

Practical challenges for climate risk modelling

ECCE Inaugural Event

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Lausanne, *February 9th 2024*

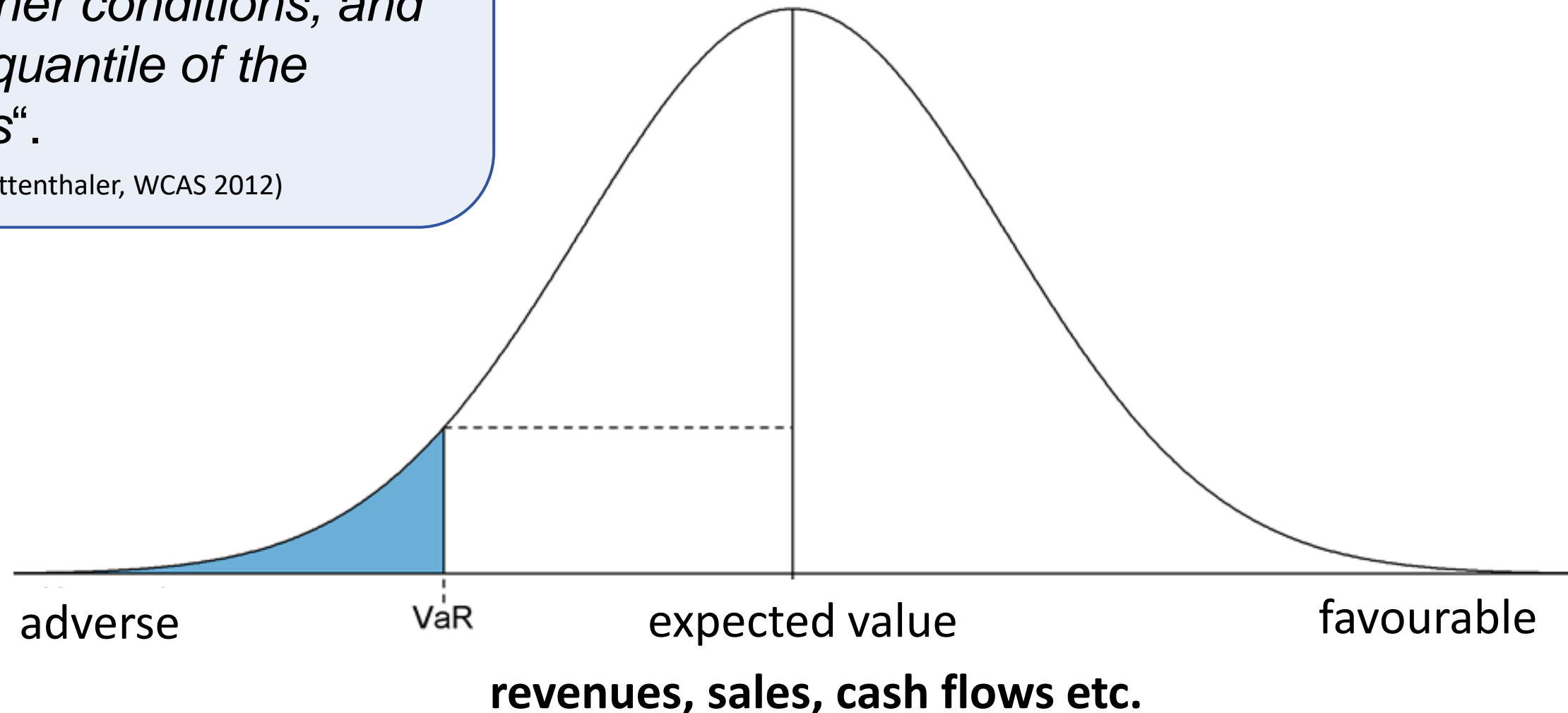


„Weather - Value at Risk“ in everyday life

Value-at-Risk _(Weather) or Weather-VaR

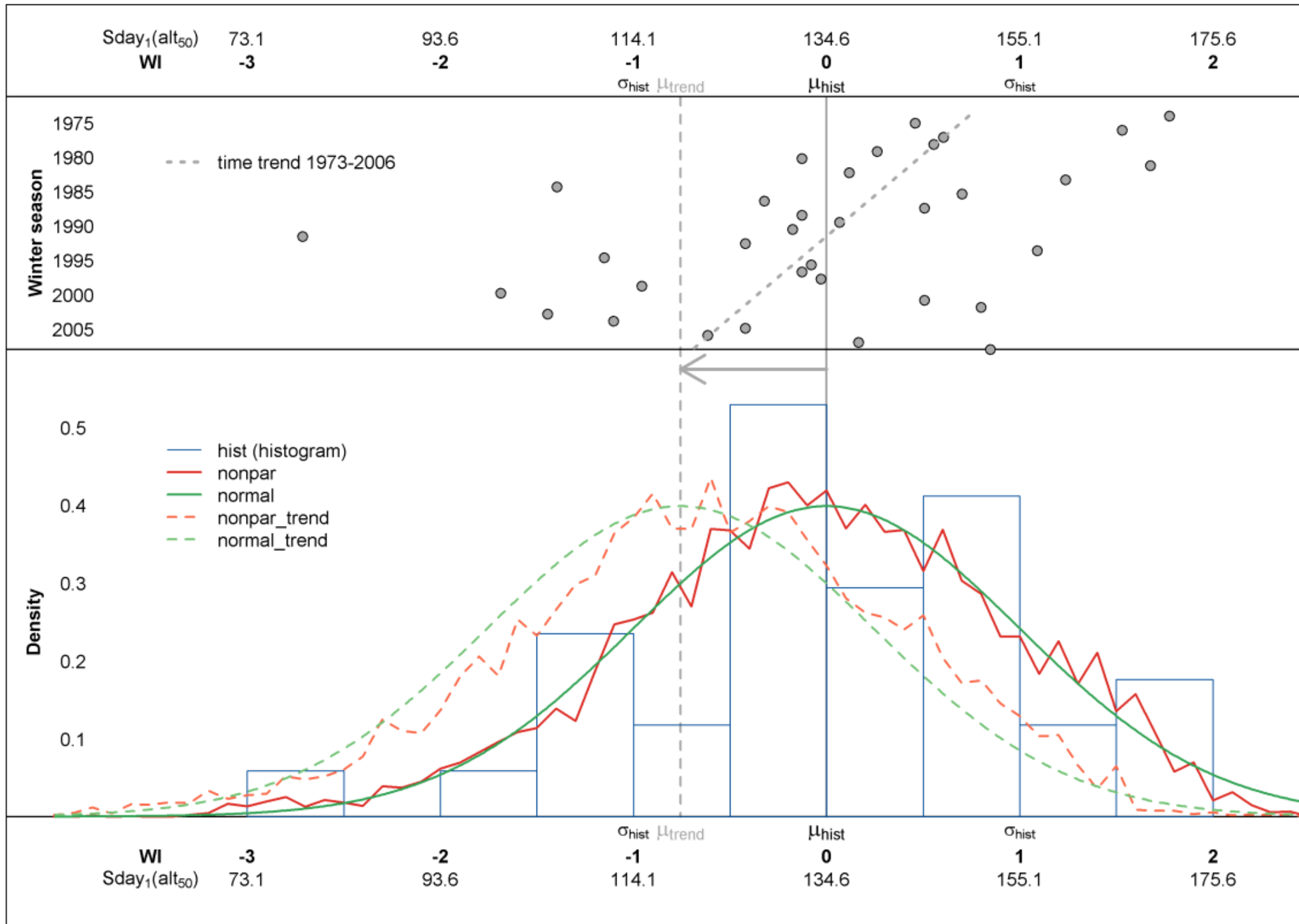
Weather-VaR (α) denotes „*the Value at Risk resulting from adverse weather conditions, and represents a quantile of the economic loss*“.

