

Heat and drought 2003: a climate analysis

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Jürgen Kropp, Annette Menzel**

*Freiburg
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Heat and drought 2003: a climate analysis

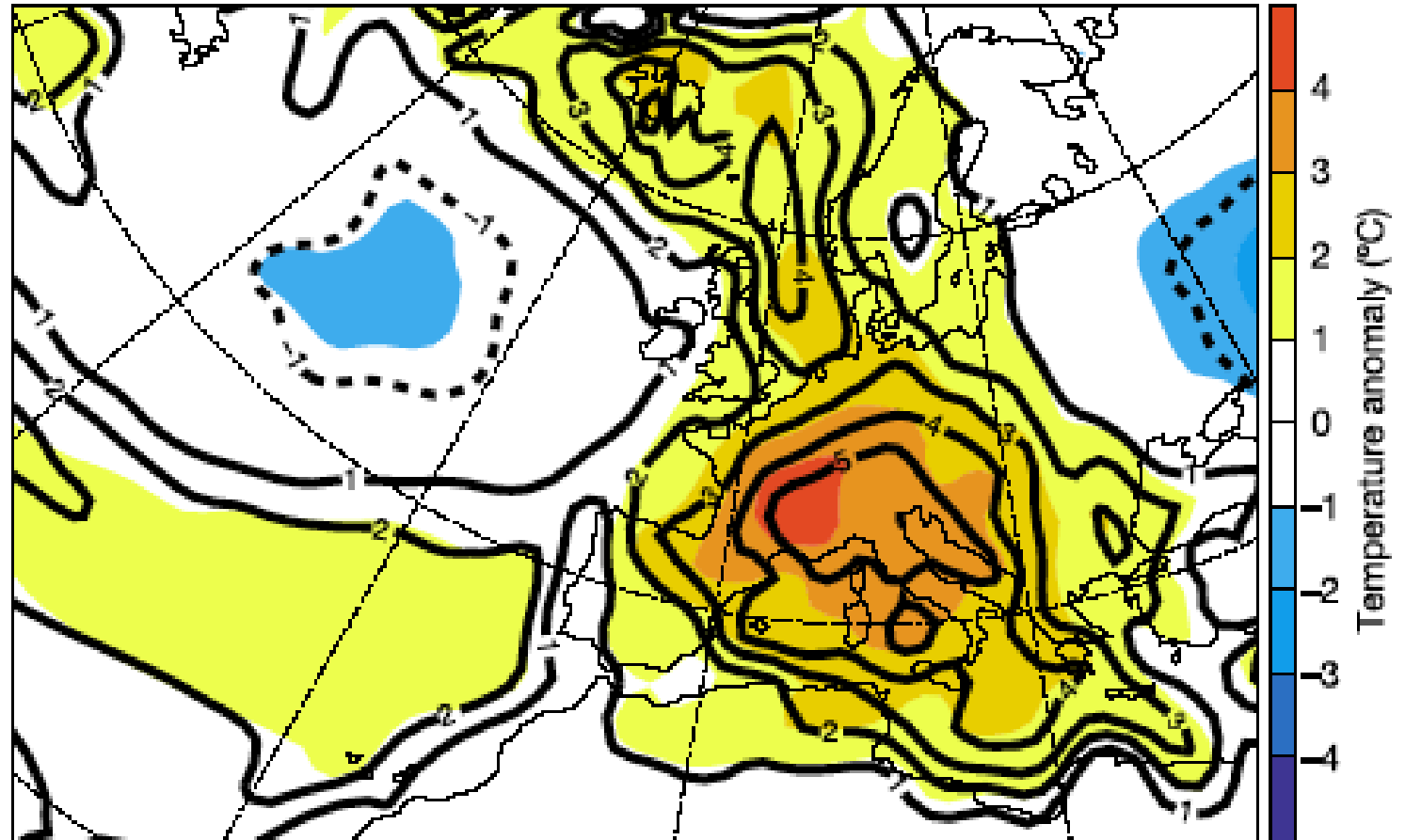
- **Temperature 2003**
- **Precipitation 2003**
- **Air humidity 2003**
- **Ground water 2003**
- **Sunshine 2003**



Temperatures 2003



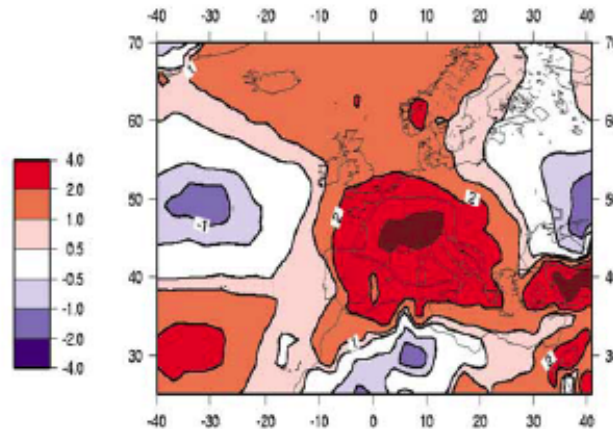
JJA 2003 mean temperature anomaly



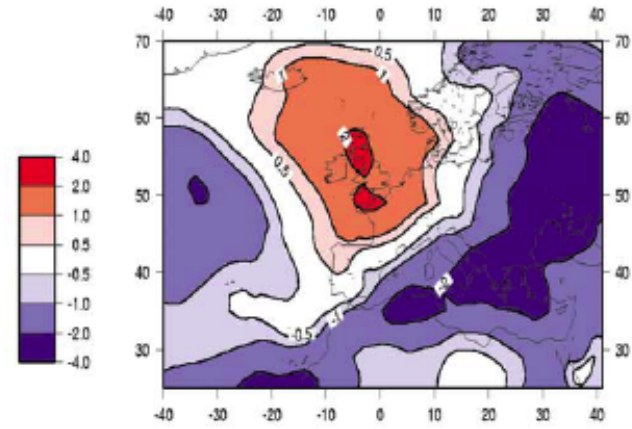
Schaer et al. Nature, Jan 2004

Temperature anomalies

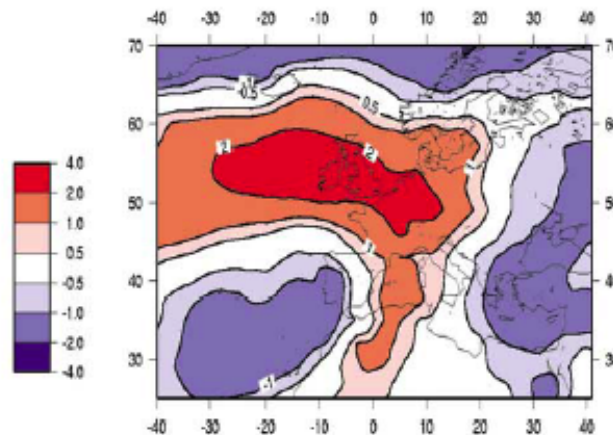
2003



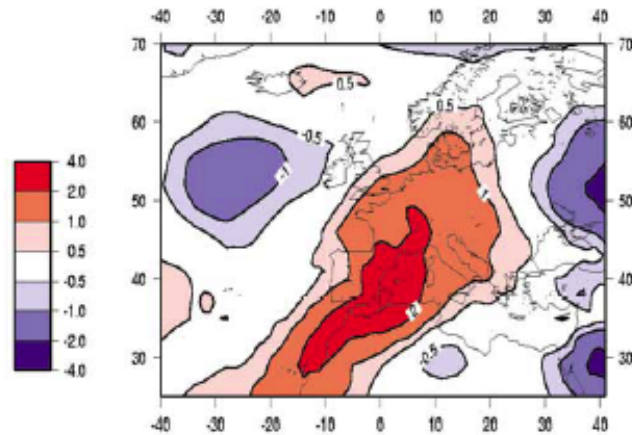
1976



1983



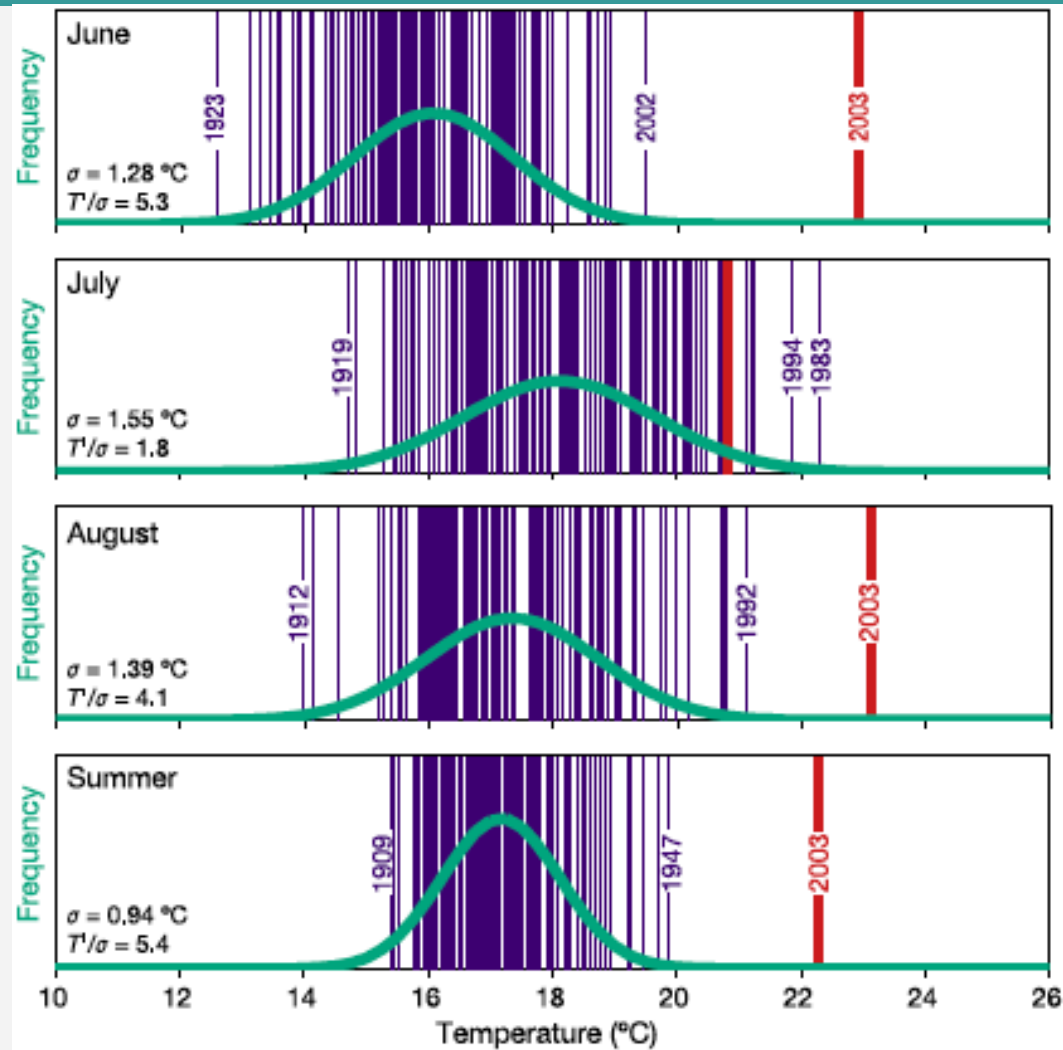
1994



André et al.,
Geoscience
336, 2004



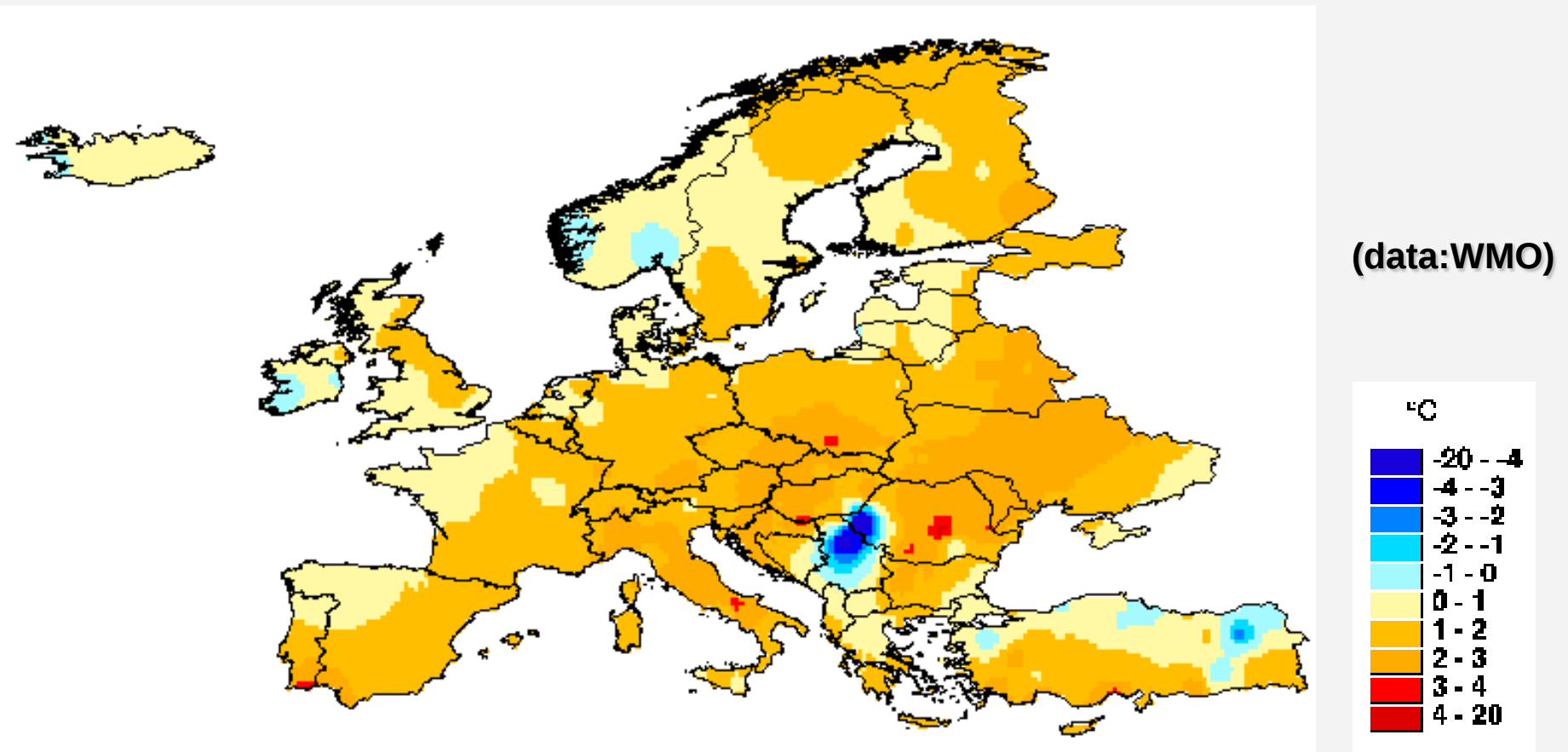
JJA 2003 mean temperature anomaly in Switzerland



