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Emerging trends in heavy precipitation and hot temperature extremes in Switzerland

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Mark A. Liniger, Mischa Croci-Maspoli & Reto Knutti

Scherrer et al, 2016, JGR, doi:10.1002/2015JD024634

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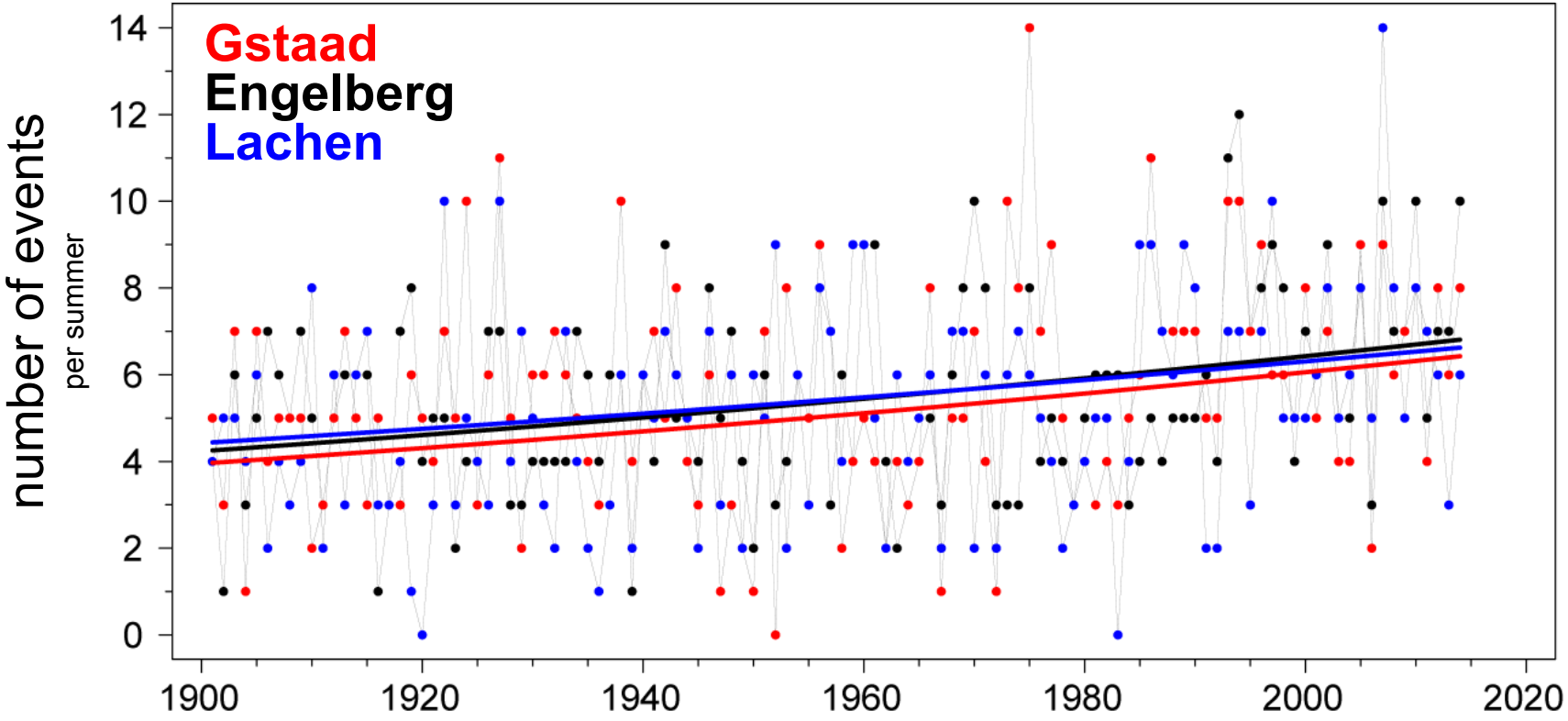
Frequency of heavy summer precipitation