(Toeglhofer, Mestel & Prettenthaler, WCAS 2012)



Accounting for time trends

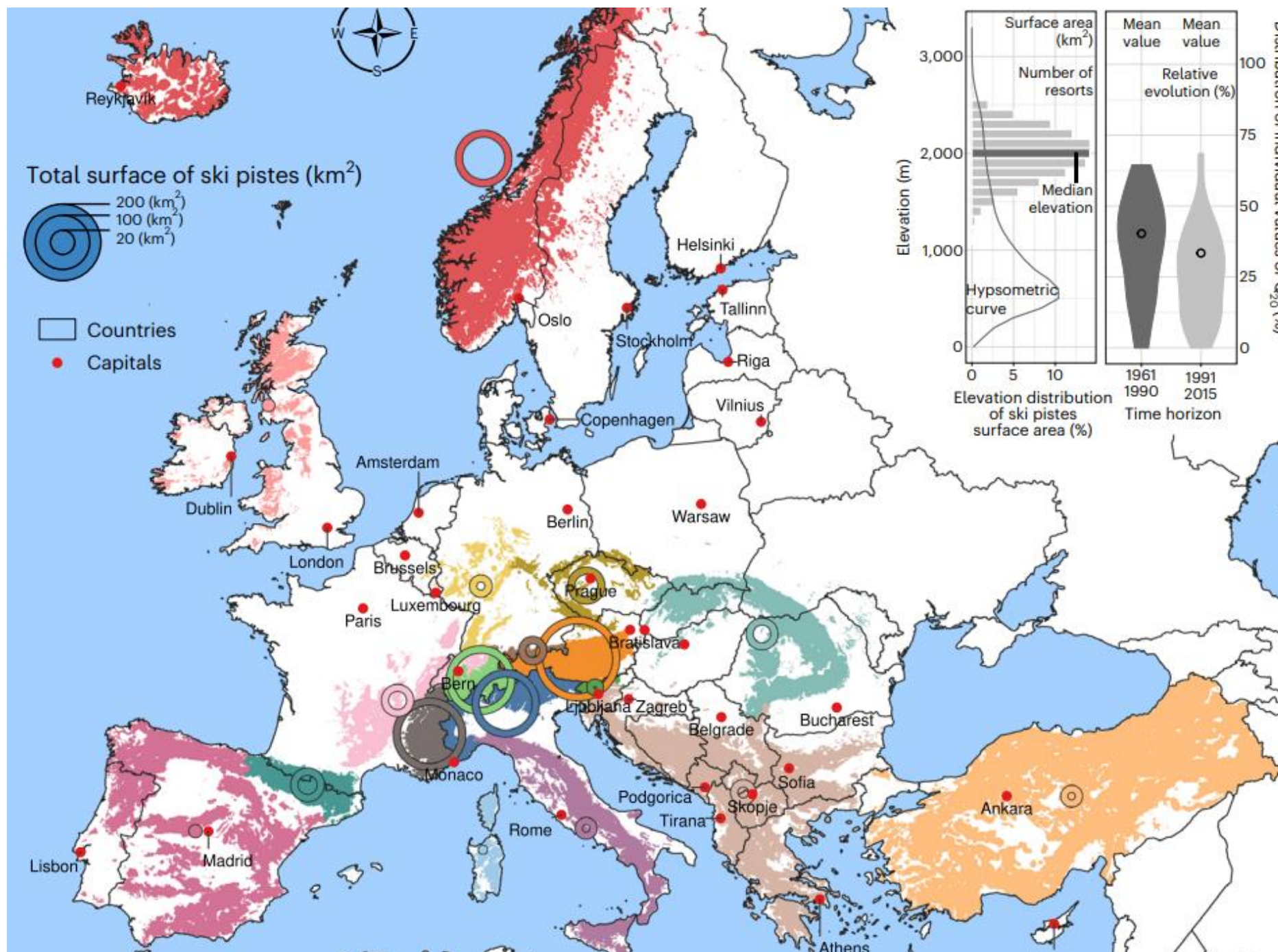
Overnight stays in Kitzbühel winters



- normal w/o trend:
1 in 300 yrs event
- nonparametric w/o trend :
1 in 127 yrs event
- normal w trend:
1 in 40 yrs event
- nonparametric w trend :
1 in 33 yrs event

(Source: Toeglhofer, Mestel & Prettenthaler, WCAS 2012)