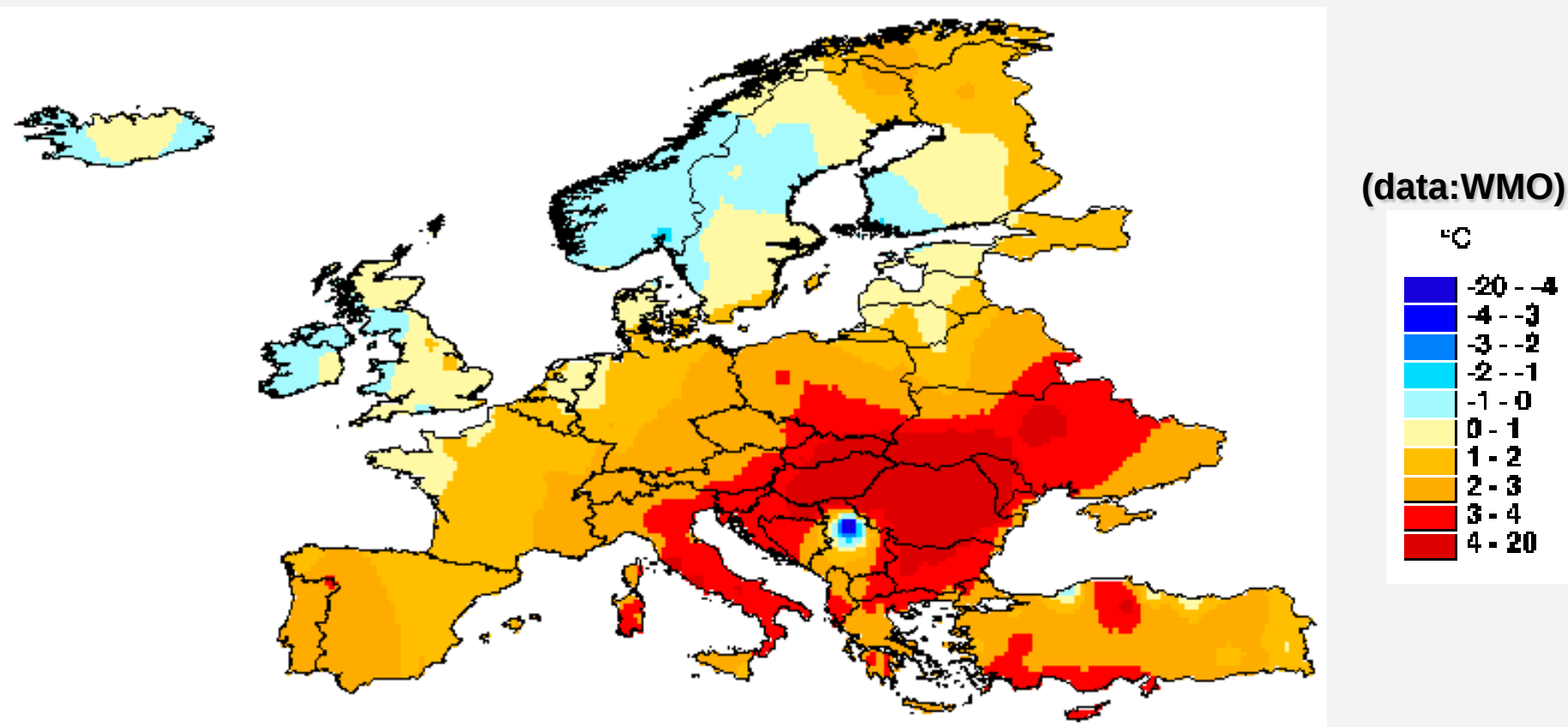
Schaer et al.
Nature, Jan 2004



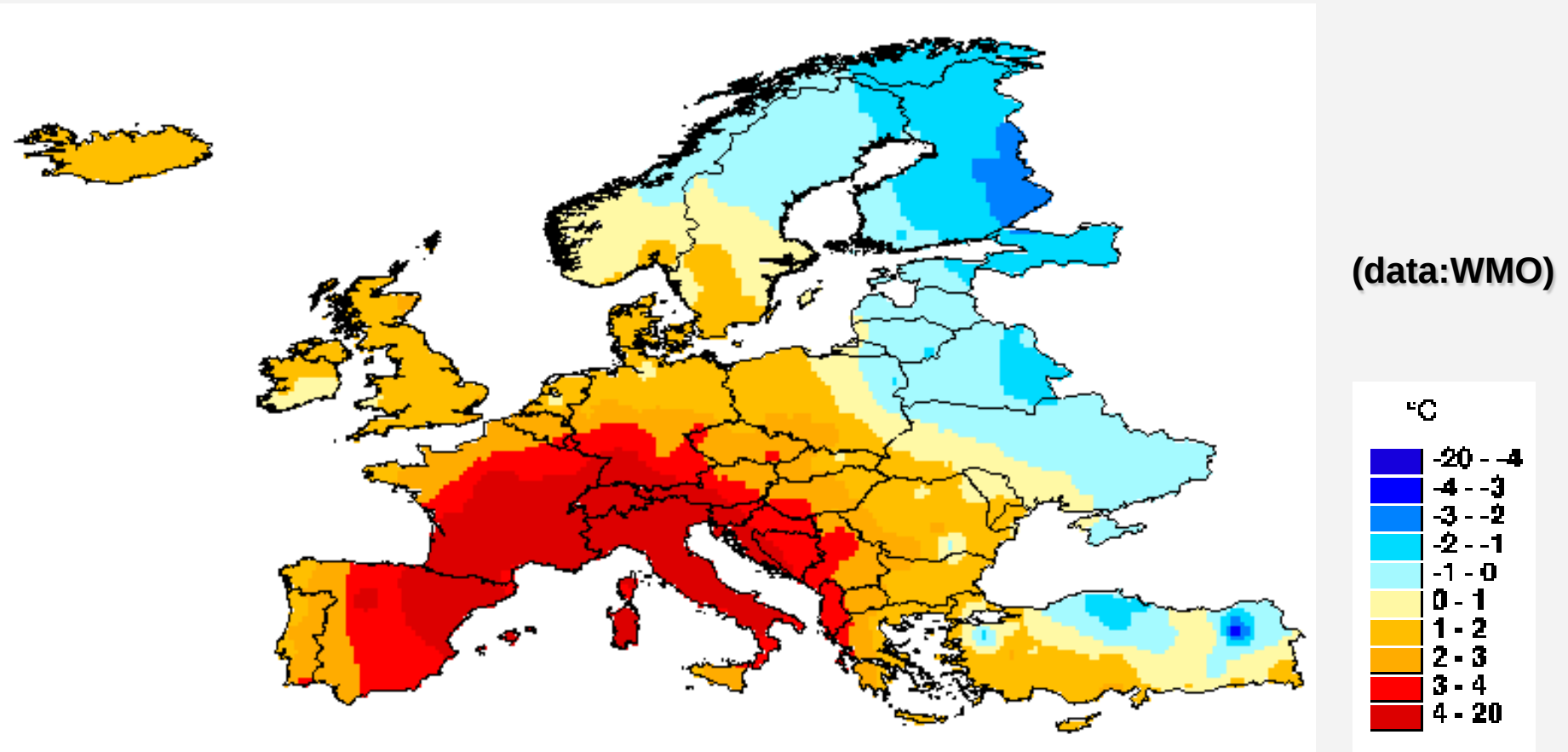
Min T anomaly in May 2003 / 1960-90



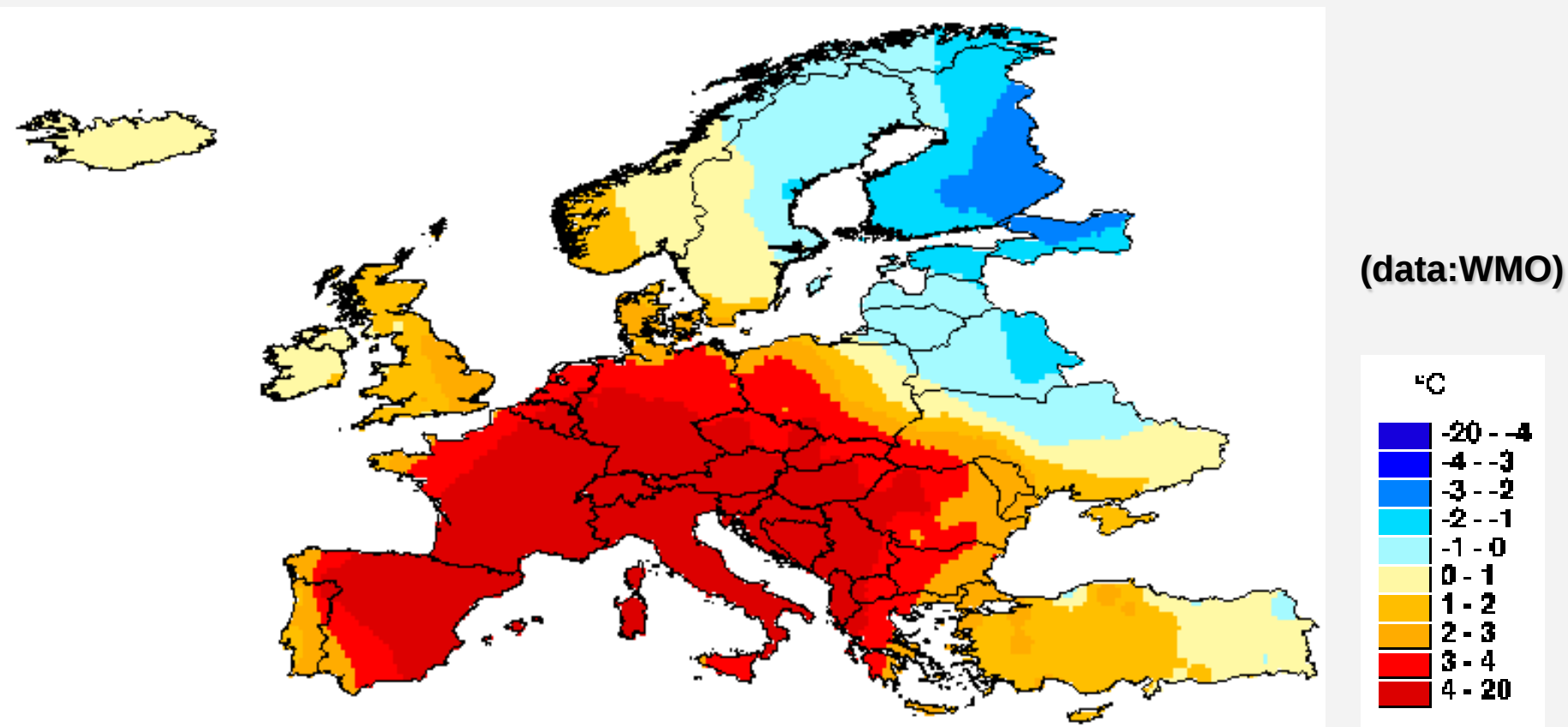
Max T anomaly in May 2003 / 1960-90



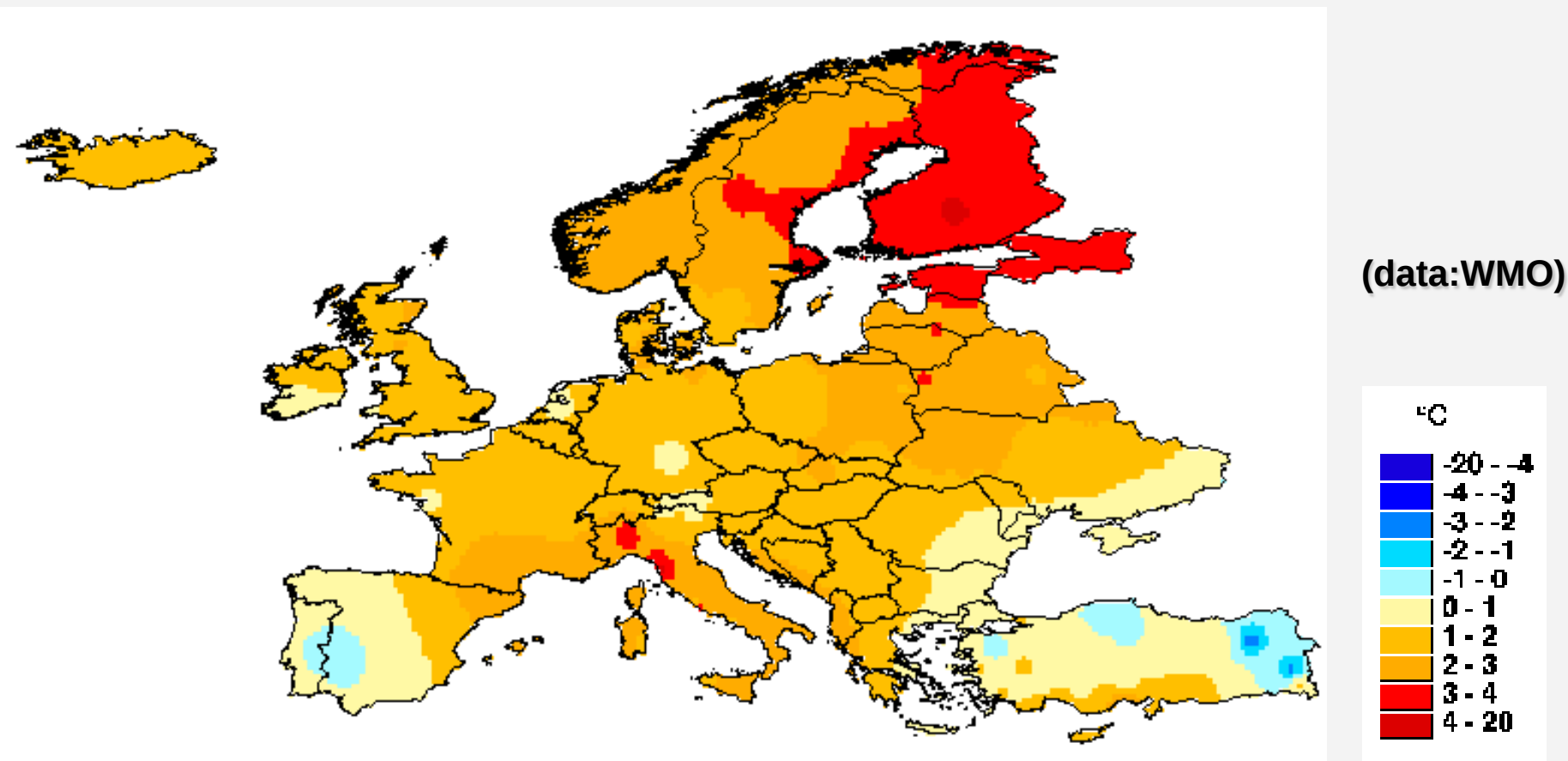
Min T anomaly in June 2003 / 1960-90



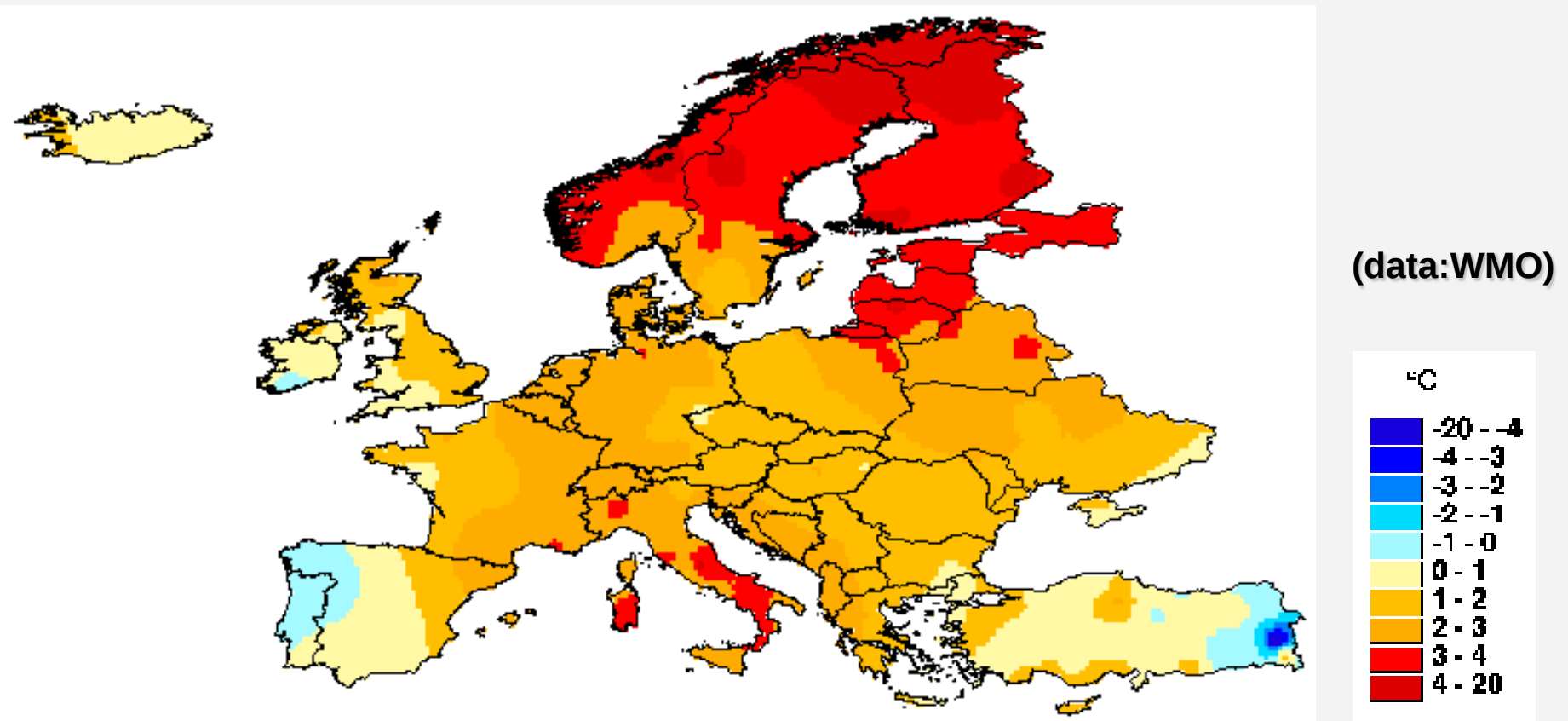
Max T anomaly in June 2003 / 1960-90



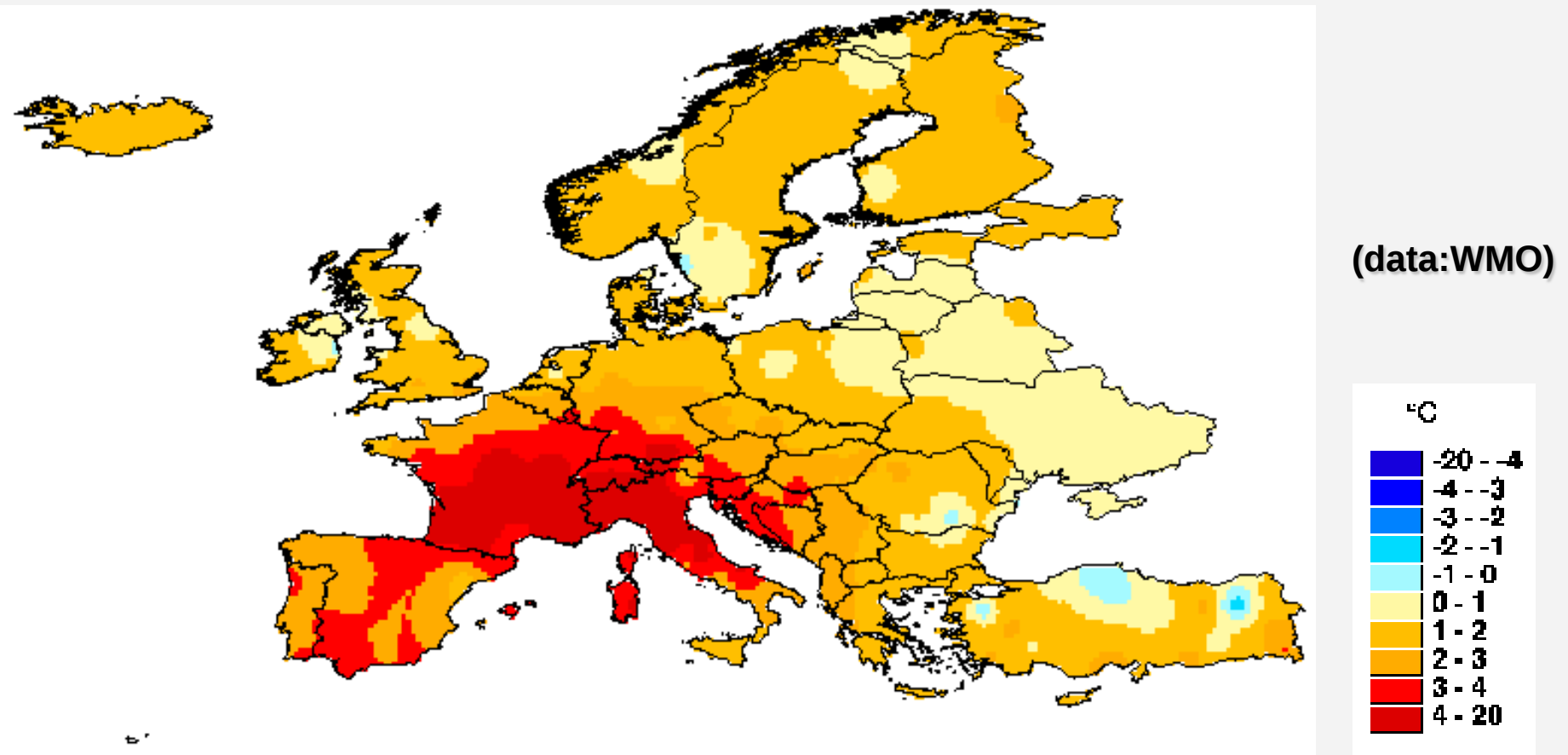