Swiss Prealps, R>~30 mm/day



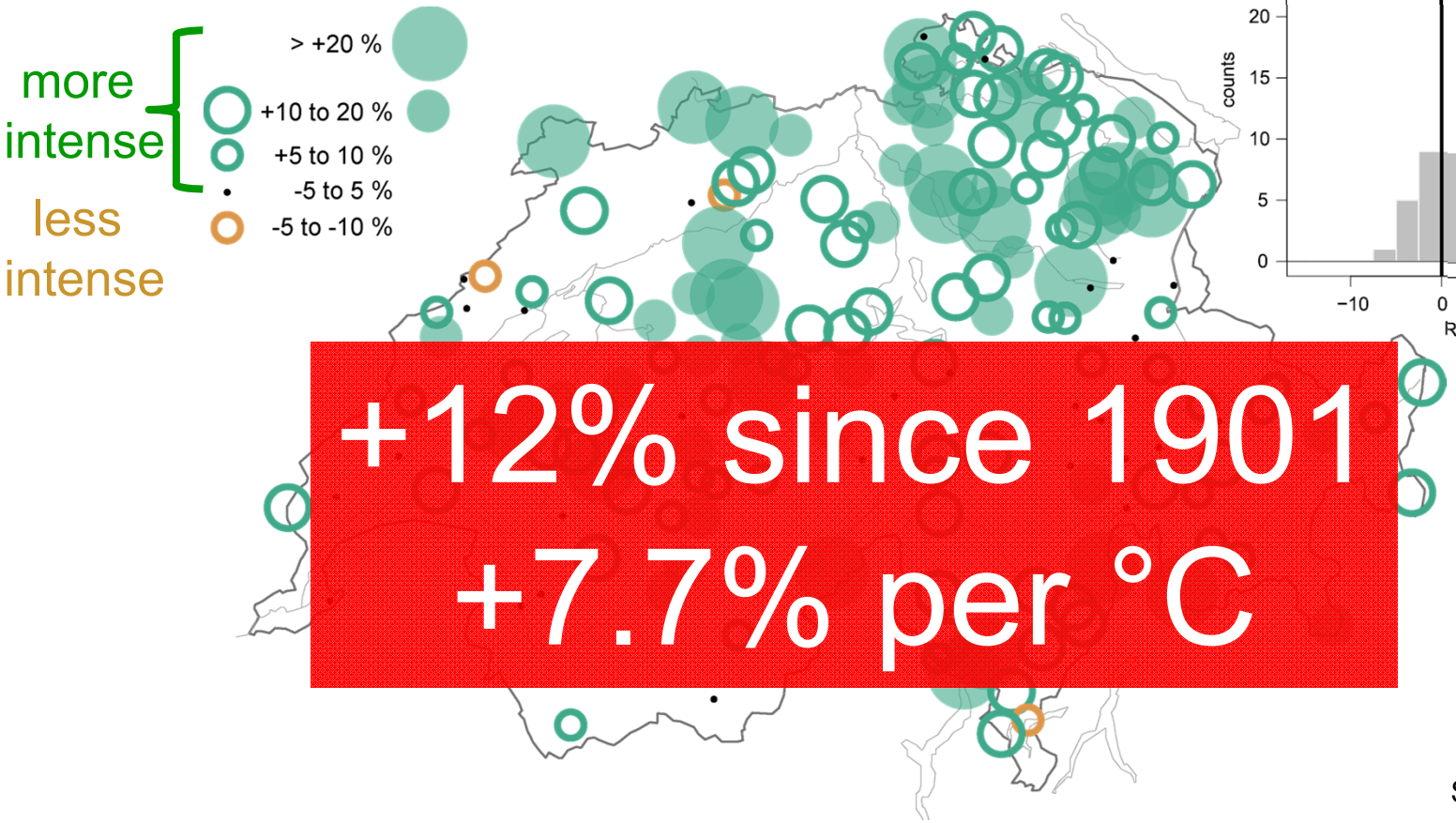
trend computation:

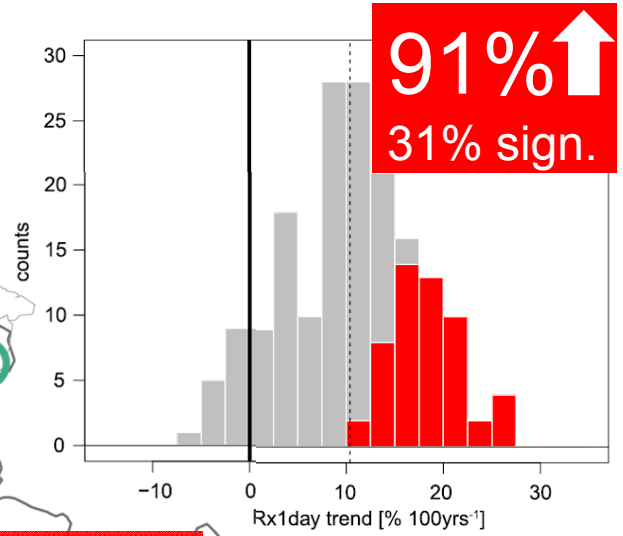
continous variables: Theil-Sen slopes, Mann-Kendall trend test

count variables: logistic trends

More intense heavy daily precipitation

Trends annual maxima 1901-2014





+12% since 1901

+7.7% per °C

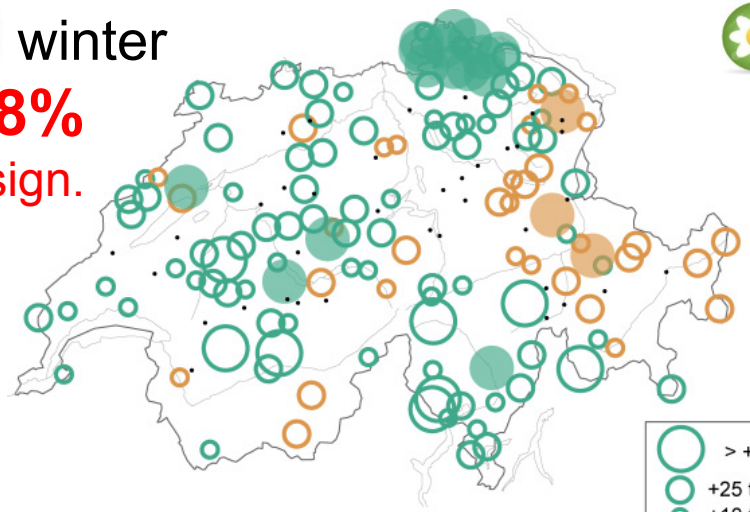
Scherrer et al. (2016)

More intense in all seasons…

winter

↑68%

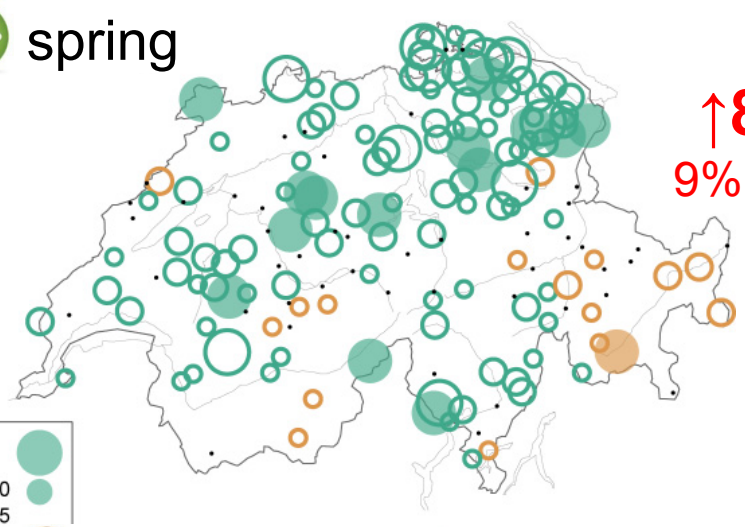
11% sign.