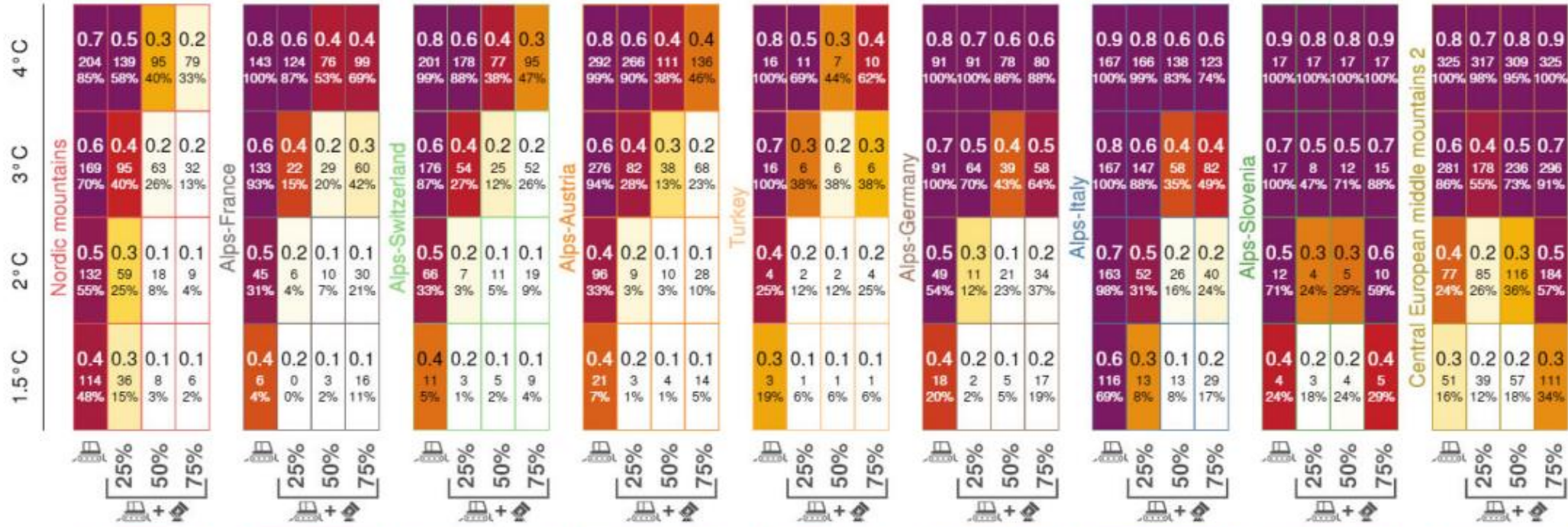
European ski industry



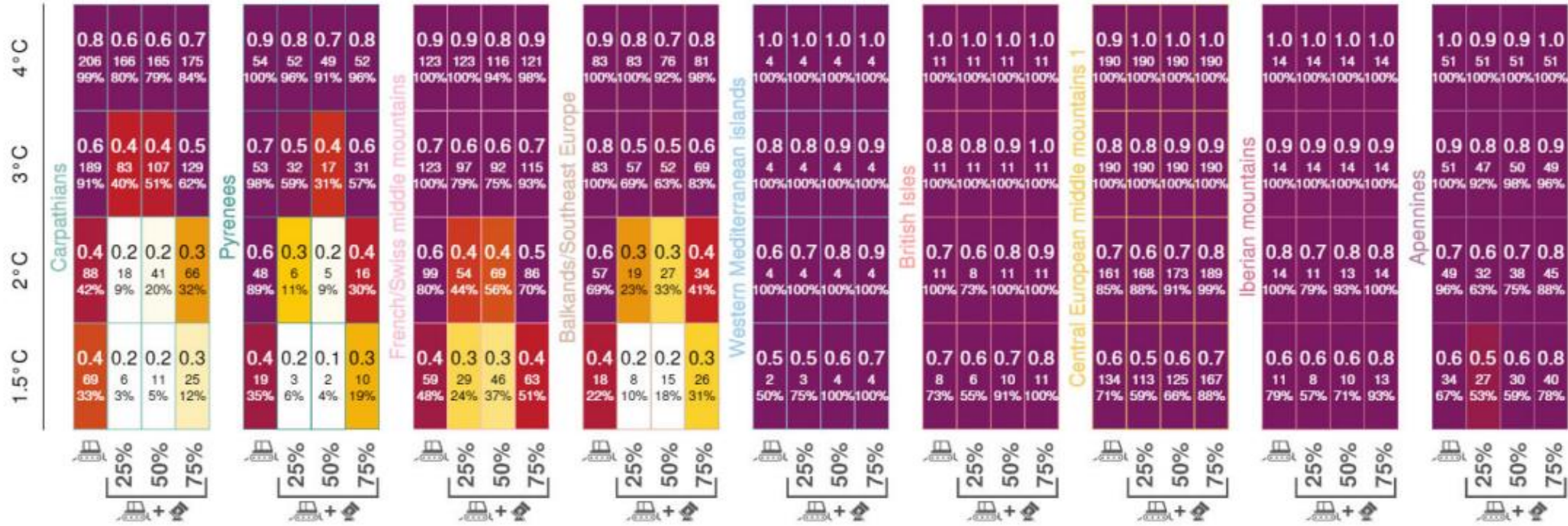
Global warming level (°C)

Alps-Switzerland	Global warming level (°C)			
	1.5°C	2°C	3°C	4°C
25%	0.4 11 5%	0.5 66 33%	0.6 176 87%	0.8 201 99%
50%	0.2 3 1%	0.2 7 3%	0.4 54 27%	0.6 178 88%
75%	0.1 5 2%	0.1 11 5%	0.2 25 12%	0.4 77 38%
	0.1 9 4%	0.1 19 9%	0.2 52 26%	0.3 95 47%

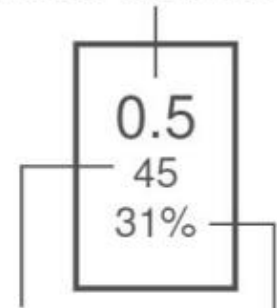
Global warming level (°C)



Global warming level (°C)



