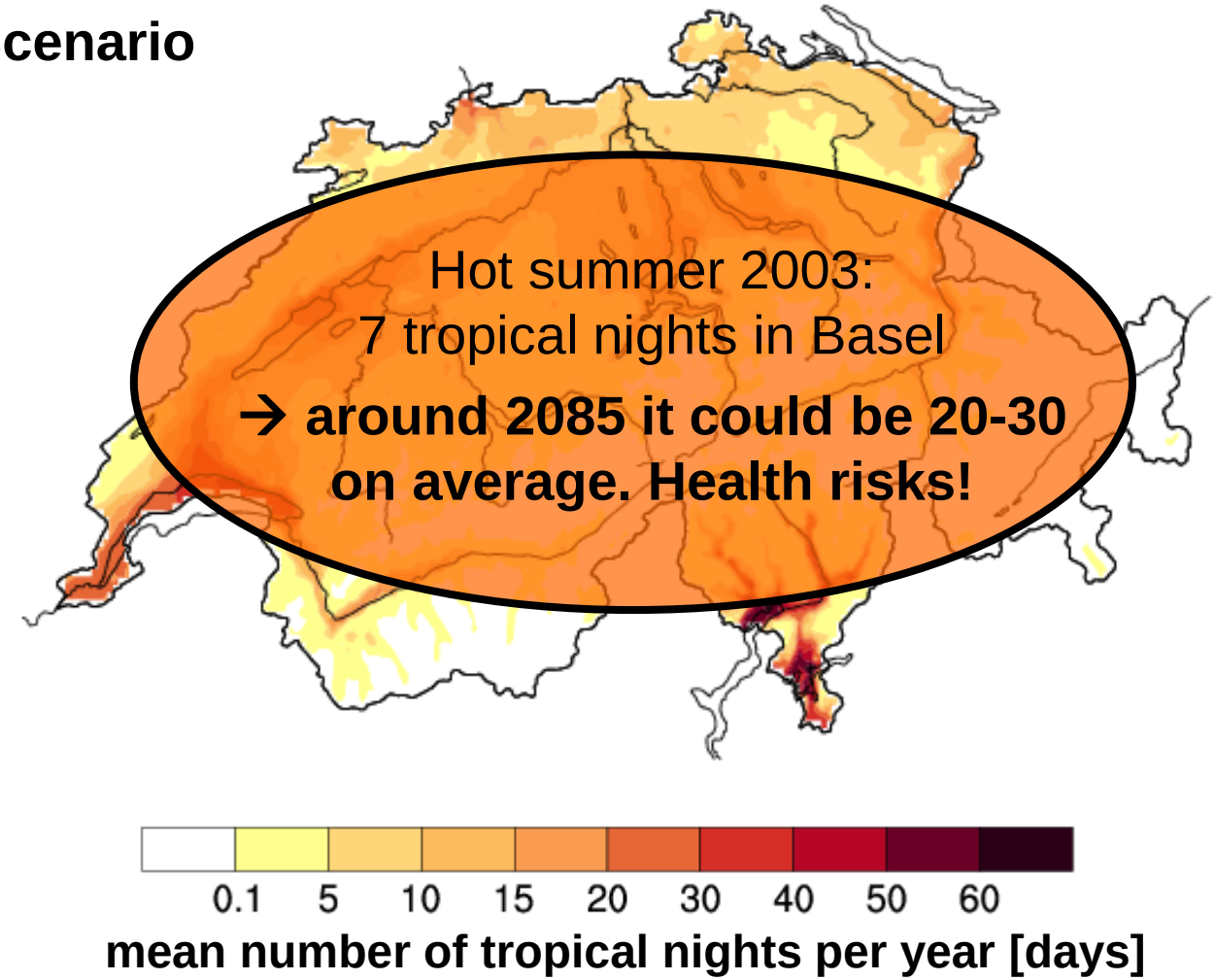
Mean duration of growing season [days]


50
40
30
More heat waves?

Tropical nights

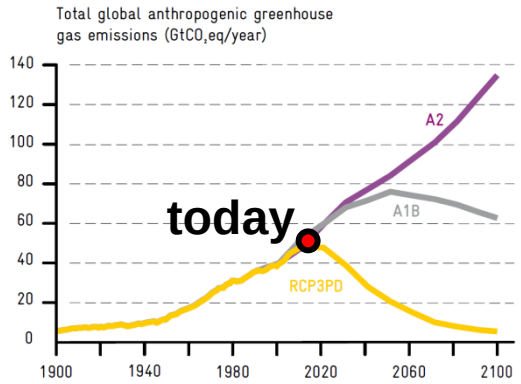
(T_{min} ≥ 20°C)