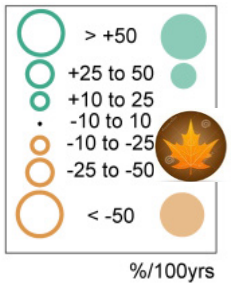


spring

↑81%

9% sign.

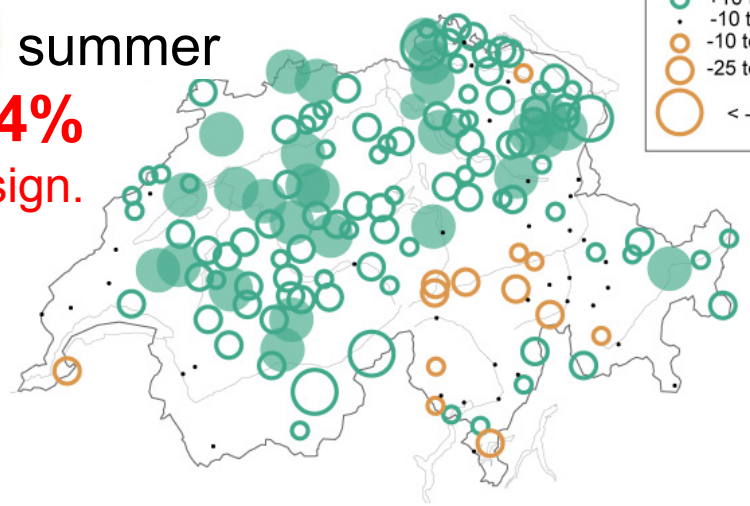




summer

↑84%

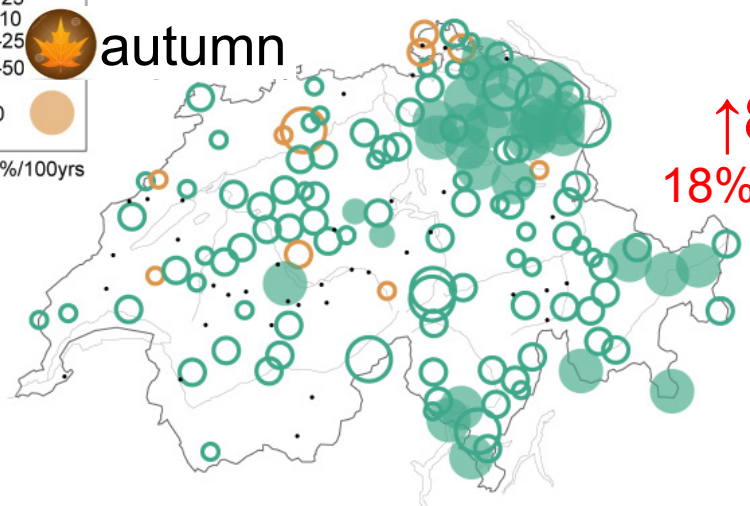
16% sign.