Value of the snow supply risk to ski tourism



Number and percentage of ski resorts with a very high risk value

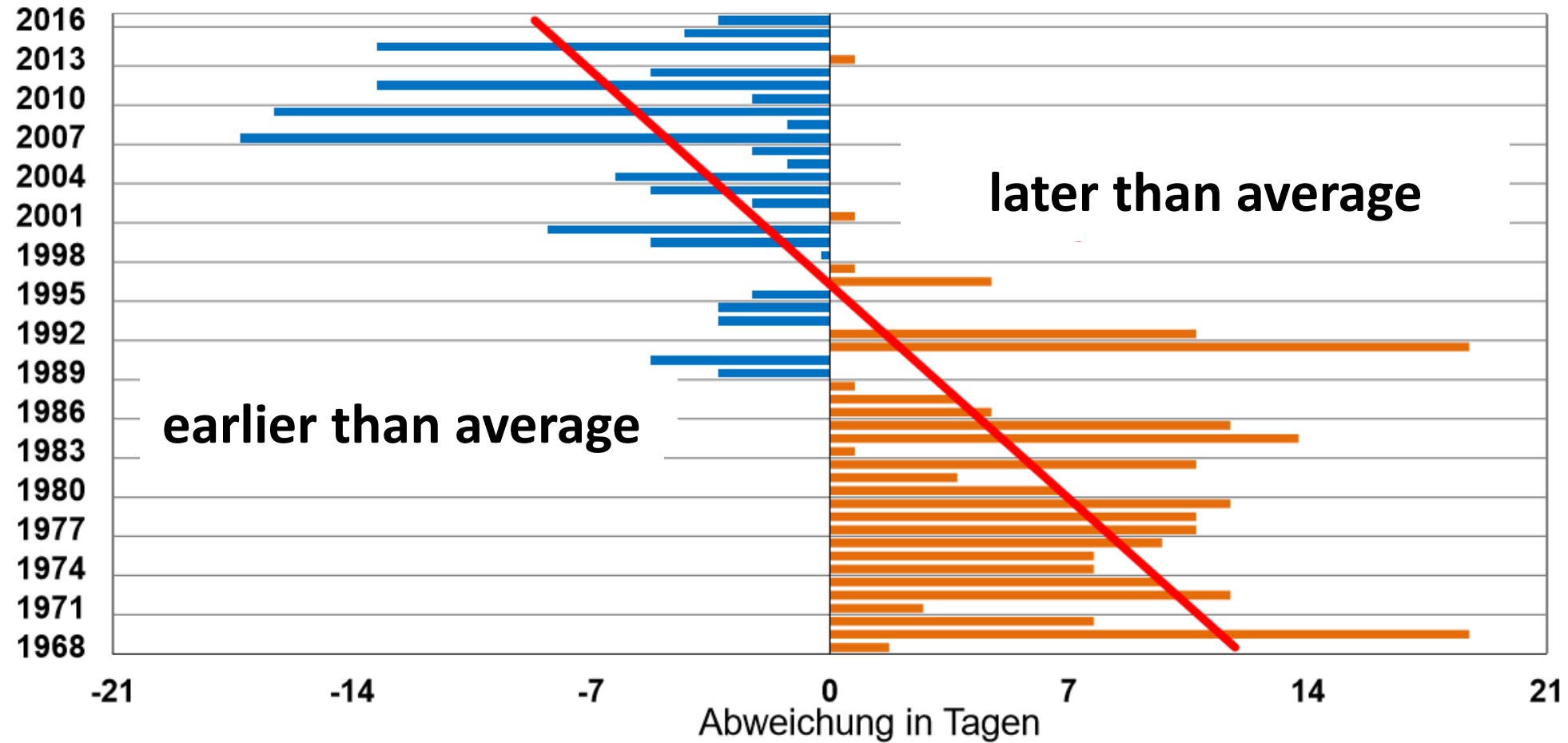
Source: Francois et al, Nature Climate Change 2023

Greening of grapevine (BBCH 12)

Veitshöchheim
Wölflein

6

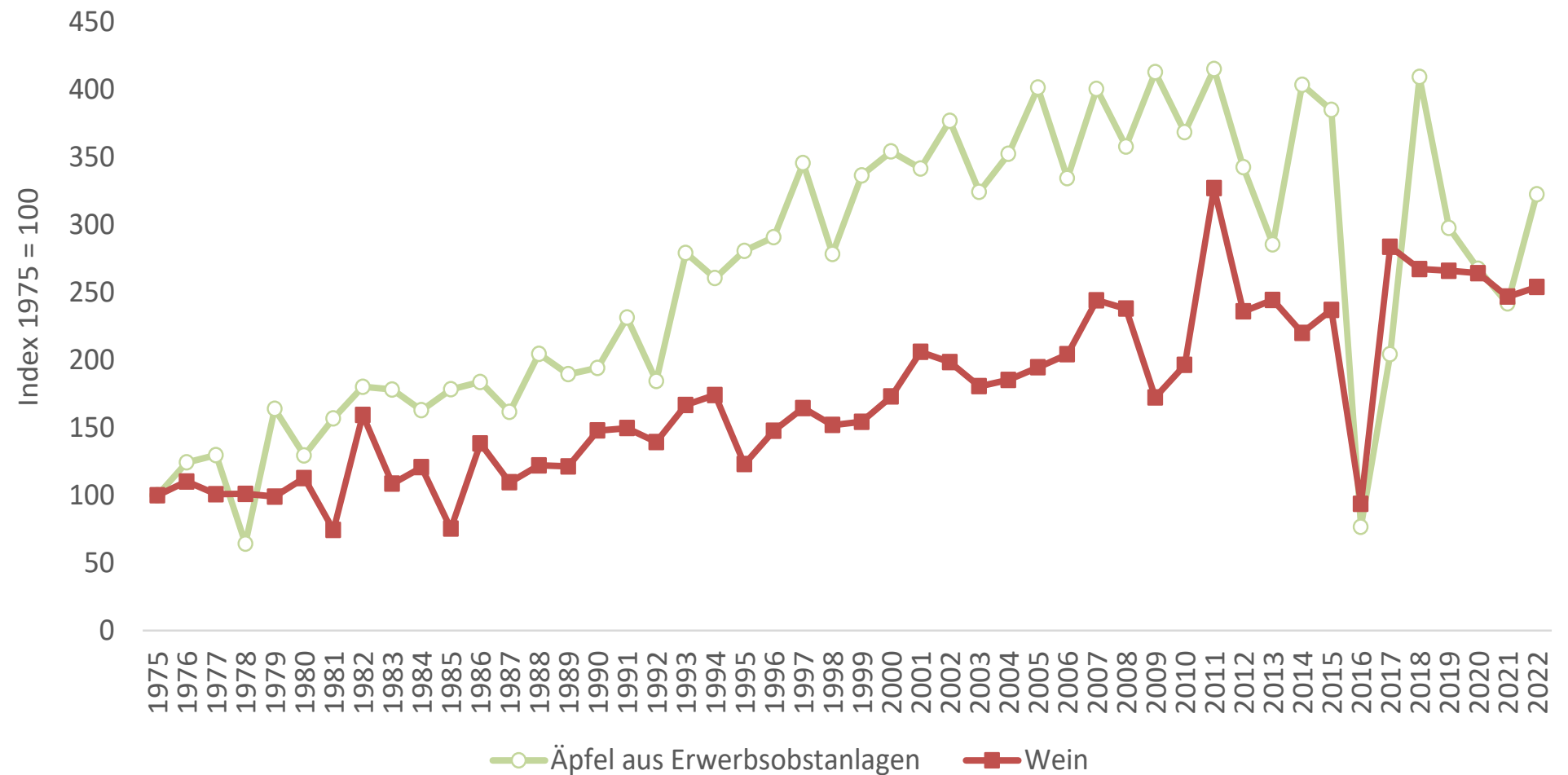
im langjährigen Mittel (1981-2010) am **8. Mai (=Nulllinie)**
Abweichung der einzelnen Jahre von diesem Mittel