Min T anomaly in July 2003 / 1960-90



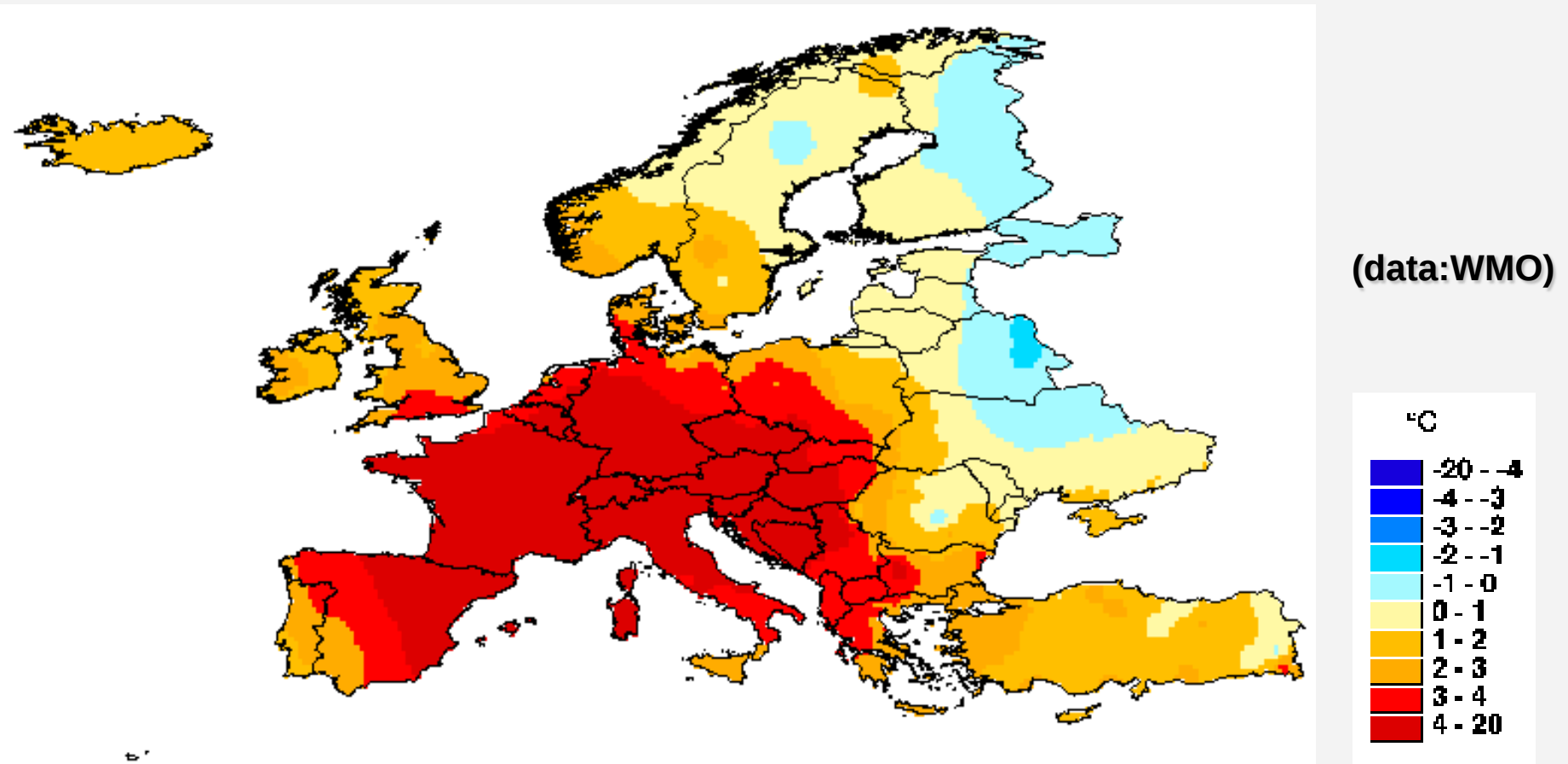
Max T anomaly in July 2003 / 1960-90



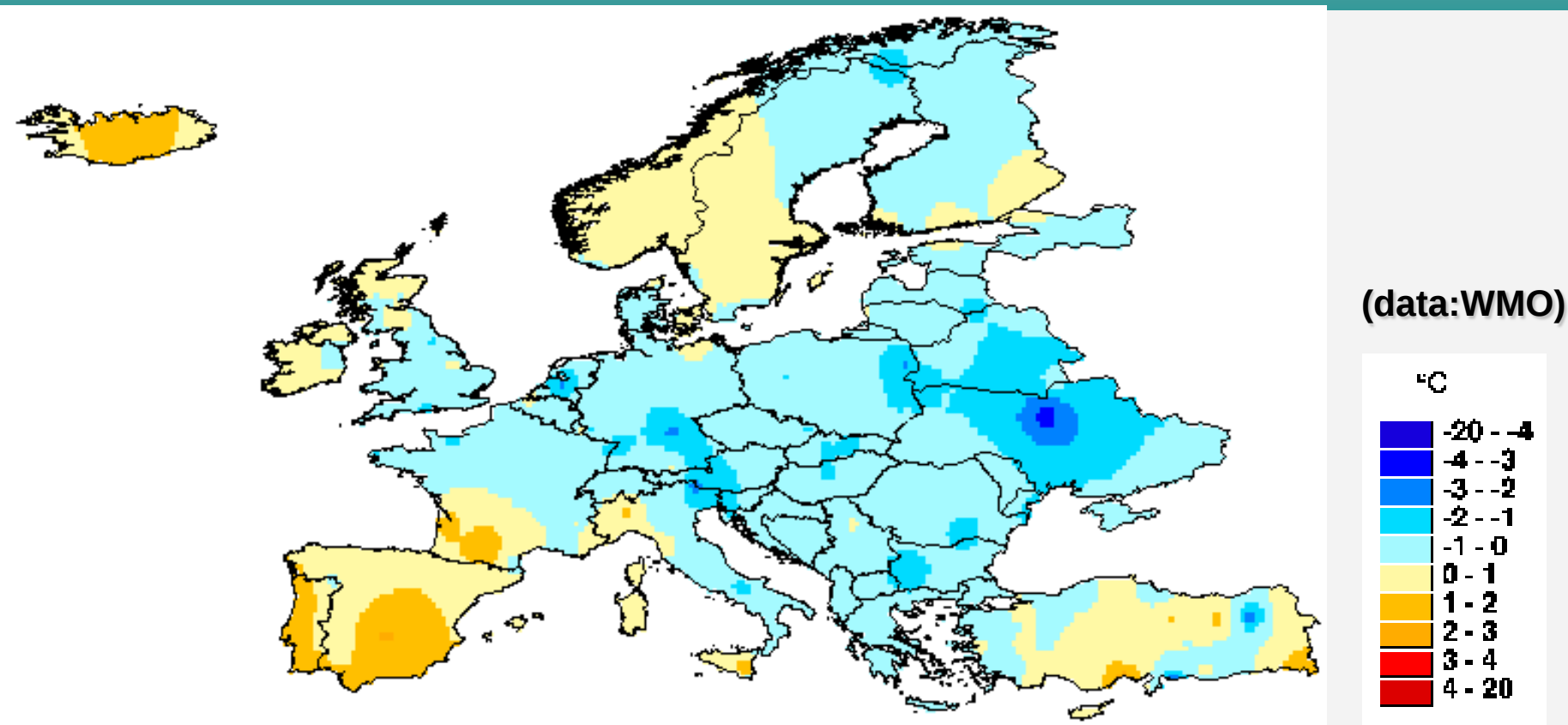
Min T anomaly in Aug 2003 / 1960-90



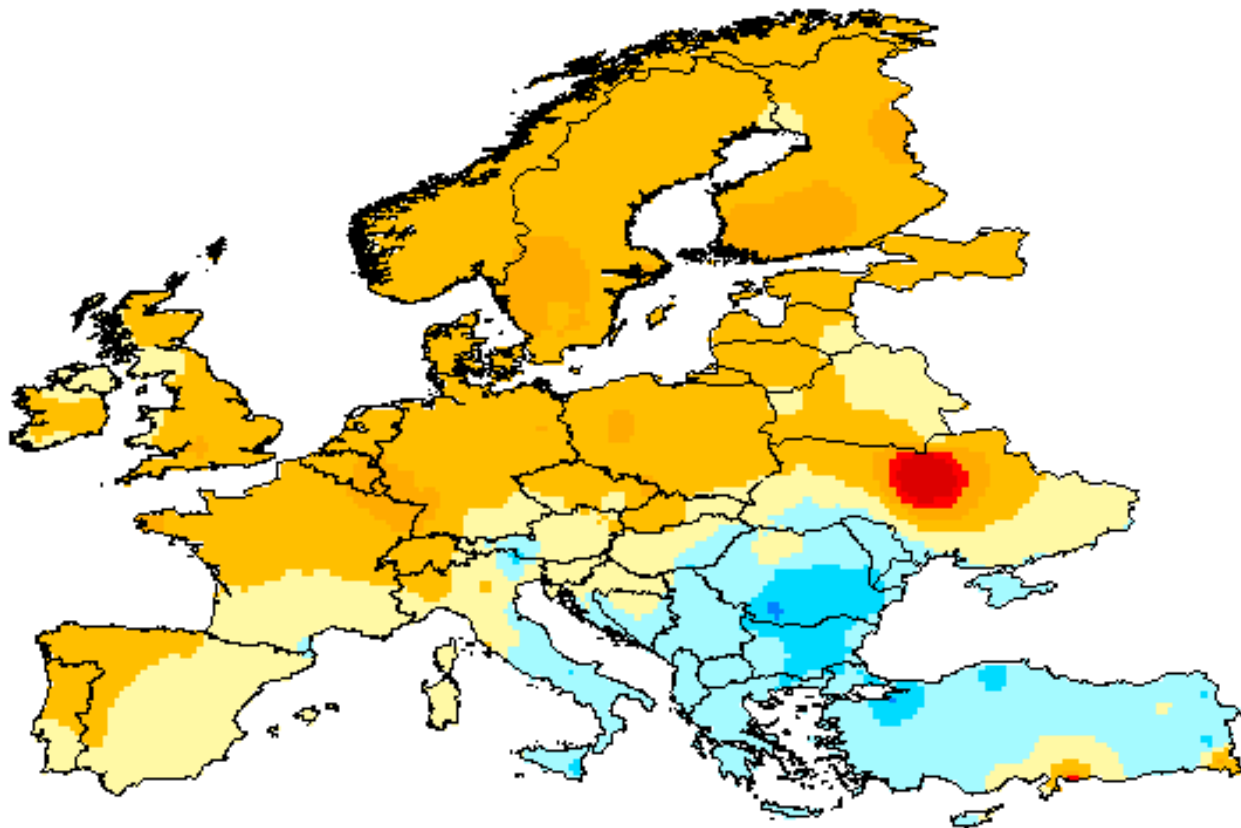
Max T anomaly in Aug 2003 / 1960-90



Min T anomaly in Sept 2003 / 1960-90



Max T anomaly in Sept 2003 / 1960-90

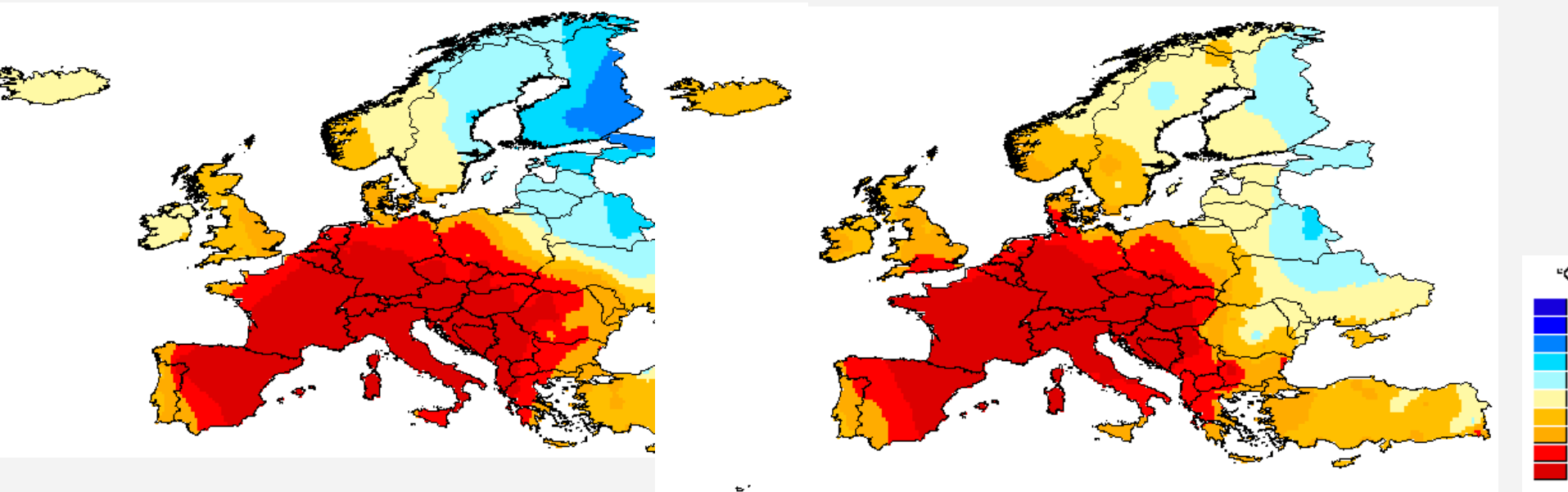


(data:WMO)