autumn

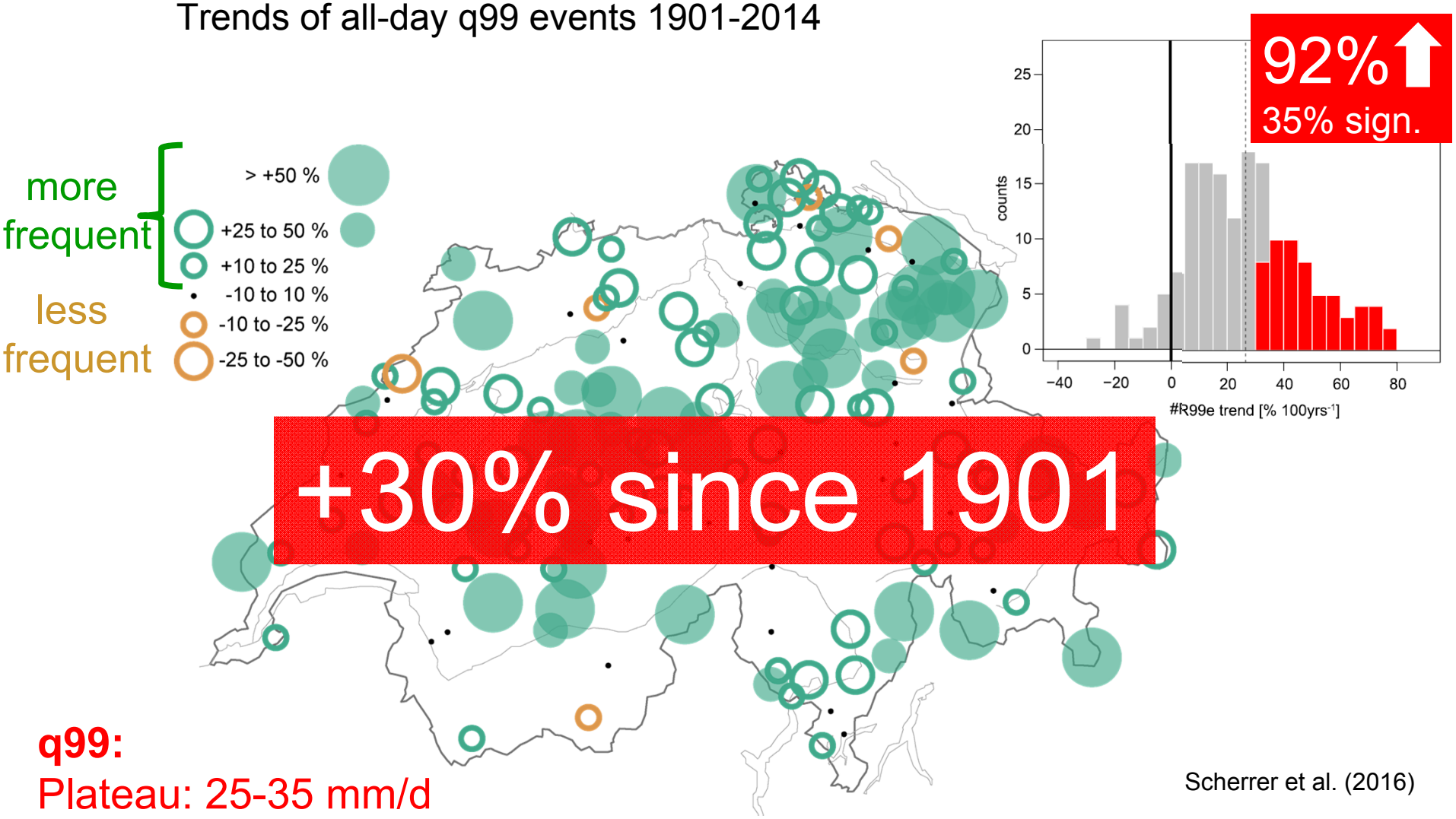
↑86%

18% sign.



More frequent heavy daily precipitation

Trends of all-day q99 events 1901-2014



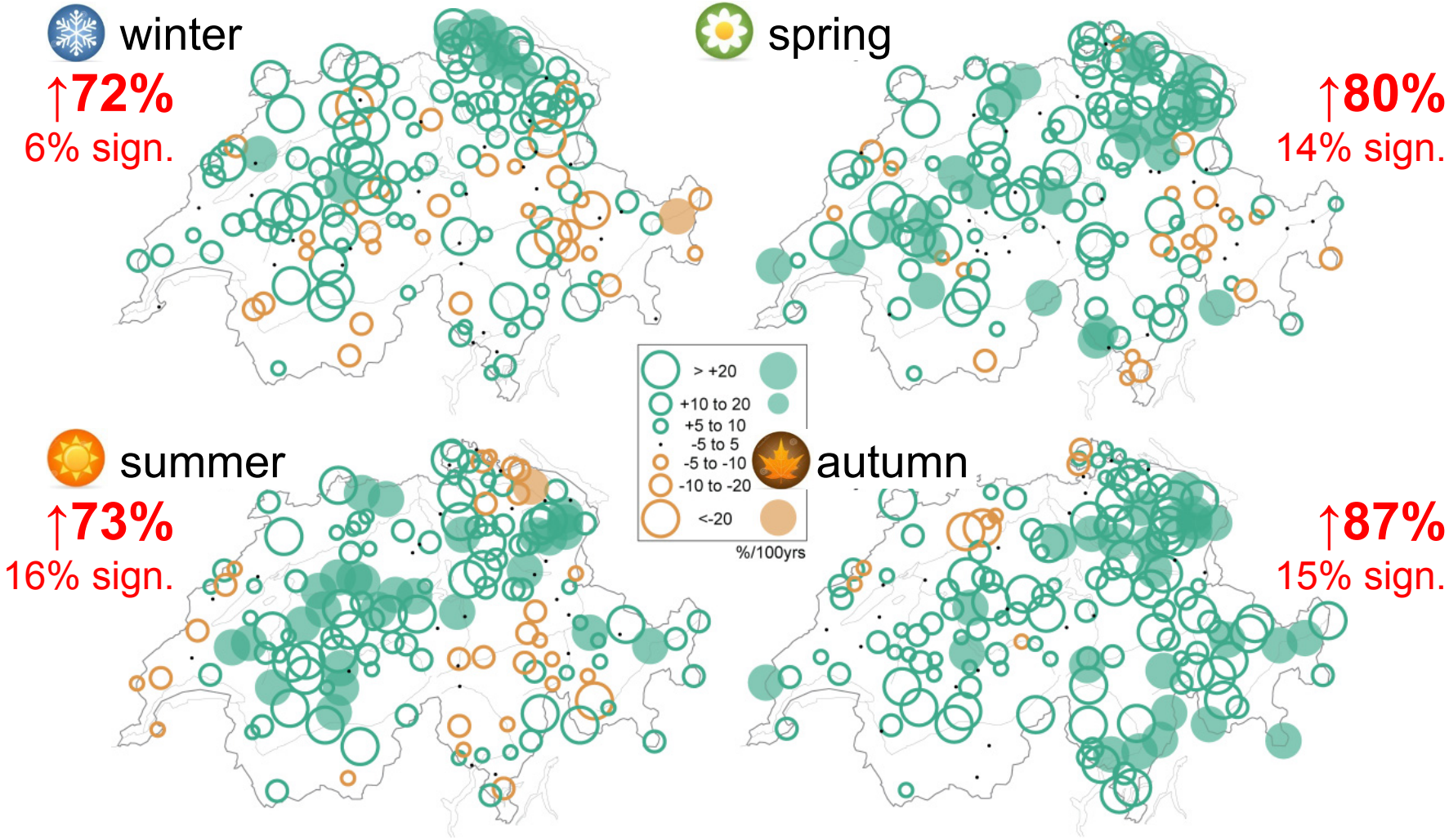
q99:

Plateau: 25-35 mm/d

Southern Alps: 55-105 mm/d

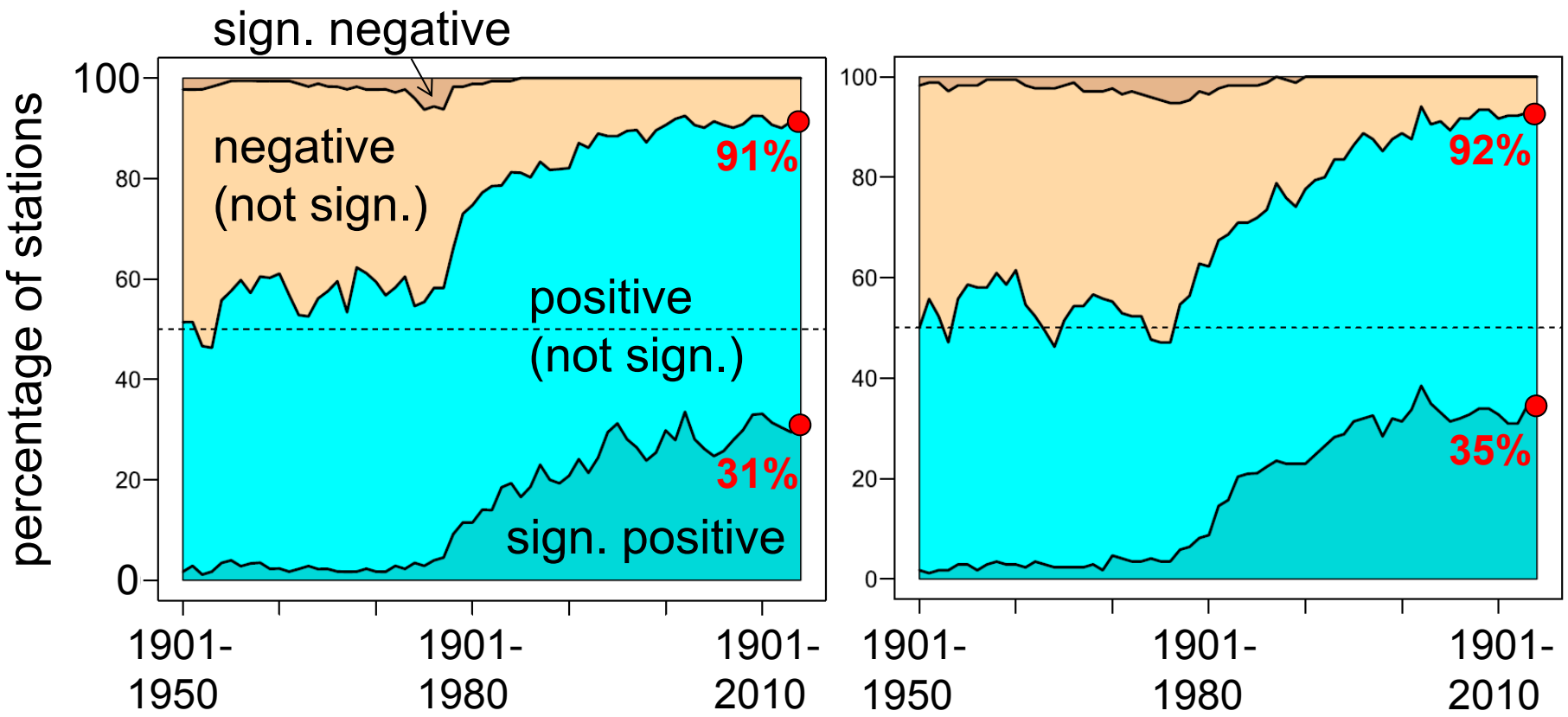
Scherrer et al. (2016)