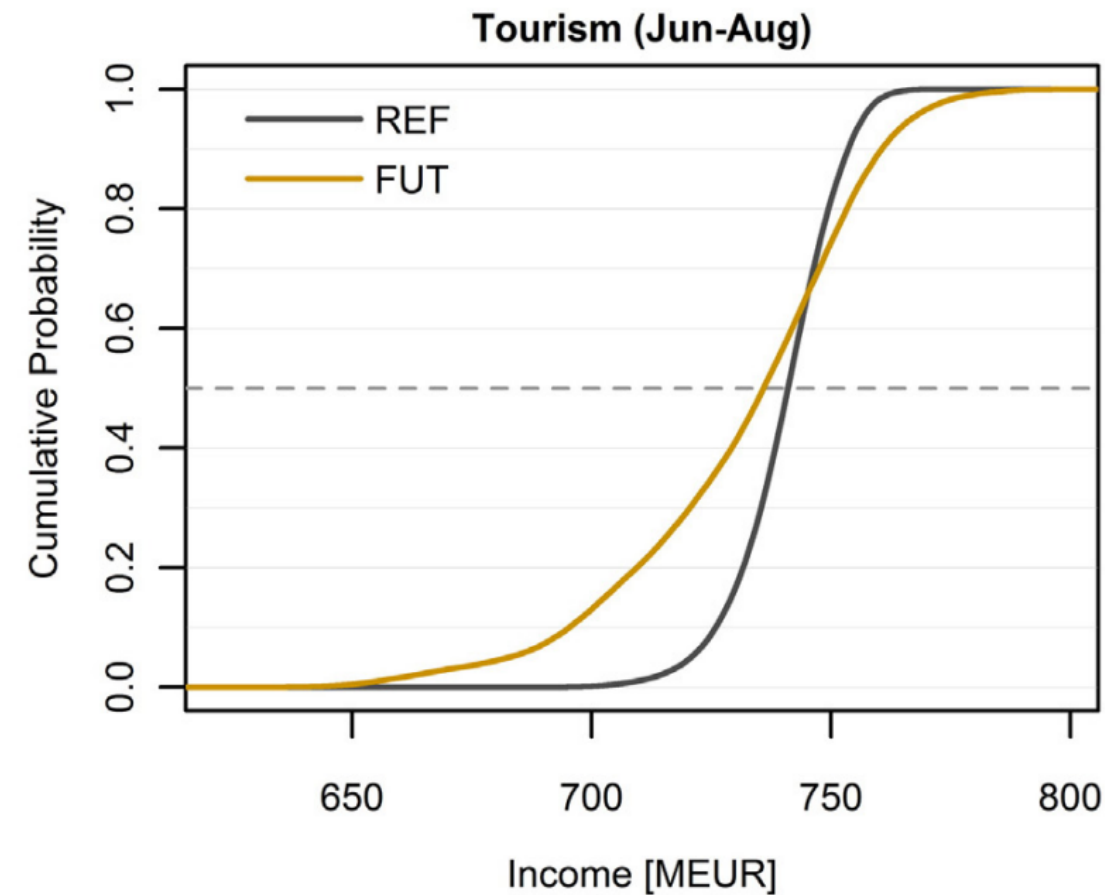
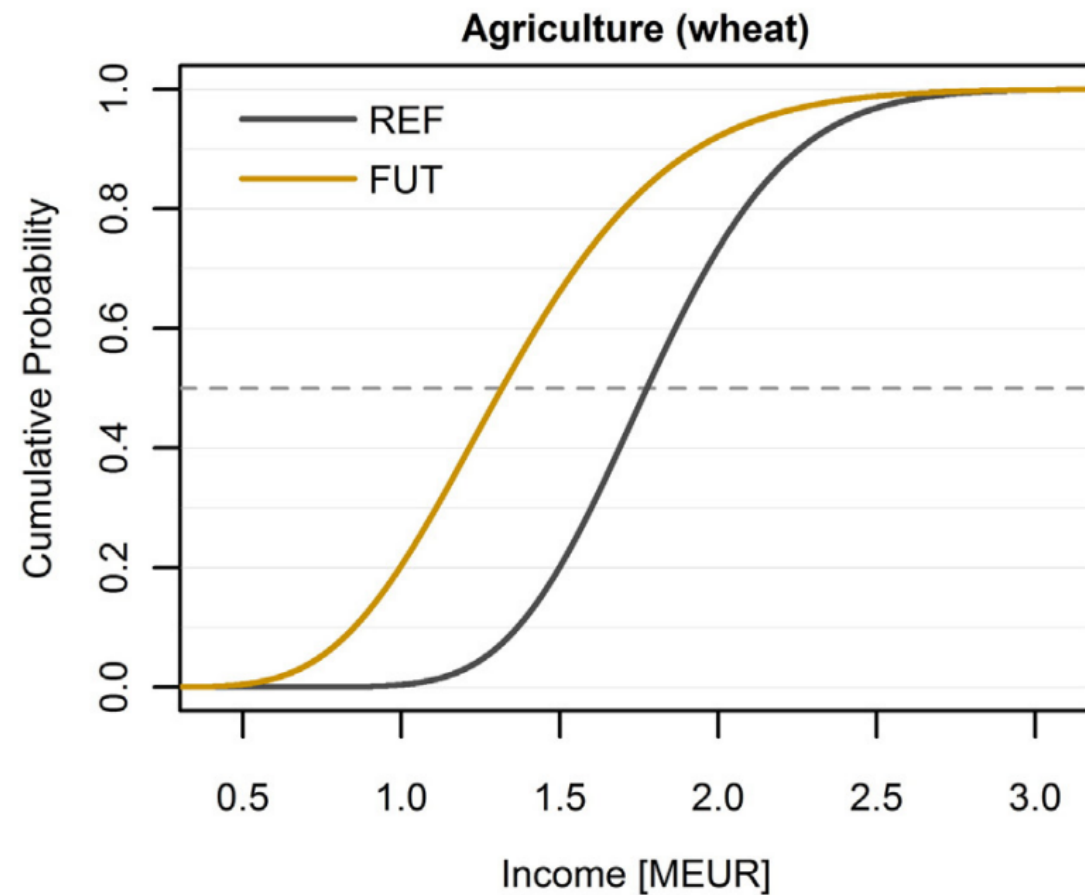
Apple and Wine Production in Styria