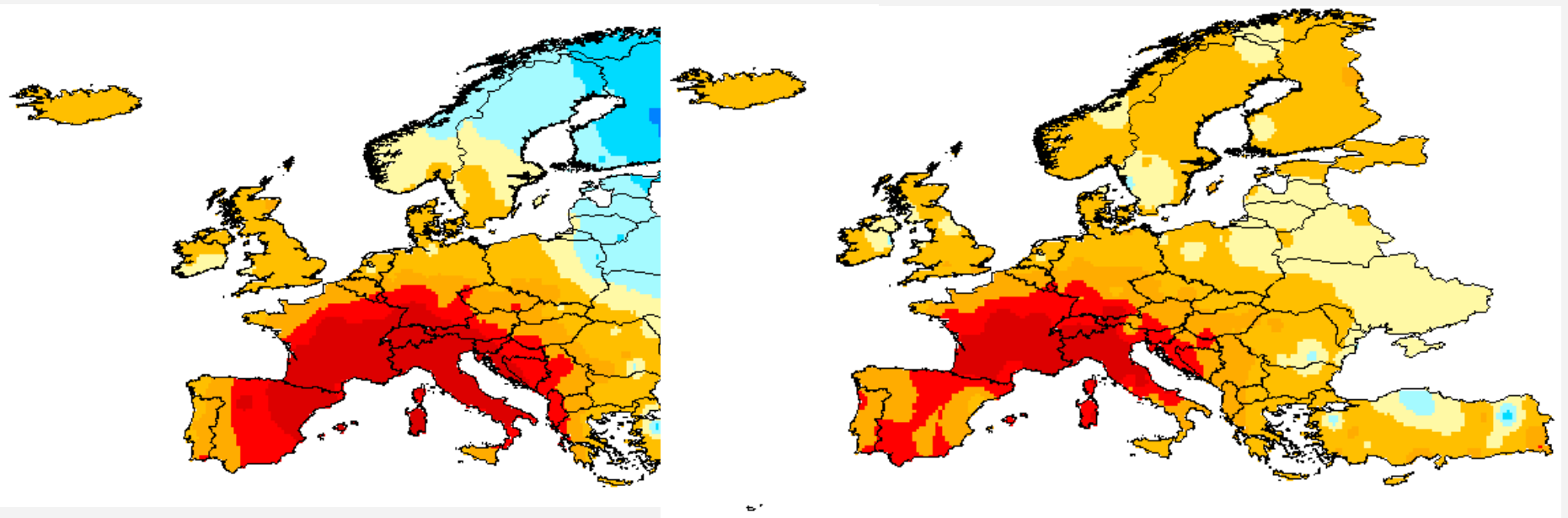
°C



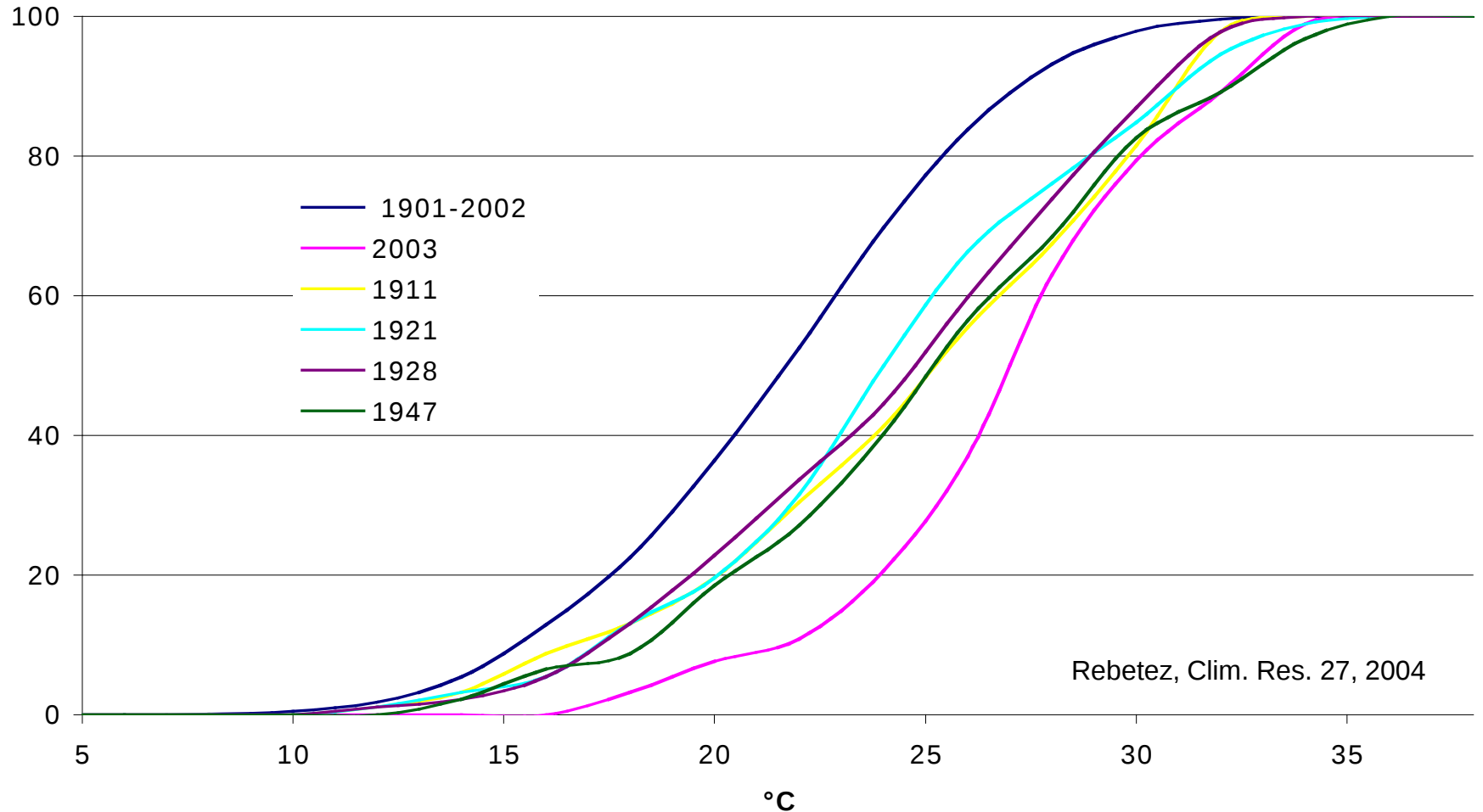
June 2003, Tmax and August 2003, Tmax



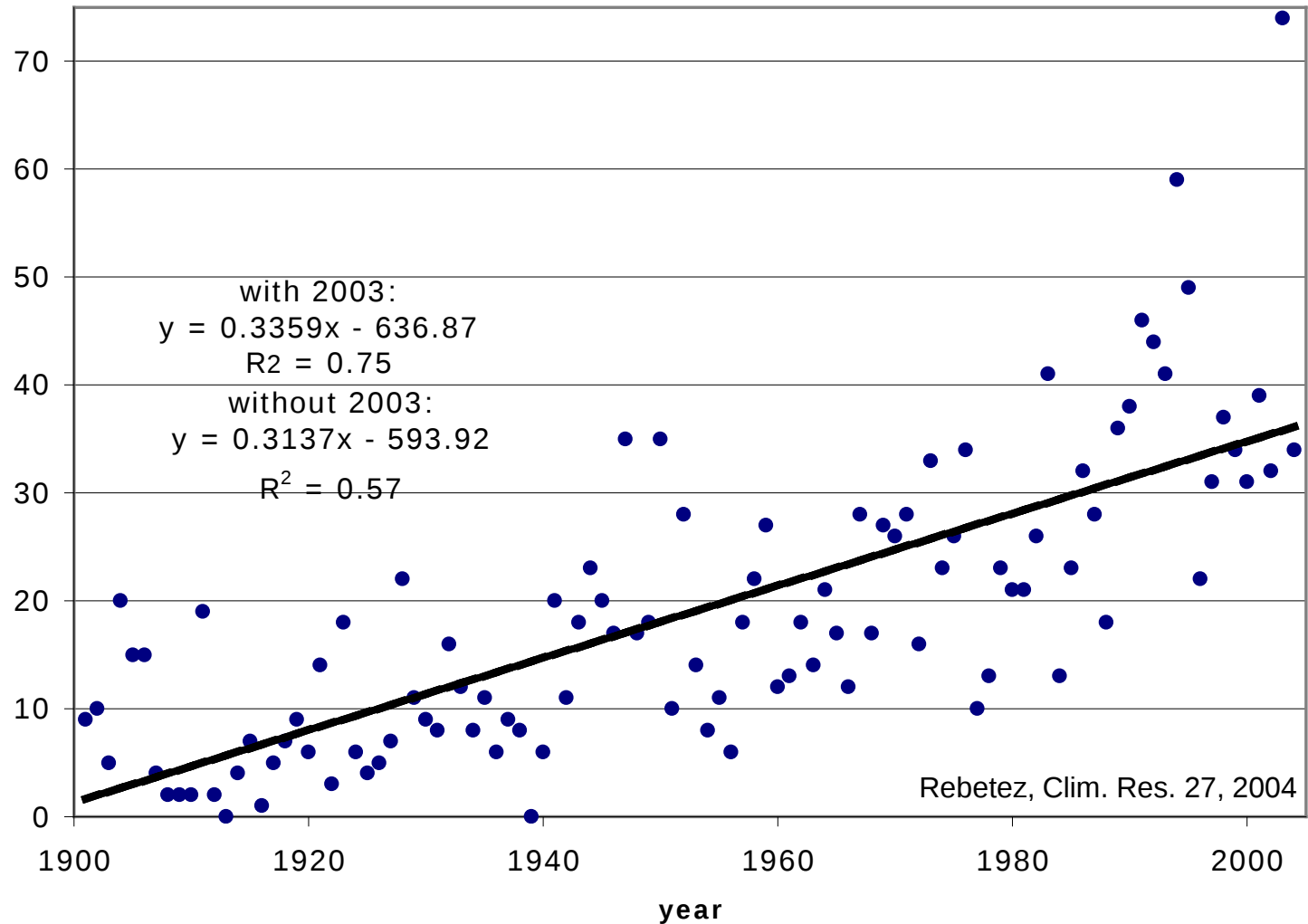
June 2003, Tmin and August 2003, Tmin



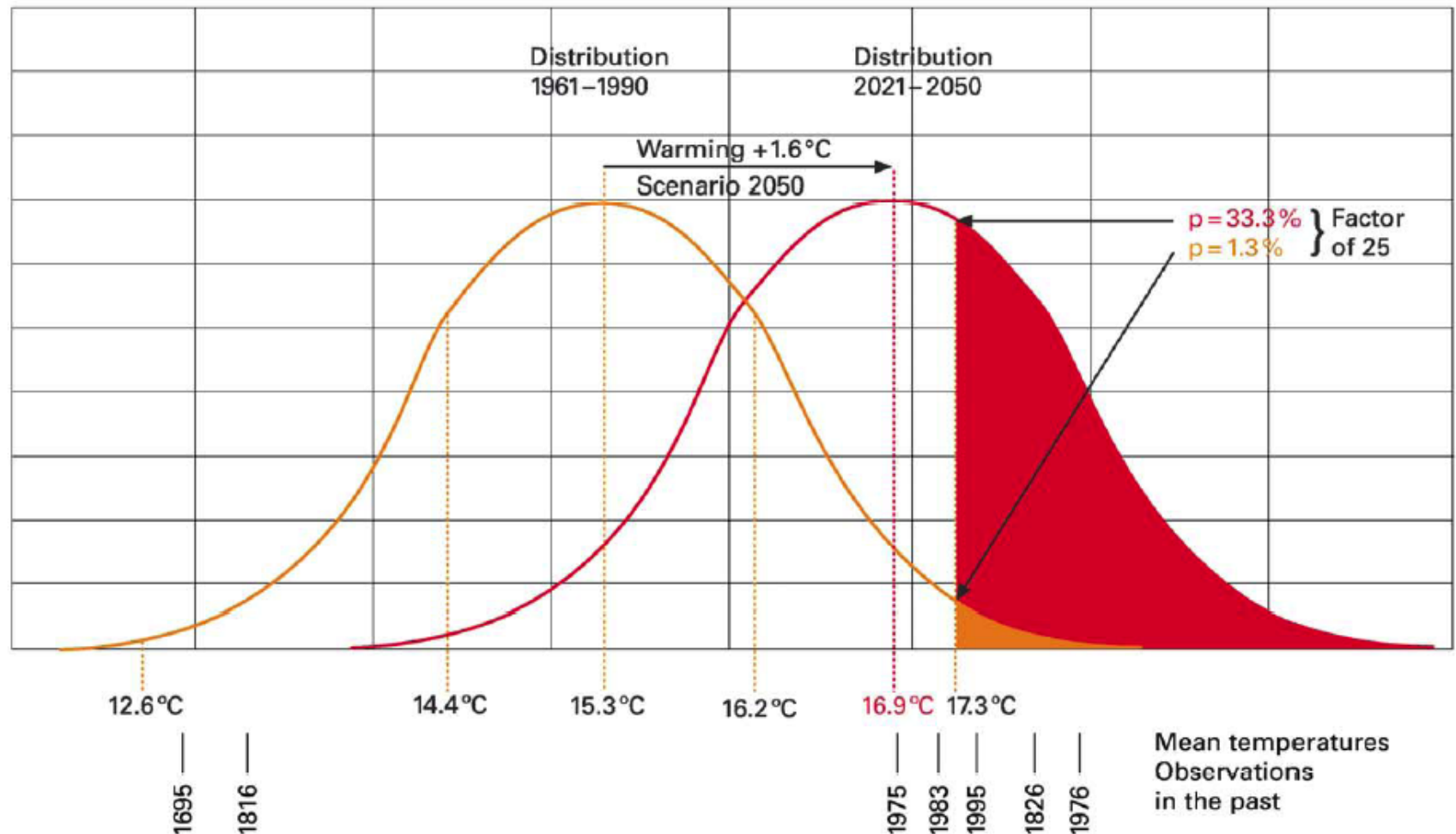
Max T during hot summers (Neuchatel, Switzerland)