More frequent in all seasons…



Trend sign evolution 1901-XXXX

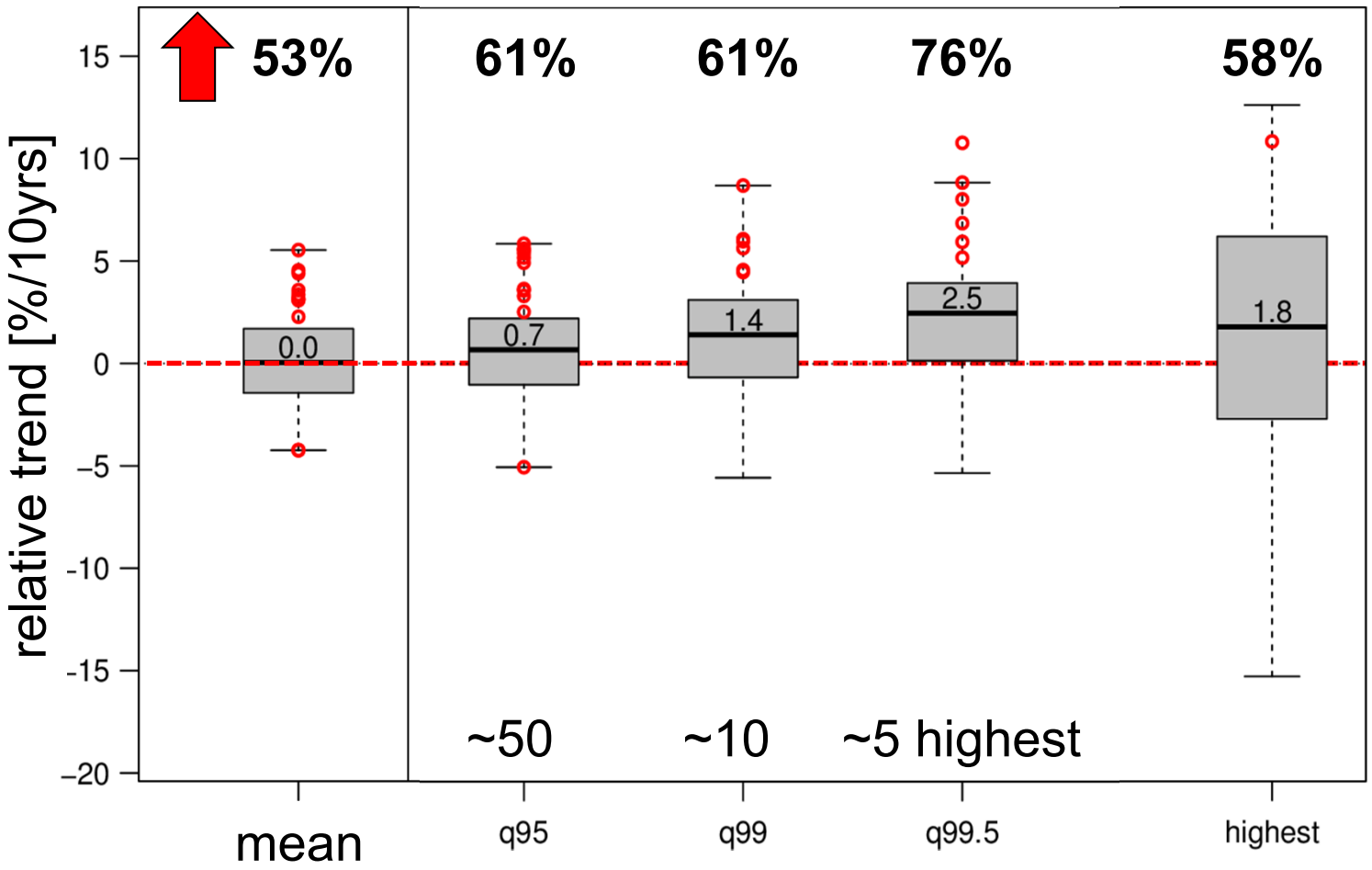
precip intensity **precip frequency**



100% corresponds to ~180 stations

Trends in hourly precipitation «intensity»

1981-2014, trends with pos. sign @ 59 autom. stations



more rare events

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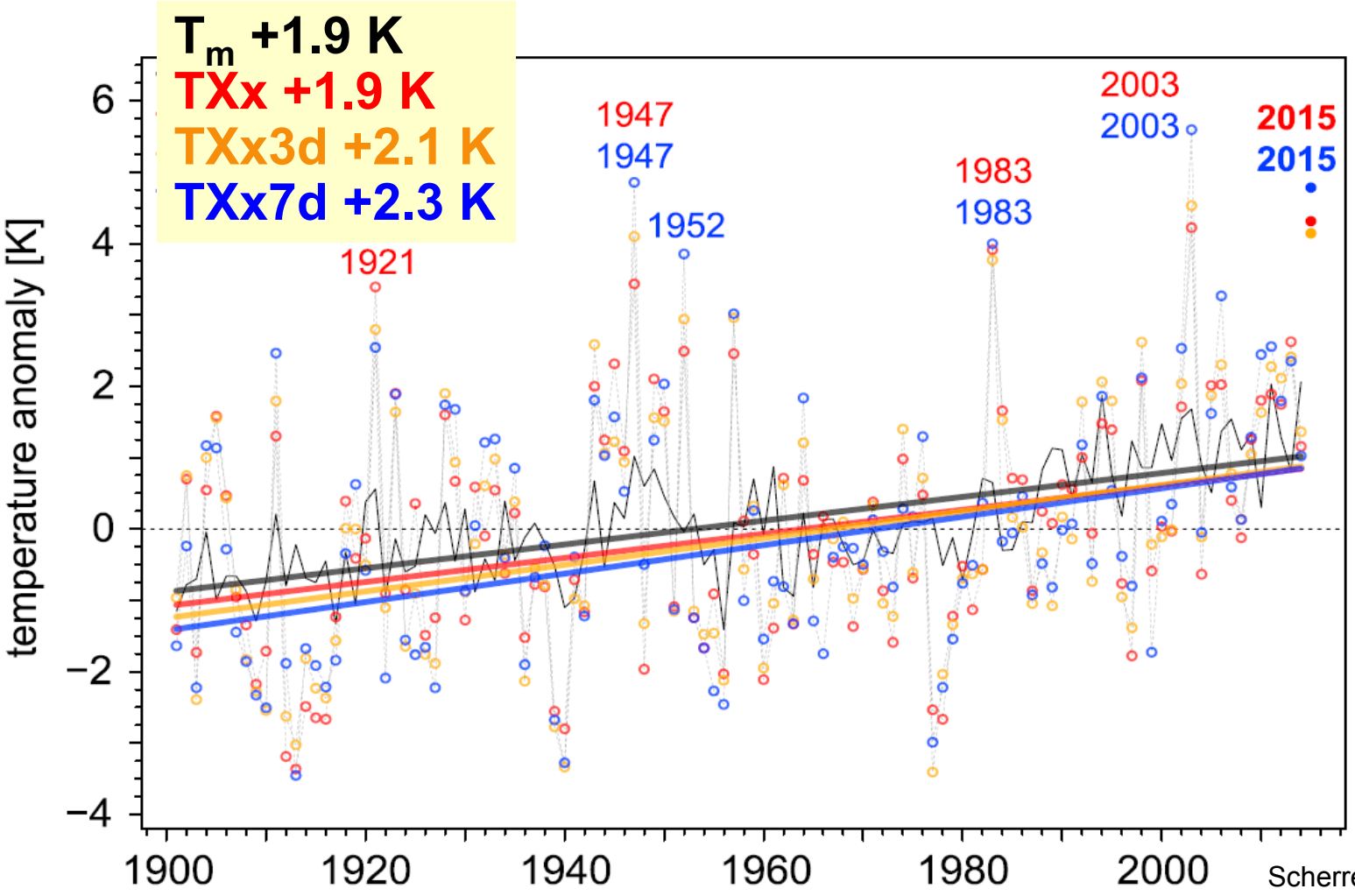
Trends of hottest 1/3/7-day period

