The dependence of the future climate of Estonia on the level of global warming

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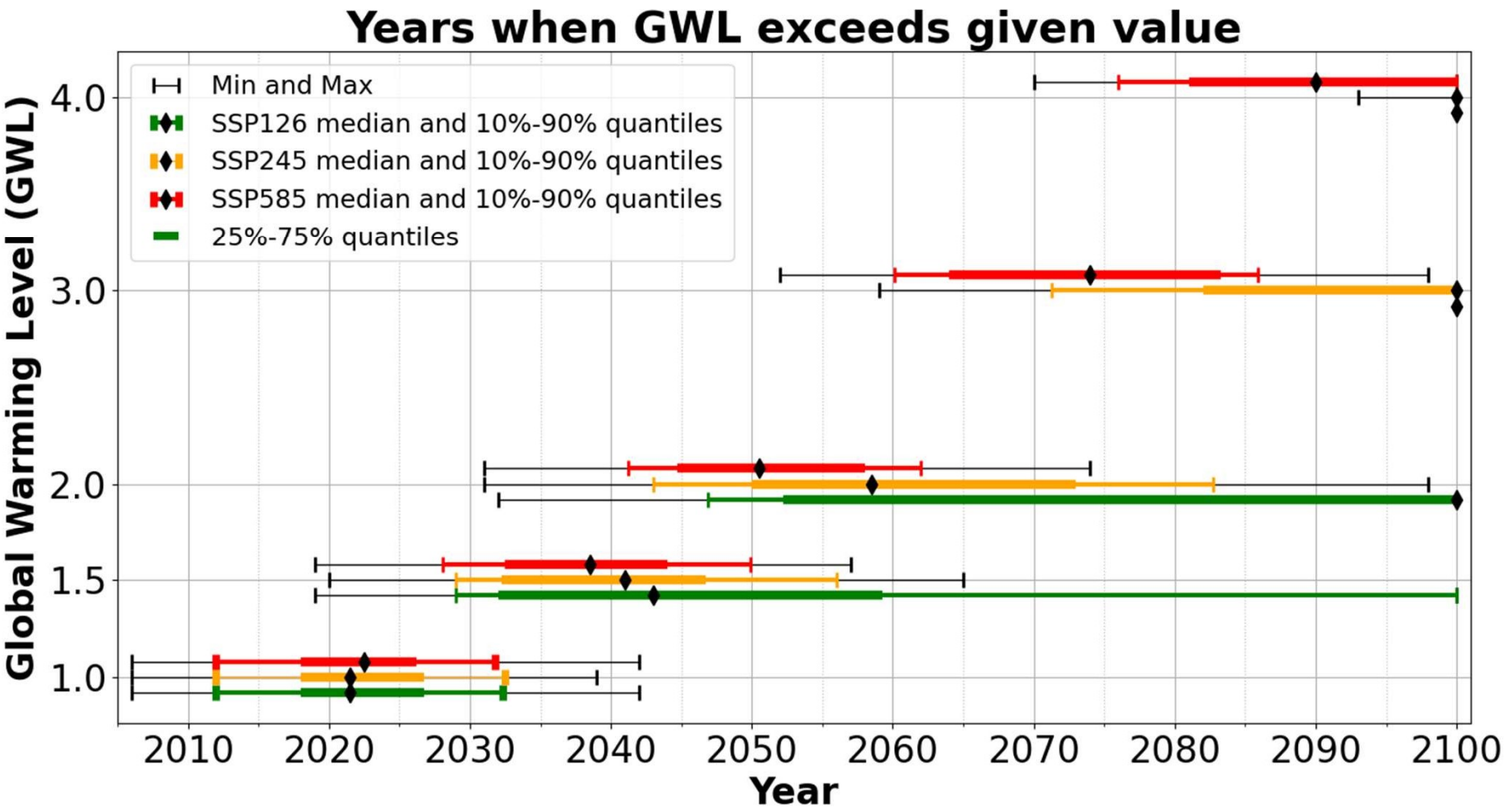
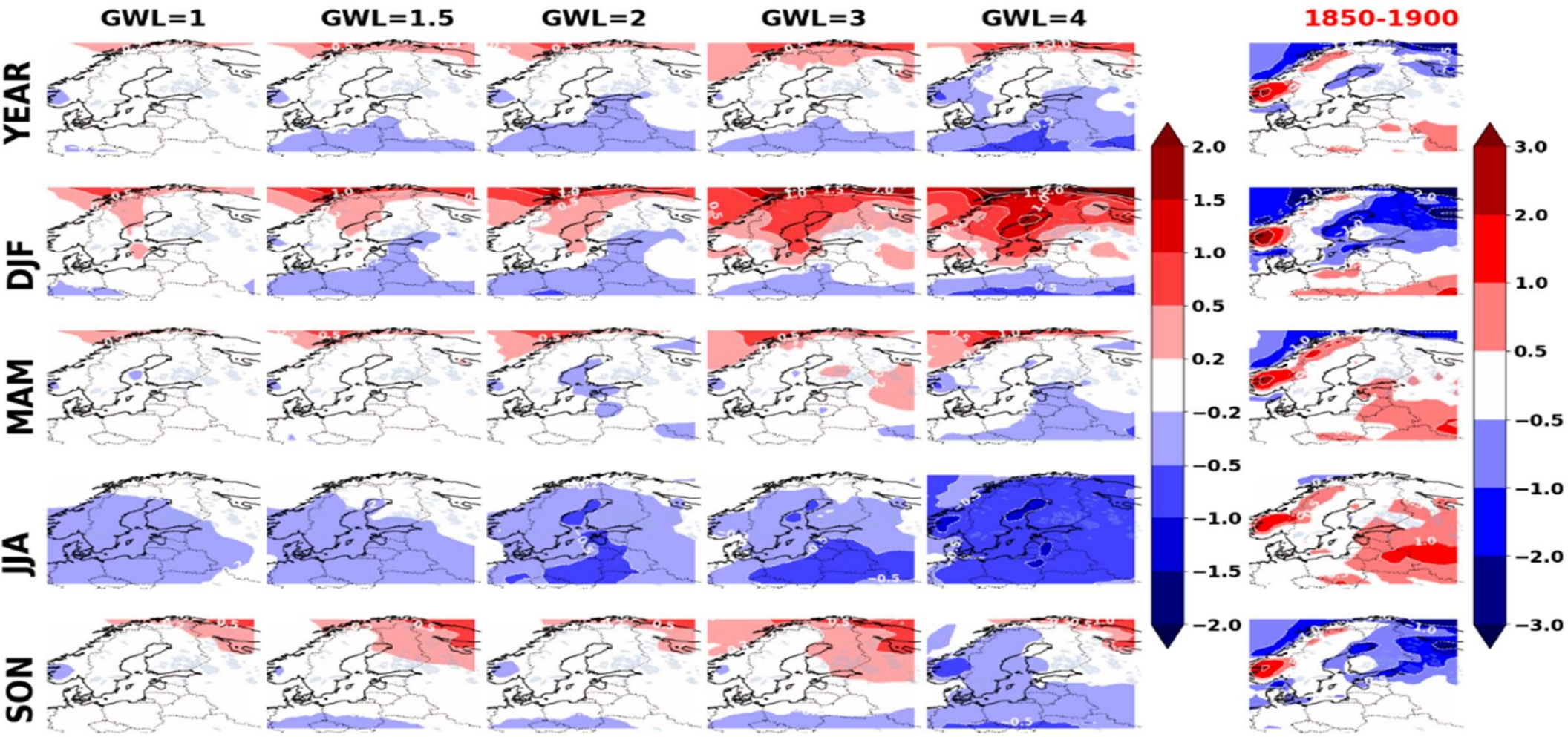
Data and methods:

Global climate projections CMIP6 and CMIP5 underpinning the IPCC AR6 Interactive Atlas from the Copernicus datastore. This study used historical experiments and climate projections based on scenarios: Representative Concentration Pathway **RCP** = 2.6, 4.5 and 8.5 and Shared Socioeconomic Pathways **SSP** = 1-2.6, 2-4.5 and 5-8.5.