Number of hot days (MinT > perc. 90 in Neuchatel, Switzerland)



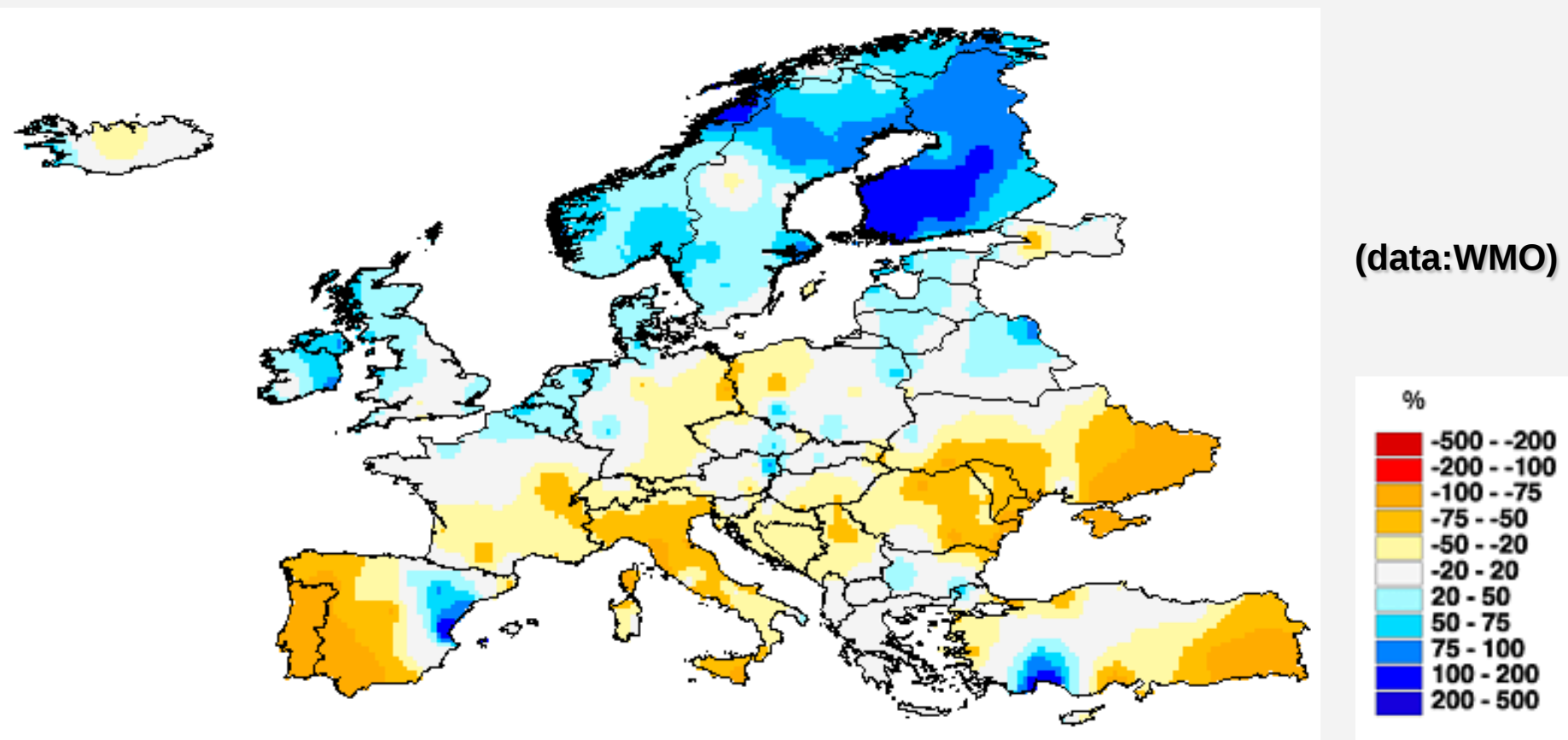
Increase of extreme values summer temperatures in Central England



Precipitation 2003



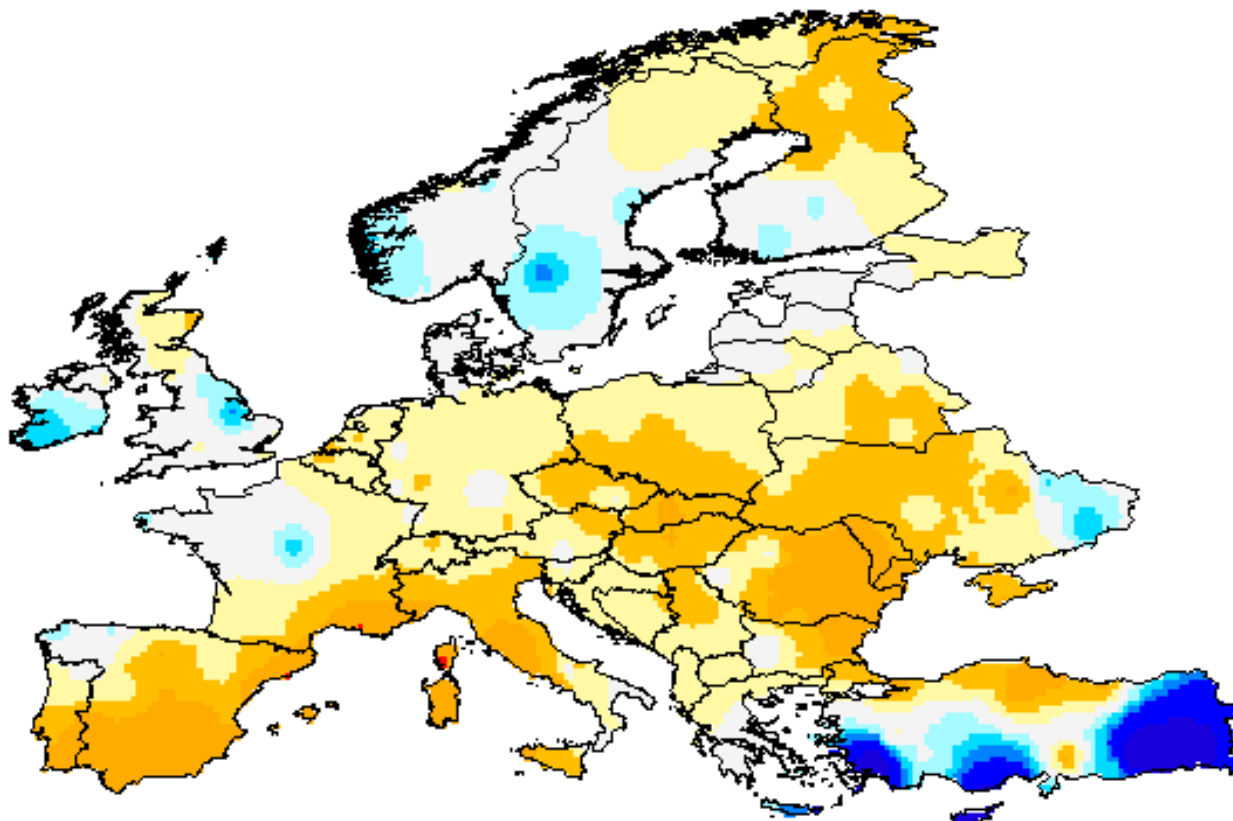
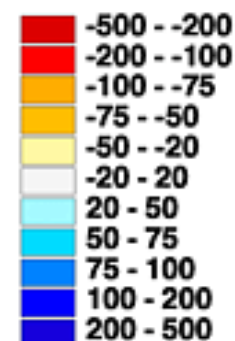
Precipitation difference in May 2003 / 1960-90