Apfelernte [t] und Weinproduktion [hl] in der Steiermark



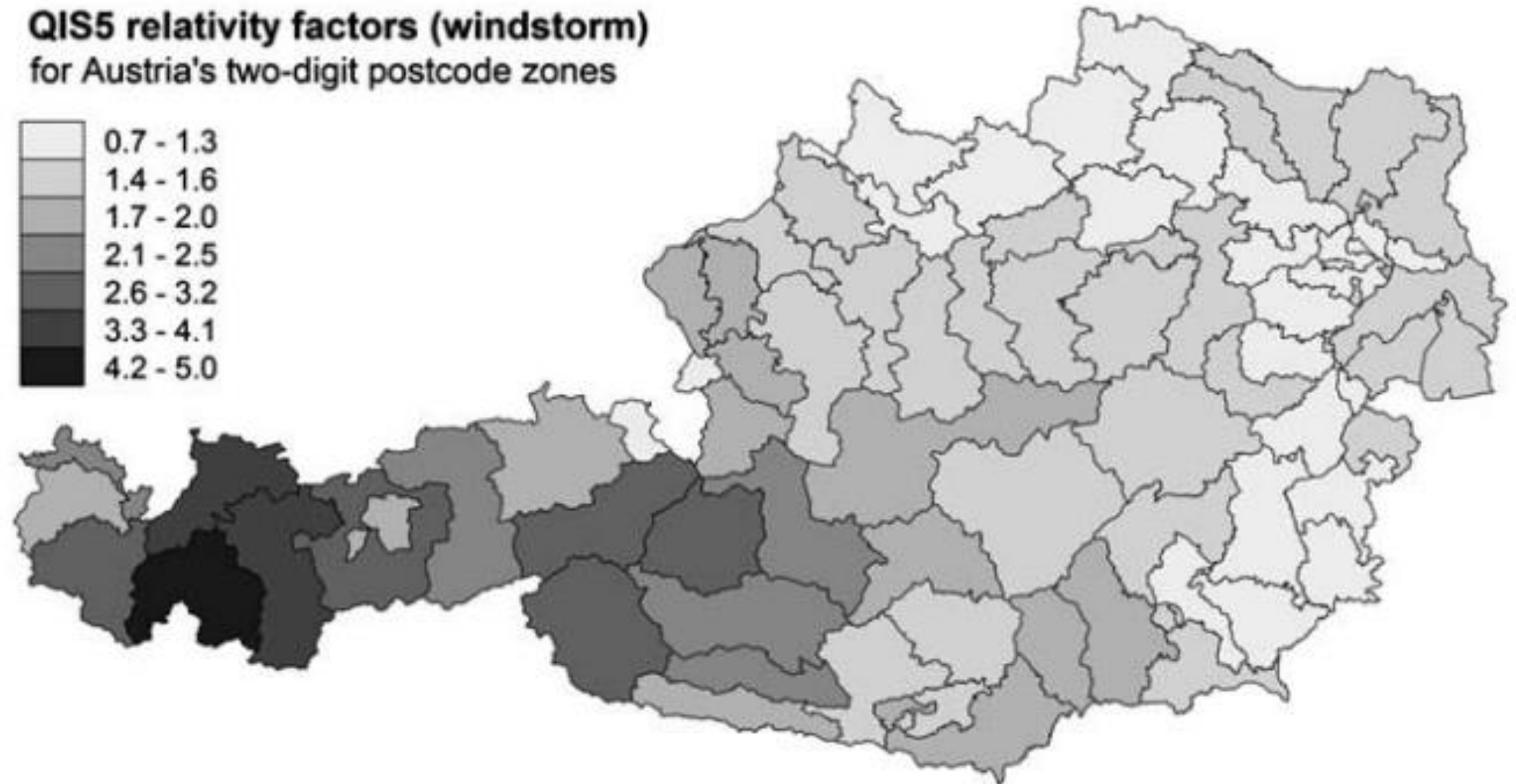
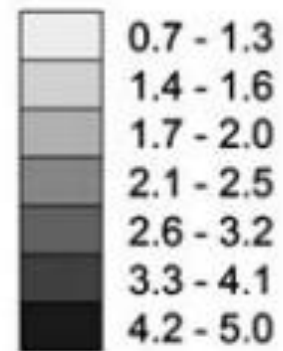
Use climate scenarios to compare risk of income loss across sectors (Sardinia)



(Source: Prettenhaler, F., Koeberl, J., Bird, 'Weather Value at Risk': A uniform approach to describe and compare sectoral income risks from climate change, Science of the Total Environment 2015)

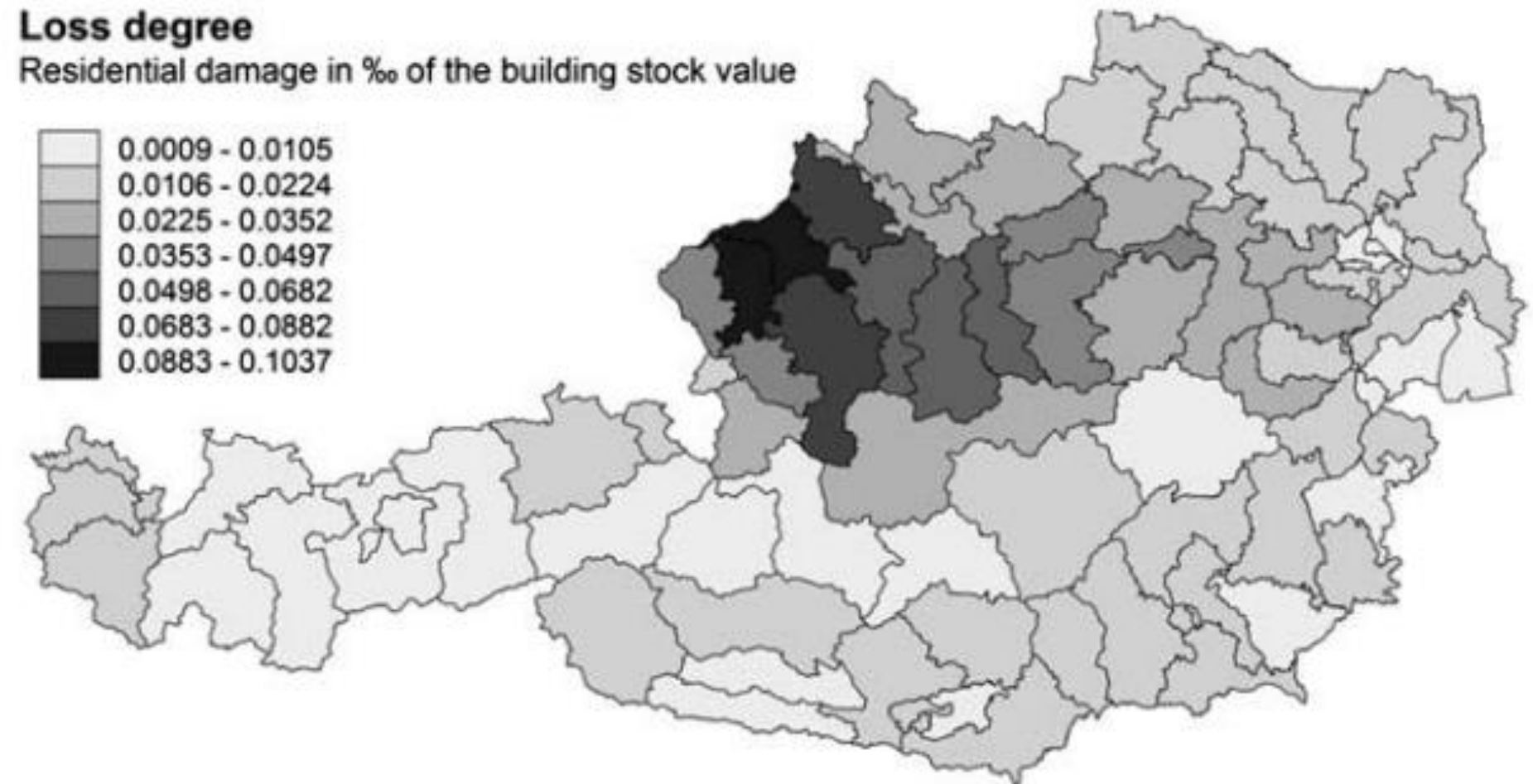
Windstorm risk estimate by standard model: importance of resolution