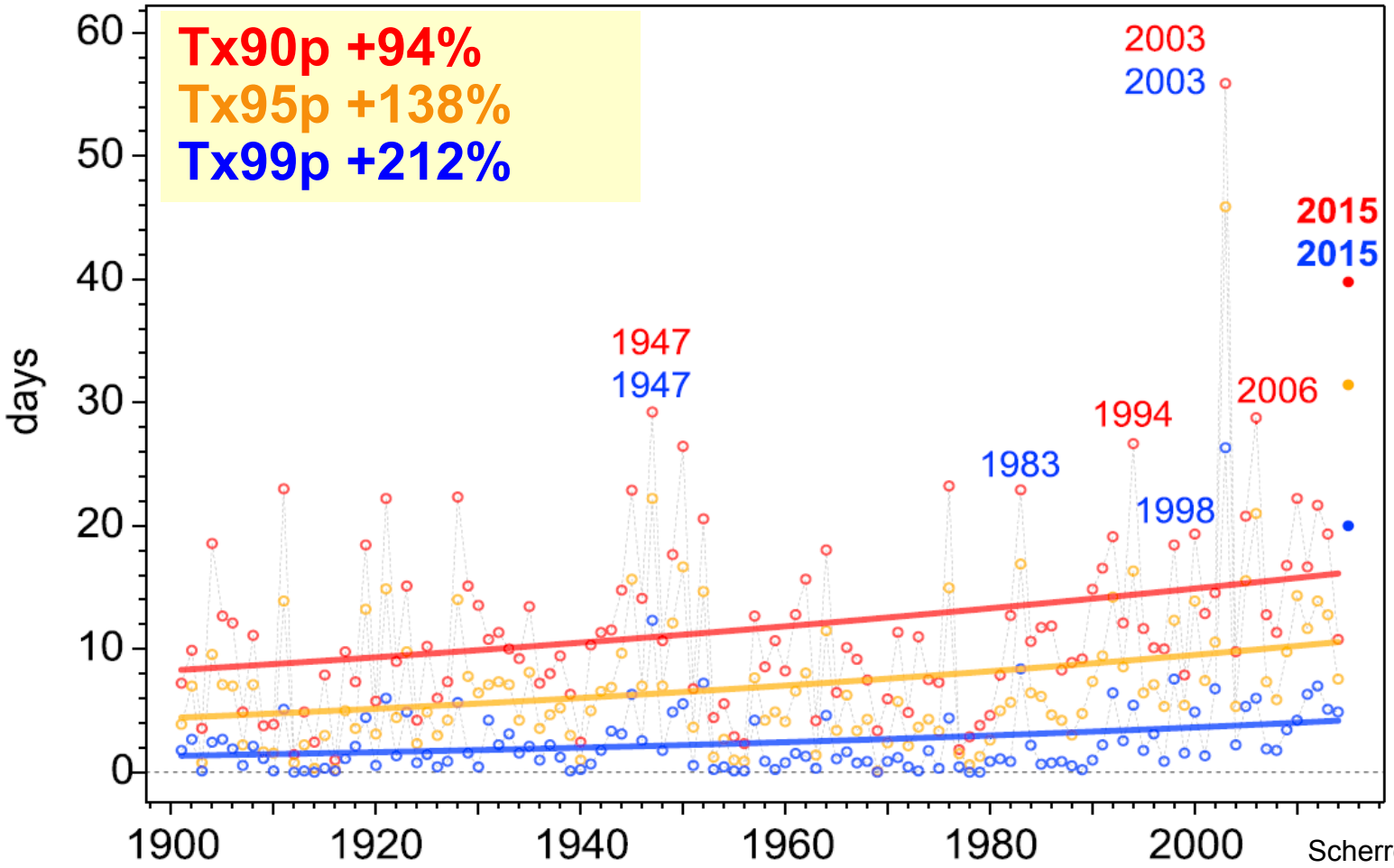


p<0.01 for all

Scherrer et al. (2016)

Trends in number of «hot days»

JJA, ref. period 1961-1990



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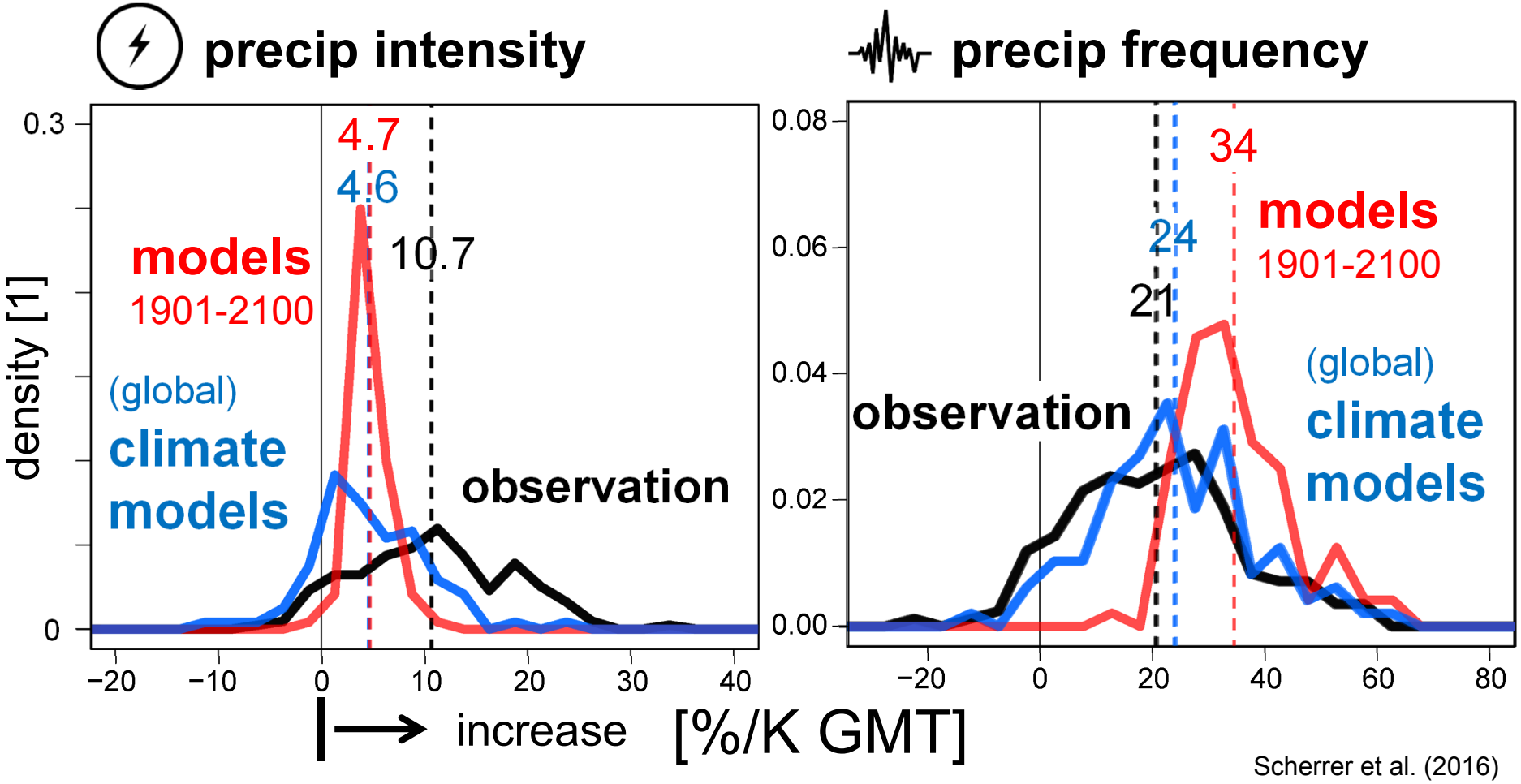
Do observations & climate models agree?