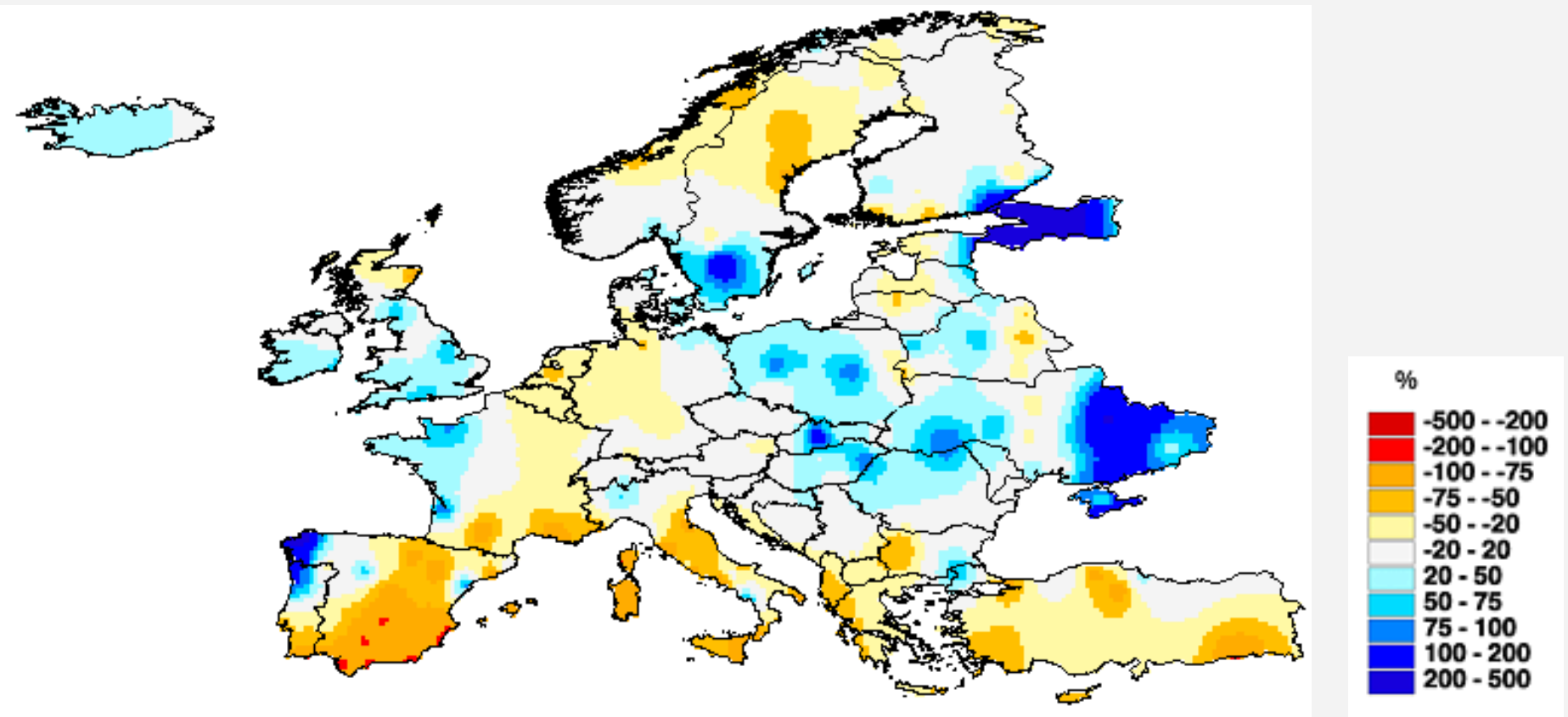
Precipitation difference in June 2003 / 1960-90

(data:WMO)

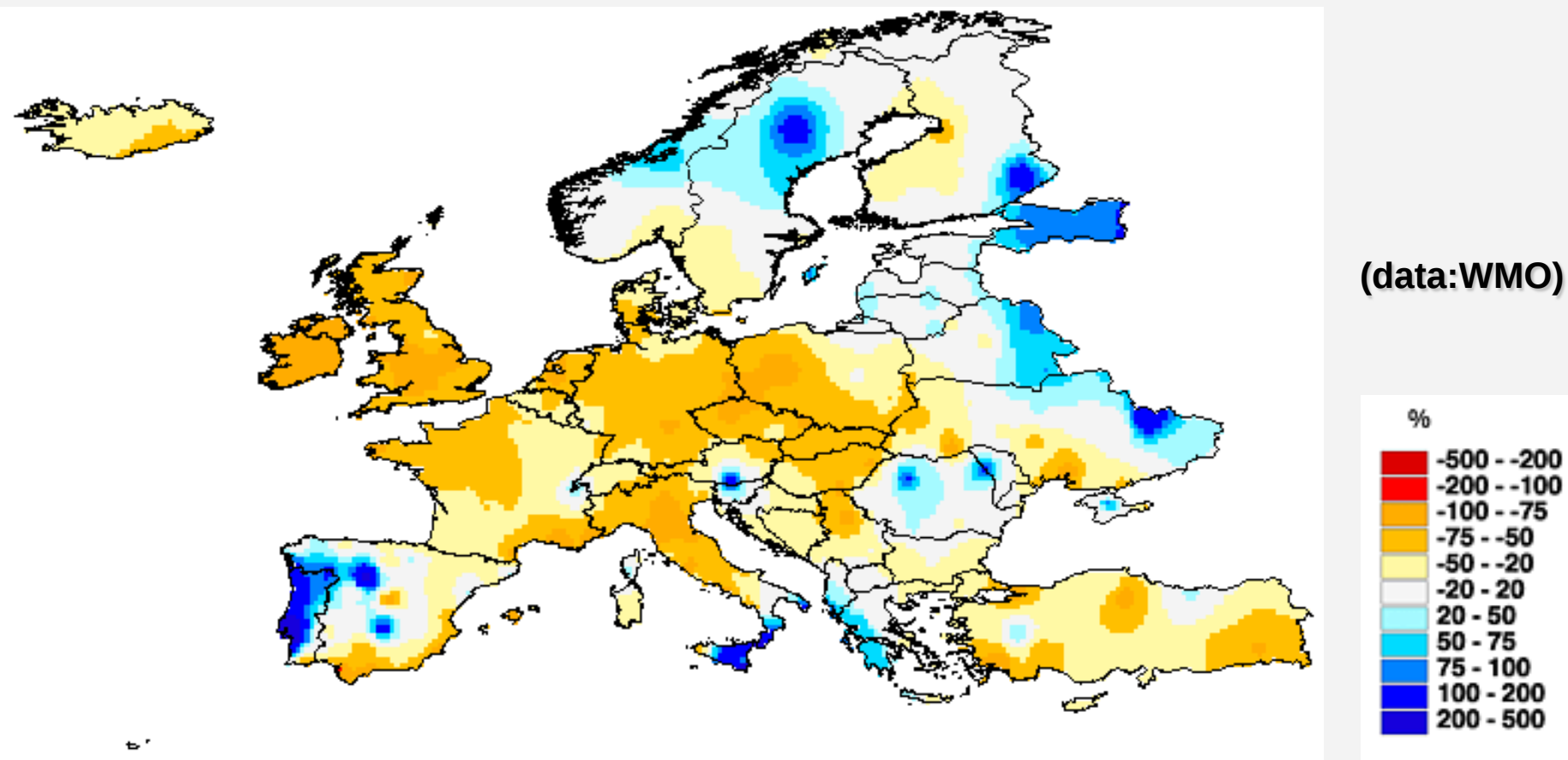
%



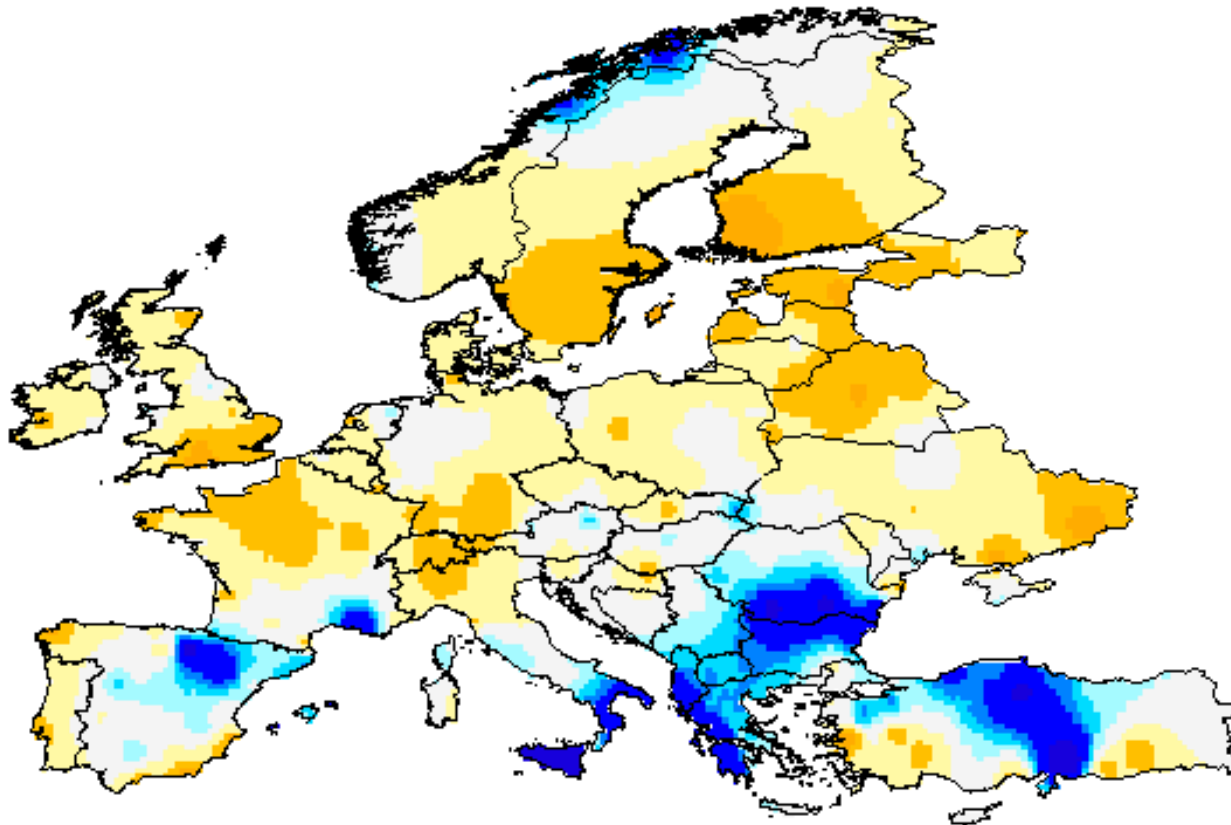
Precipitation difference in July 2003 / 1960-90



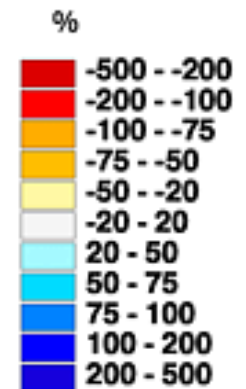
Precipitation difference in Aug 2003 / 1960-90



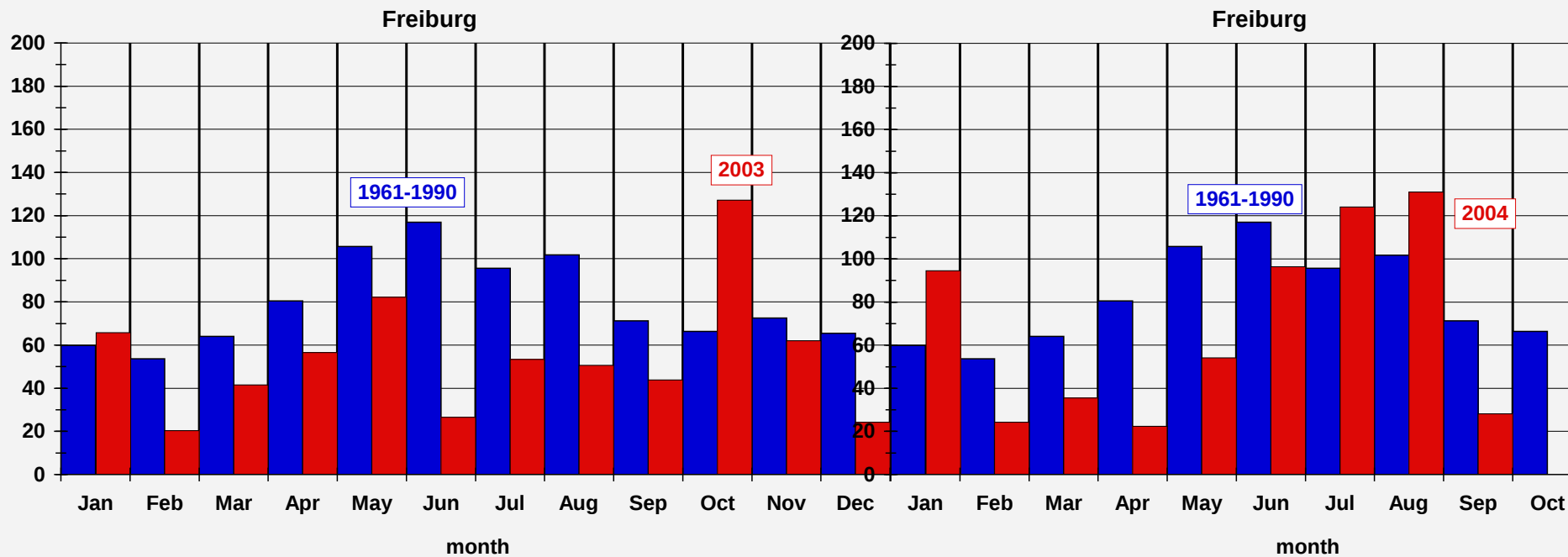
Precipitation difference in Sept 2003 / 1960-90