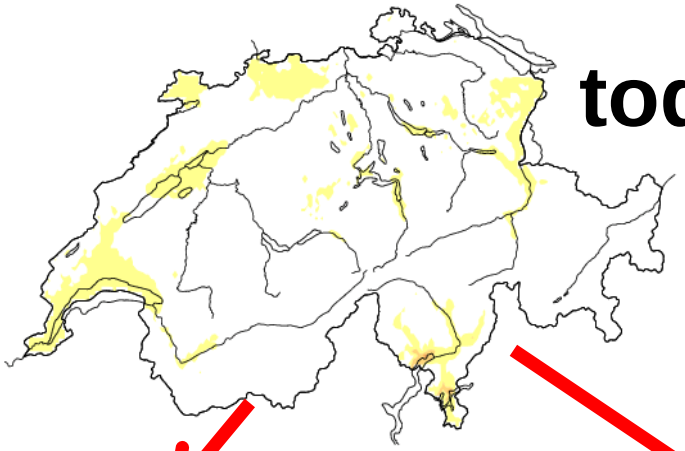
A1B-Scenario
~2085



The emission path taken is essential

number of tropical nights



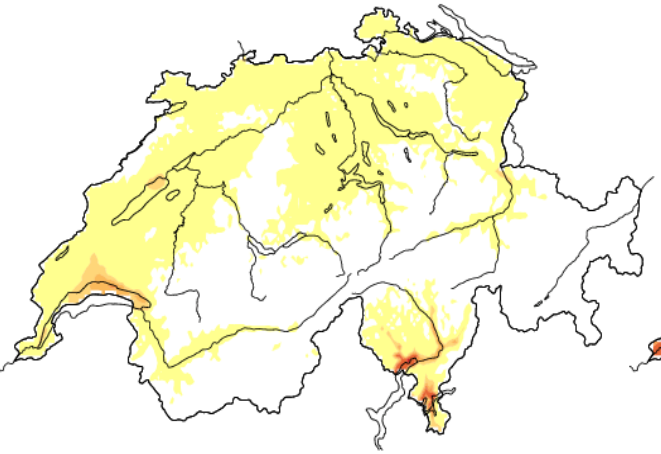


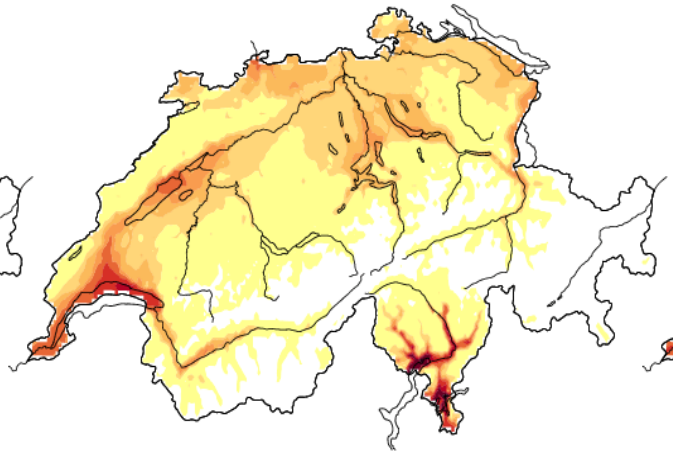
2085

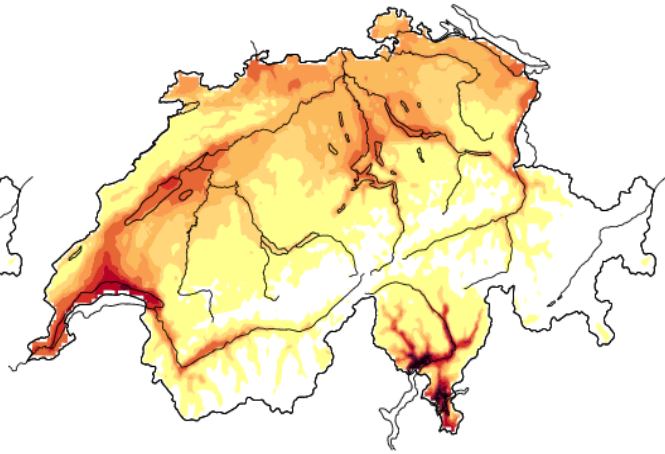
strong reduction

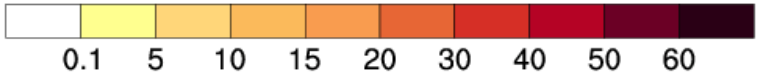
technical progress

no intervention









National Centre for Climate Services

gegründet am 16. November 2015

Das NCCS…

das Netzwerk für Klimadienstleistungen des Bundes

- koordiniert die Erarbeitung und Verbreitung von Klimadienstleistungen
- fördert als Schnittstelle zwischen den Produzenten und Nutzern den Dialog und die gemeinsame Entwicklung der Klimadienstleistungen
- sorgt dafür, dass die Klimadienstleistungen auf die Bedürfnisse der Nutzer ausgerichtet sind
- stellt Klimadienstleistungen in verständlicher Form zur Verfügung

→ www.nccs.ch

Themenschwerpunkte

→ Klimaszenarien

→ Wasserkreislauf

→ Waldfunktionen

→ Schadorganismen

→ Gefahrenprozesse

Summary

- The Alpine climate is influenced by different air masses (oceanic/continental air) and thus very variable by nature
- The Alpine climate has already changed (half way of 2°C target reached) and will change due to climate change
- The amplitude of future change stronly depends on decisions taken in the near future
- The new NCCS wants to facilitate the use of climate information for research, applications and decision making