QIS5 relativity factors (windstorm)
for Austria's two-digit postcode zones



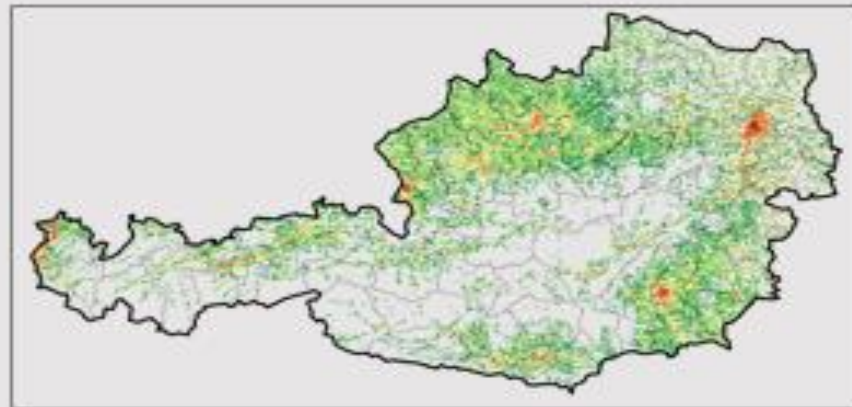
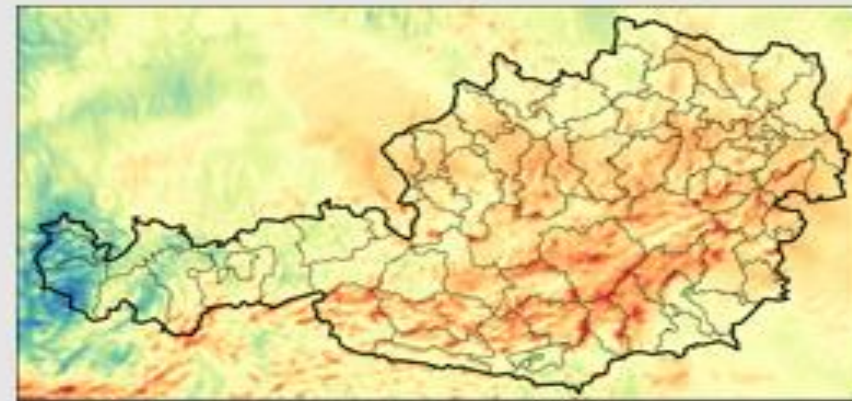
Source: Prettenthaler, F.,
Albrecher, H., Koeberl, J.,
Kortschak, D.: Risk and
Insurability of Storm
Damages to Residential
Buildings in Austria,
02/2012, Geneva Papers
on Risk and In-surance -
Issues and Practice)

Damage based modelling

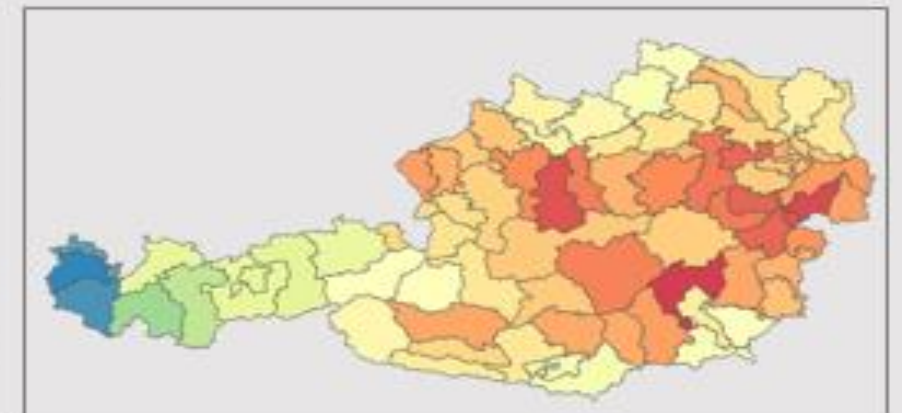


Source: Prettenthaler, F.,
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Hybrid Indicators