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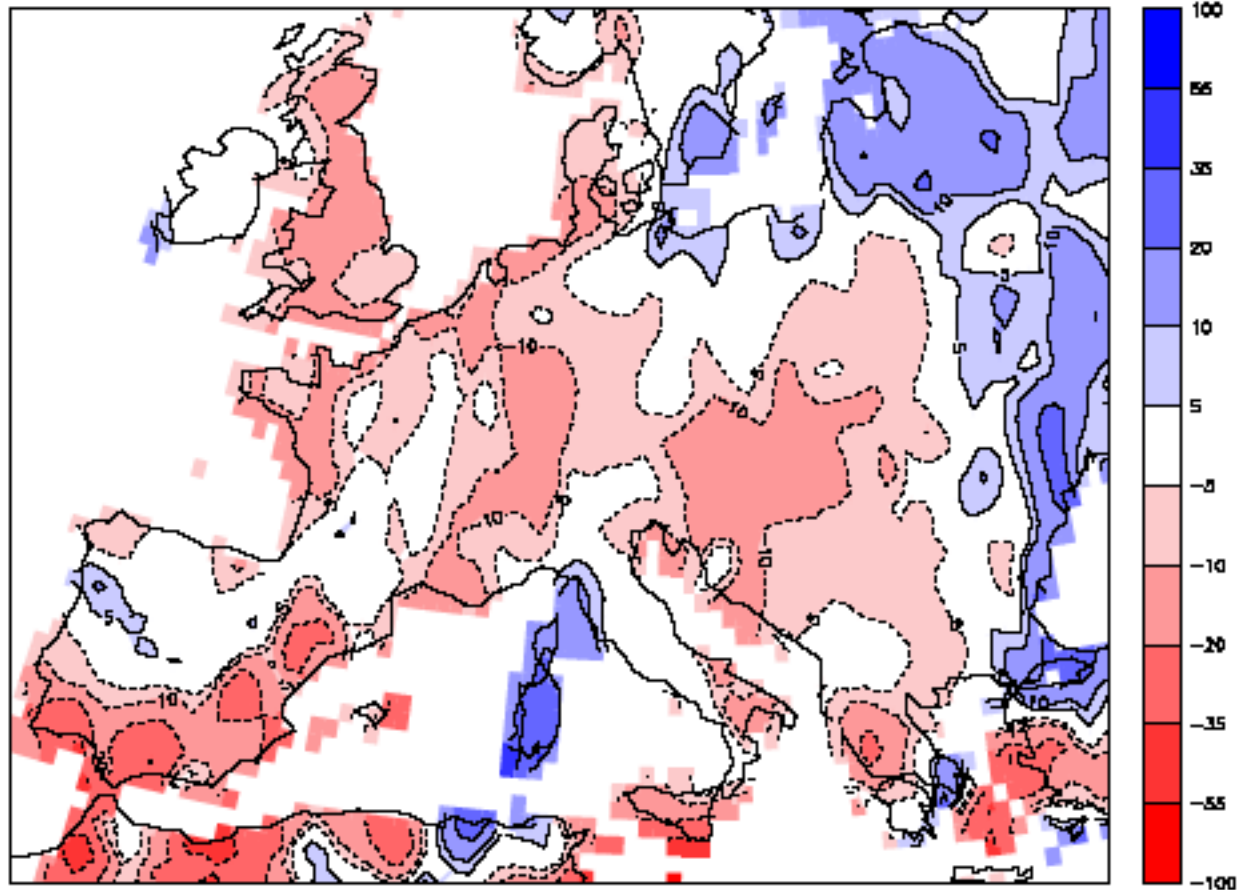


Monthly sums of precipitation in Freiburg (Germany)



Trend in summer drought (1976-2000 / 1951-1975)

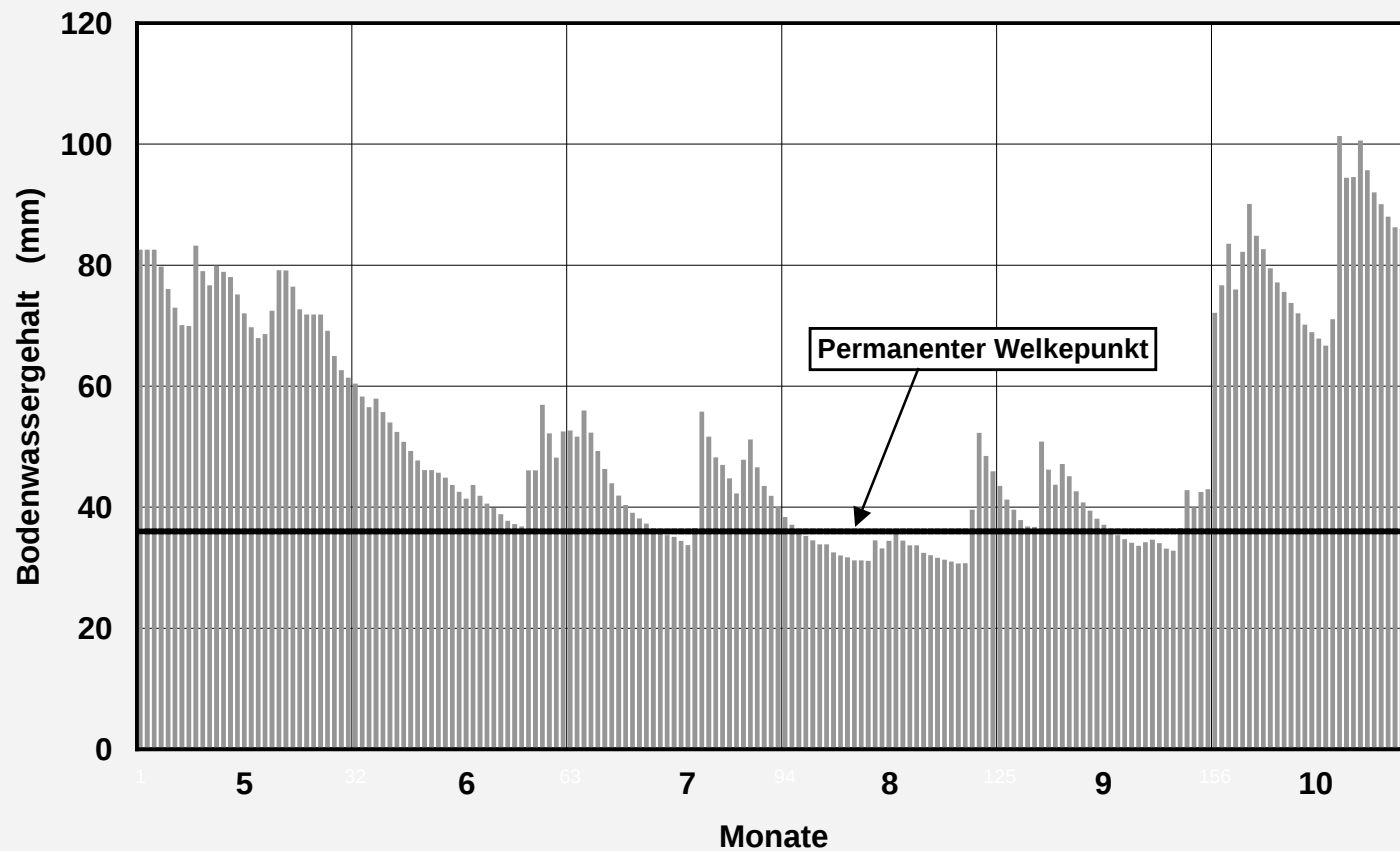
(b) CRU Summer Mean Precipitation: 1976 thru 2000 minus 1951 thru 1975



Pal et al., GRL 31, 2004

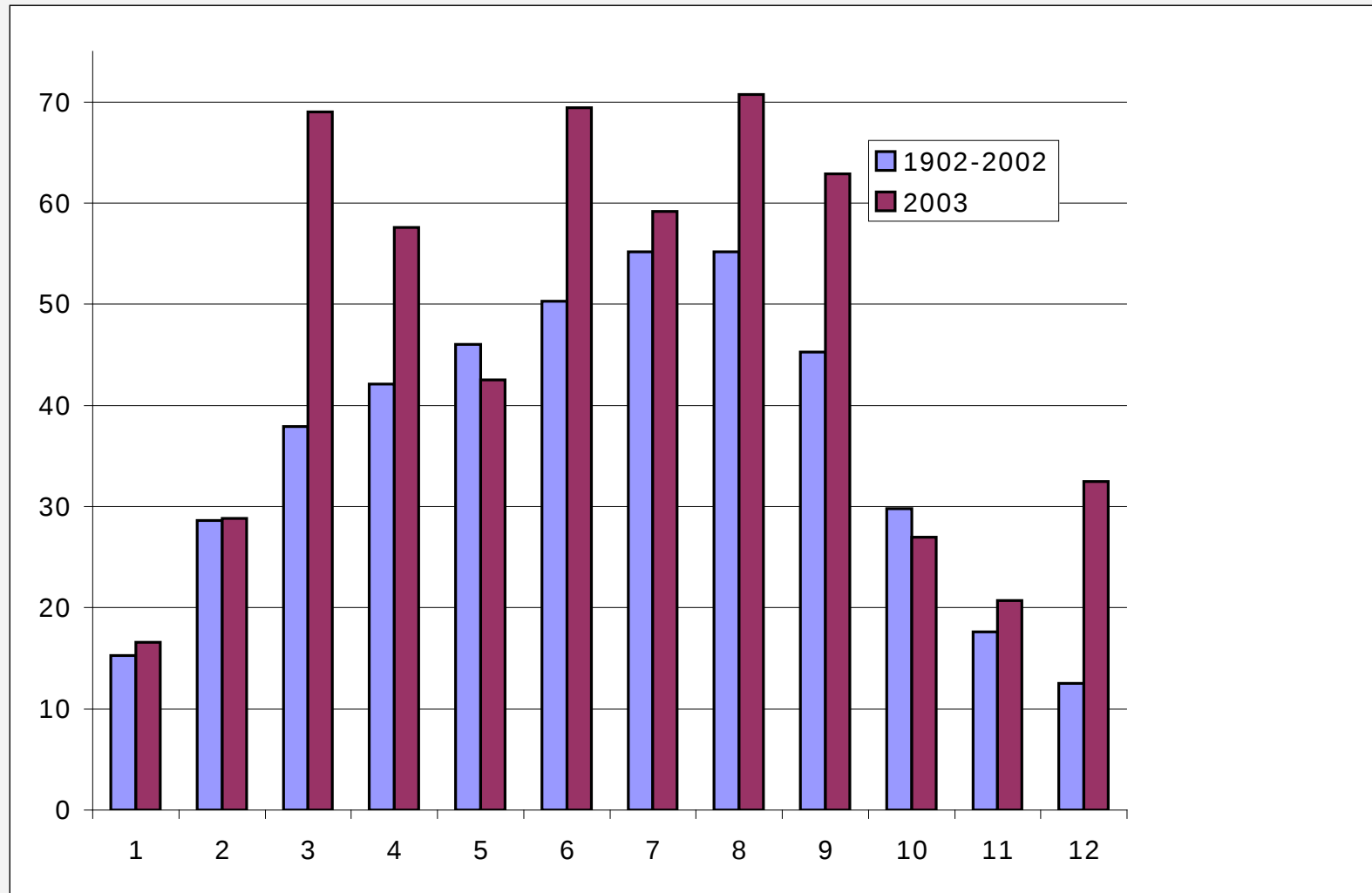


Groundwater content (Hartheim, Rhine Valley): 2003



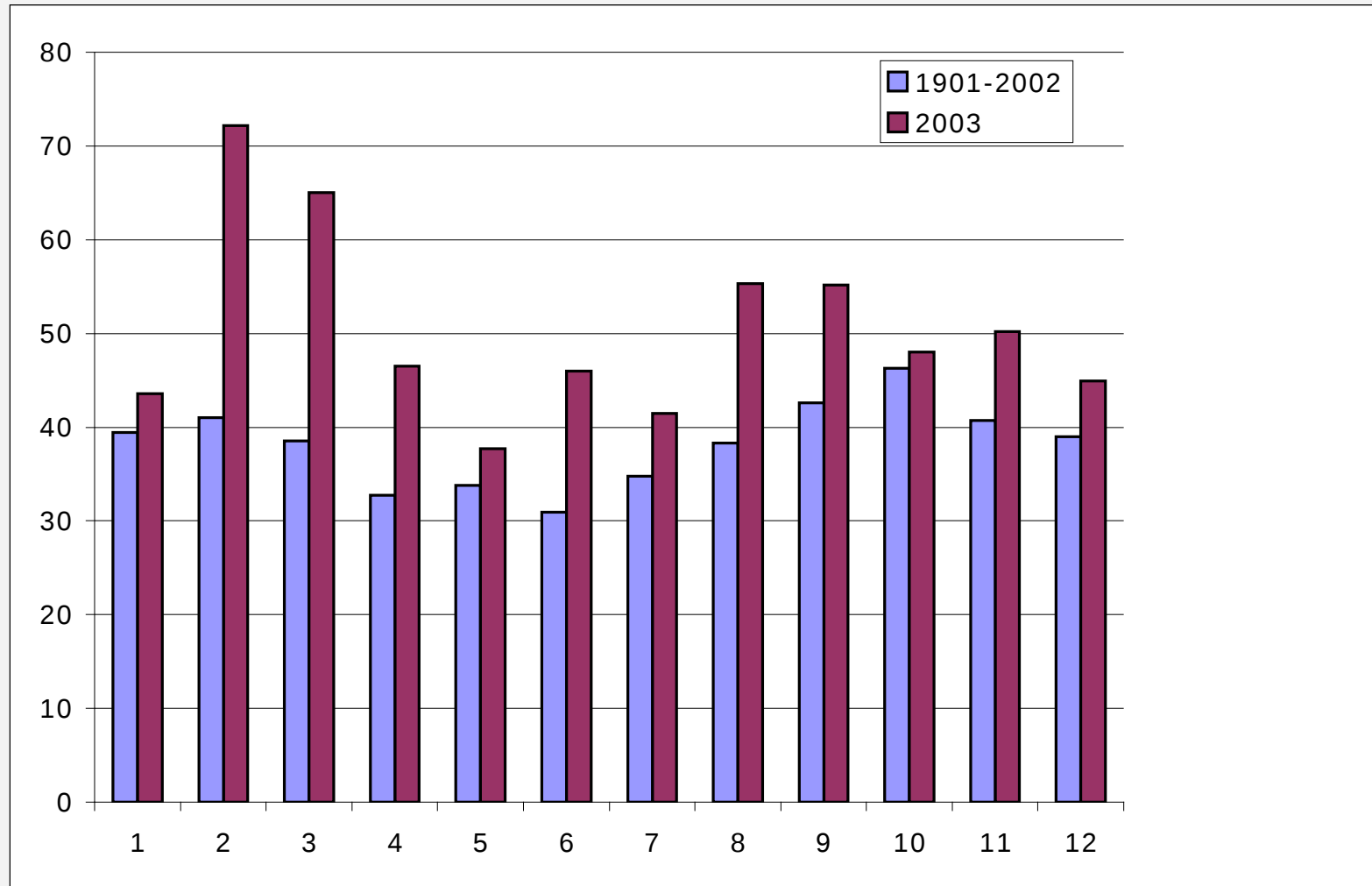
Sunshine duration [%]: : 2003 / 1902-2002