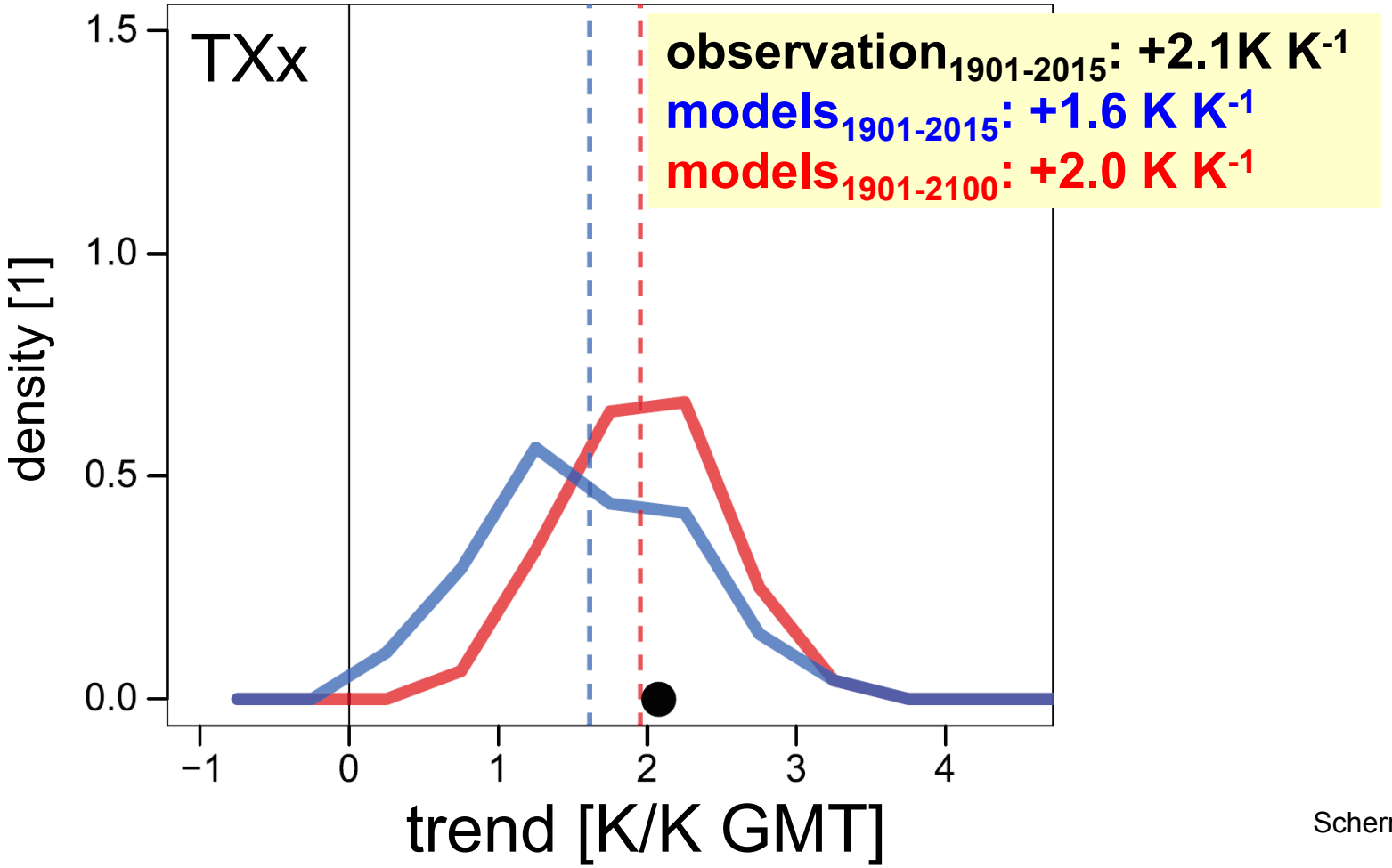
Heavy precipitation



Scherrer et al. (2016)

Do observations & climate models agree?

Hot temperature extremes



Scherrer et al. (2016)

Summary

Heavy precipitation

1901–: more intense (∅+12%), more frequent (∅+30%) trends pos. >90% of stations, sim. signals in all seasons

1981–: very small tendency for intensity increases

Hot temperature extremes

- Hottest day/week warmed by +1.6 – 2.3°C since 1901
- frequency of very hot days more than tripled since 1901

→ Observed trends consistent with model projections, physical understanding & results on larger scale!