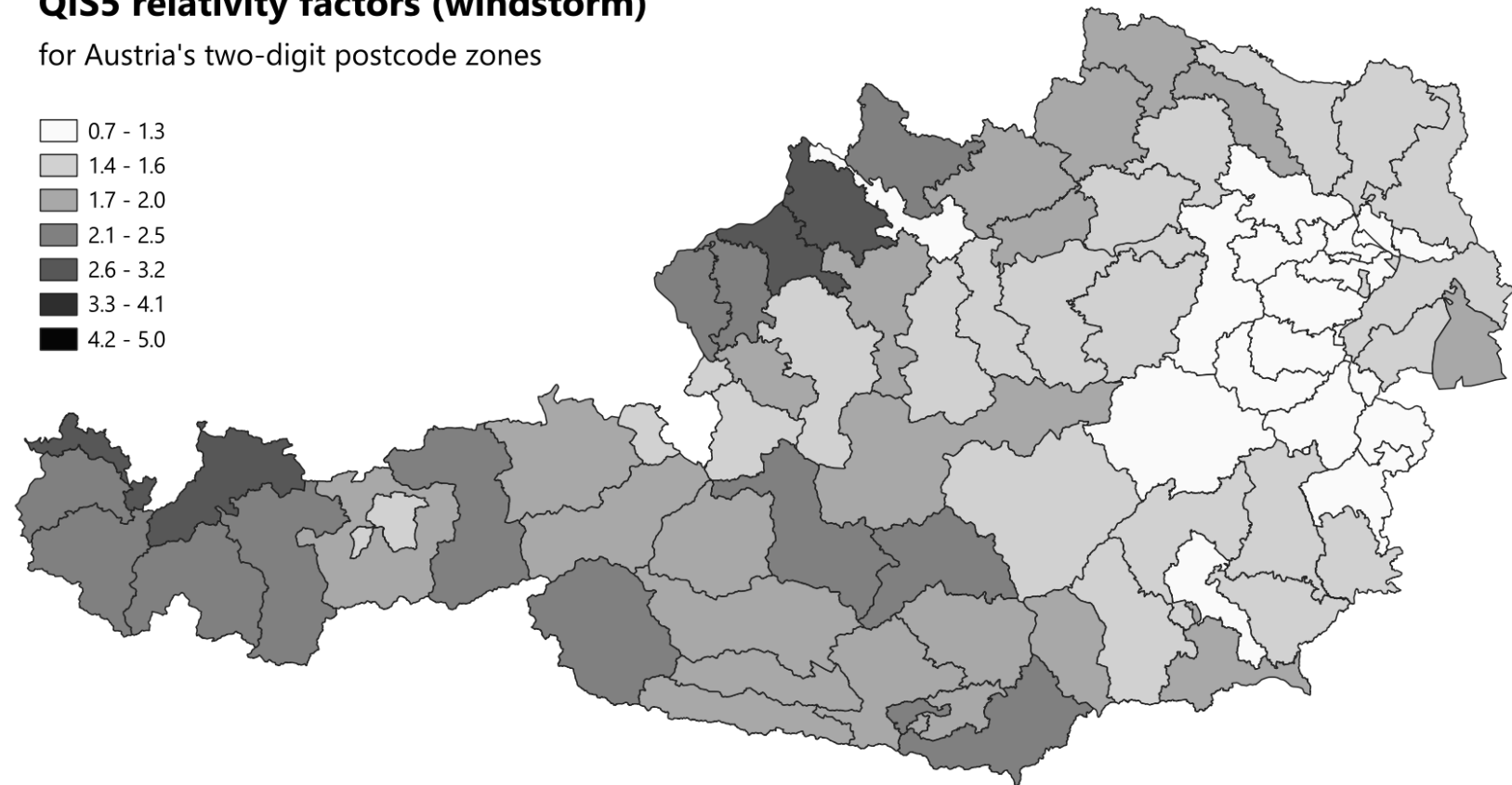
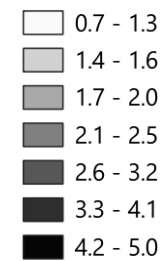
building-value-weighted max. wind speed



Changed relativity factors

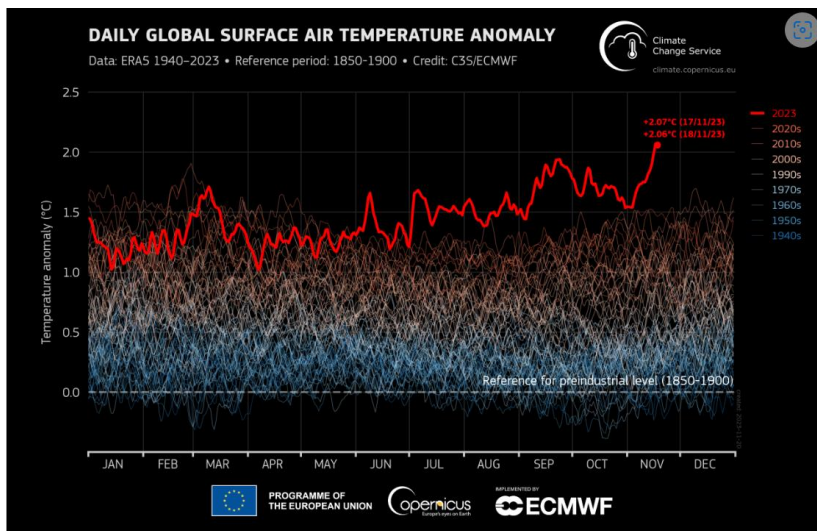
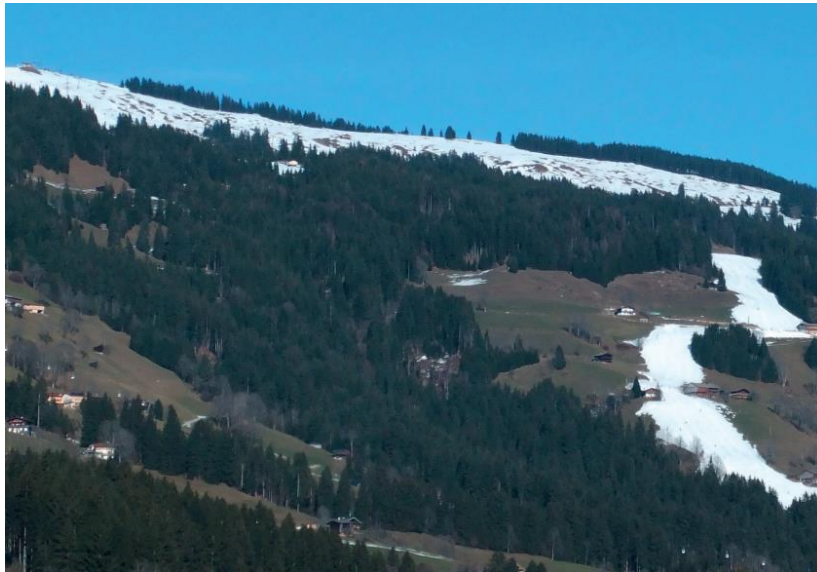
QIS5 relativity factors (windstorm)

for Austria's two-digit postcode zones



Source: Prettenthaler, F., Albrecher, H., Koeberl, J., Kortschak, D.: Risk and Insurability of Storm Damages to Residential Buildings in Austria, 02/2012, Geneva Papers on Risk and In-surance - Issues and Practice)

Take home messages



- Extremes matter
- Map climate extremes to economic extremes
- Time trends and CC will make extreme events more „normal“
- Topography matters
- Resolution matters
- Trust in hybrid indicators