Neuchatel, 487 m a/sl



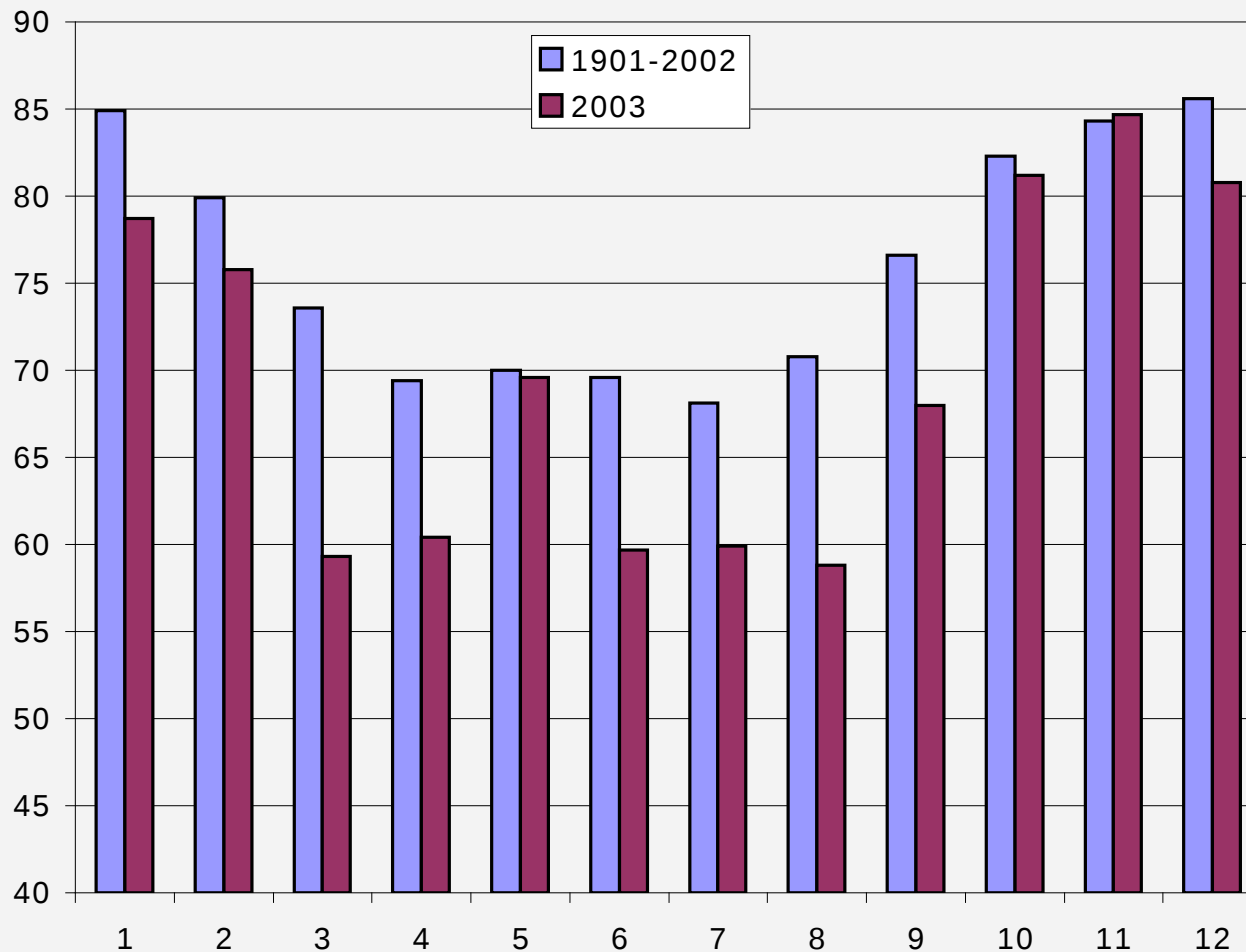
Sunshine duration [%]: 2003 / 1901-2002

Santis, 2500 m/sl



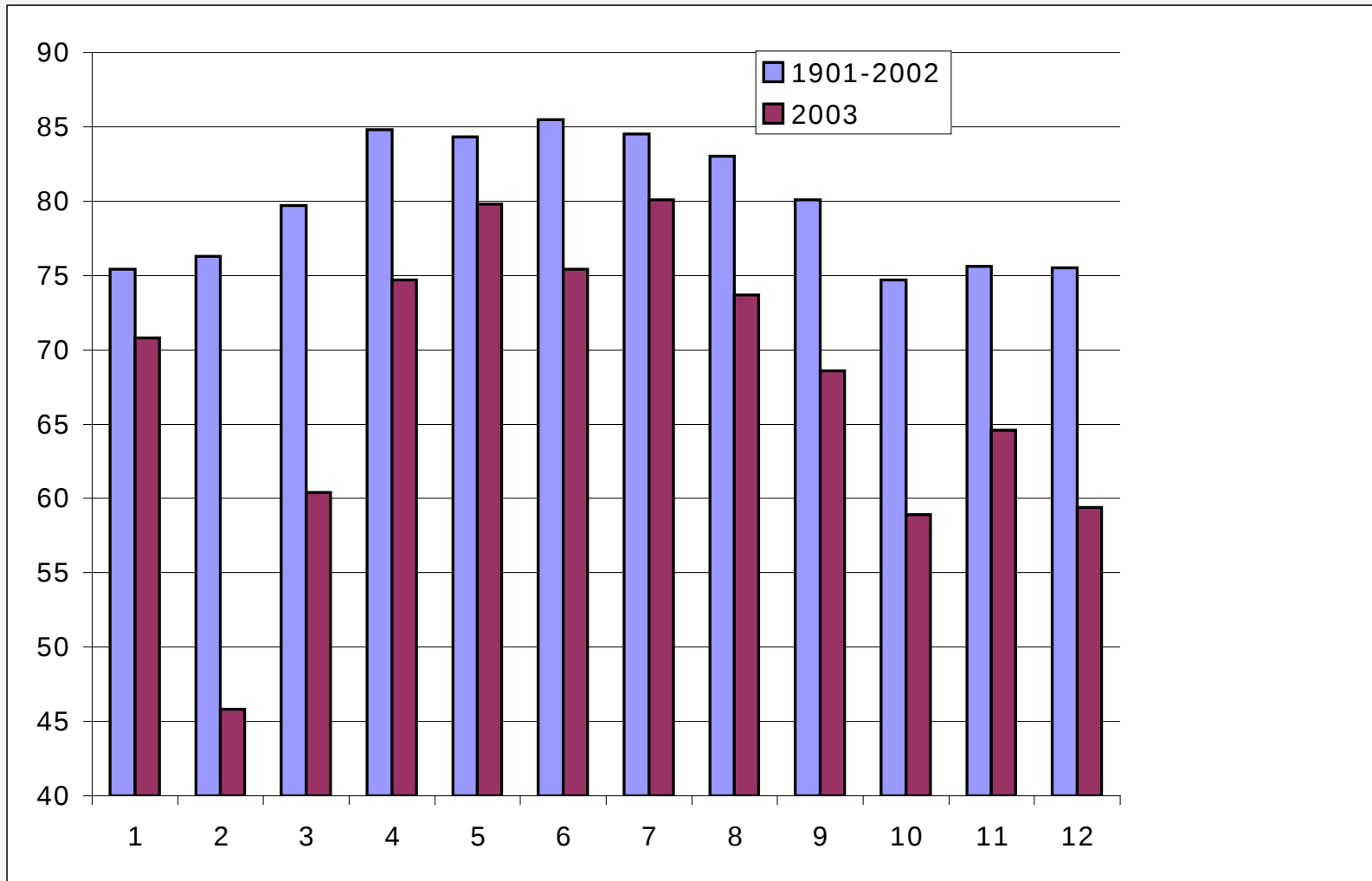
Relative humidity [%]: 2003 / 1902-2002

Neuchatel, 487 m a/sl

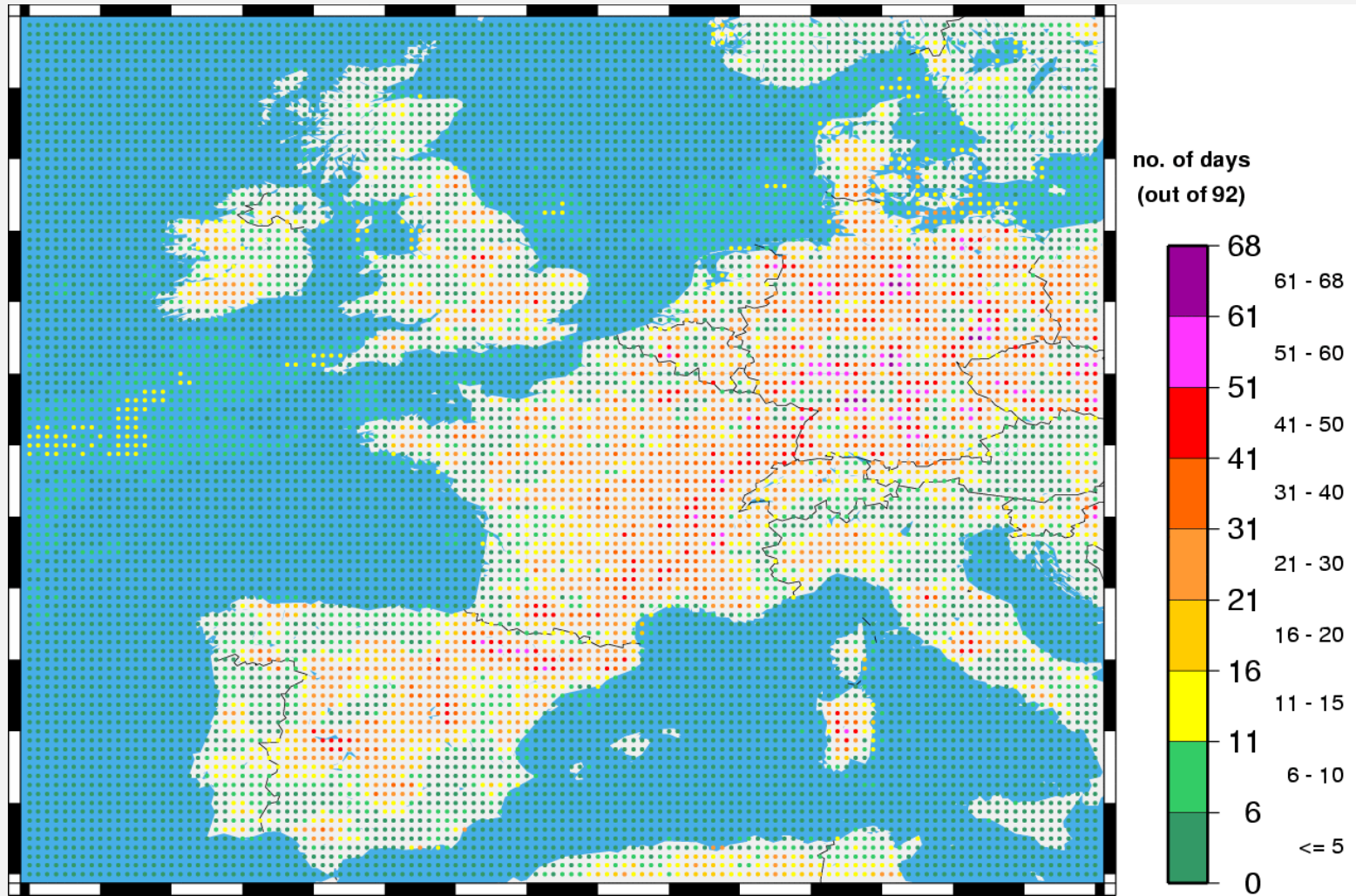


Relative humidity [%]: 2003 / 1901-2002

Santis, 2500 m/sl



Nr days with minimum humidity below percentile 10 (French Global Model ARPEGE)



Conclusion

- Length of the period
- Geographical amplitude
- Extremely few cold / cool days during the whole summer
- Comparable to 1947 and 1976 (length), but even longer and more extreme
- The observed drying trend over most of Europe
 - Is consistent with projected changes in mean summer precipitation under increased GHG concentrations
 - might continue in the future (Pal et al., GRL 31, 2004)
- Very dry and sunny year