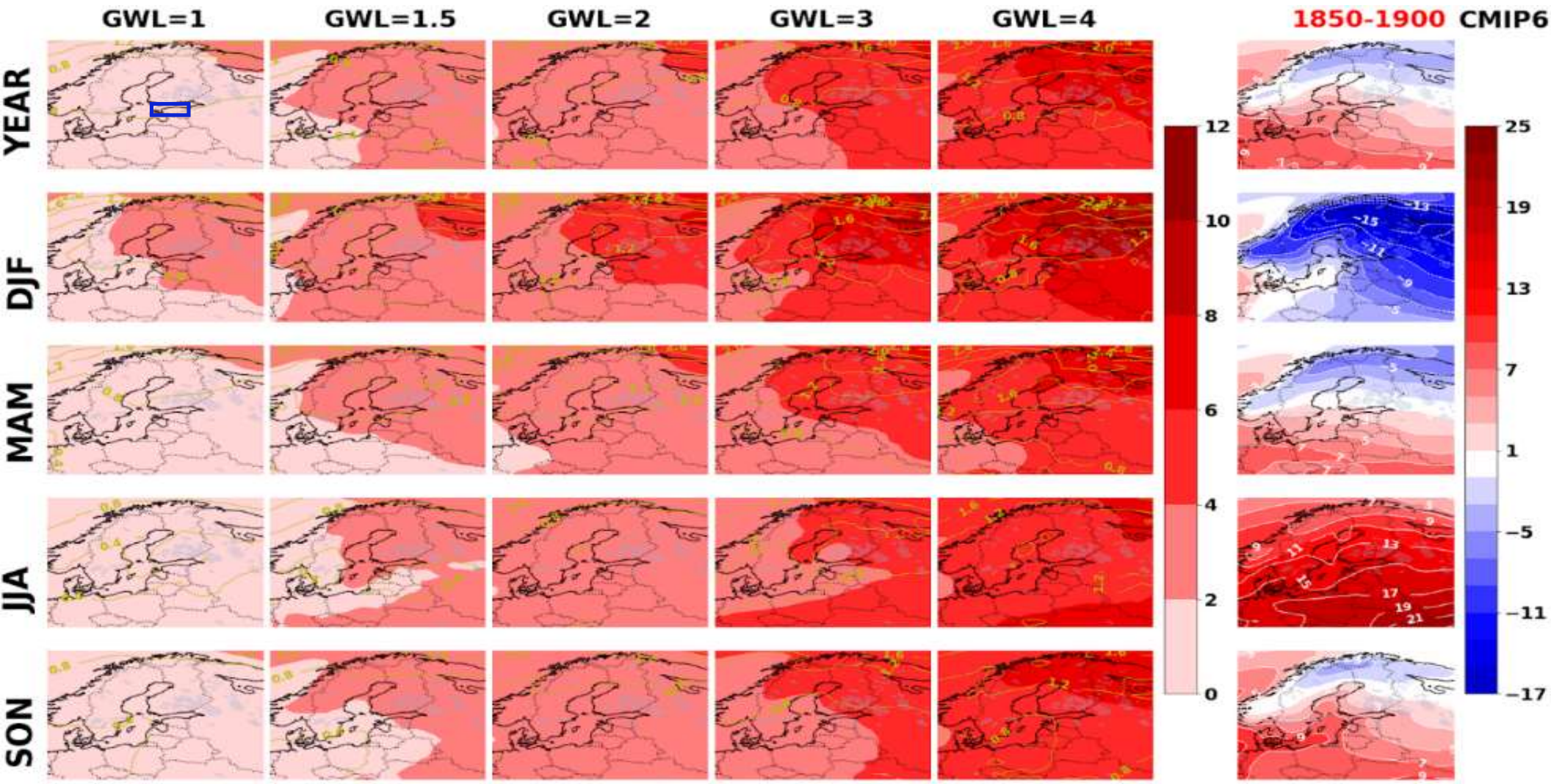
We follow IPCC AR6 and analyse the climate conditions in Estonia as a function of the Global Warming Level (GWL).

Definition: A climate simulation reaches the defined GWL when its global near-surface air temperature change averaged over successive 20-year periods first attains that level of warming relative to 1851–1900.

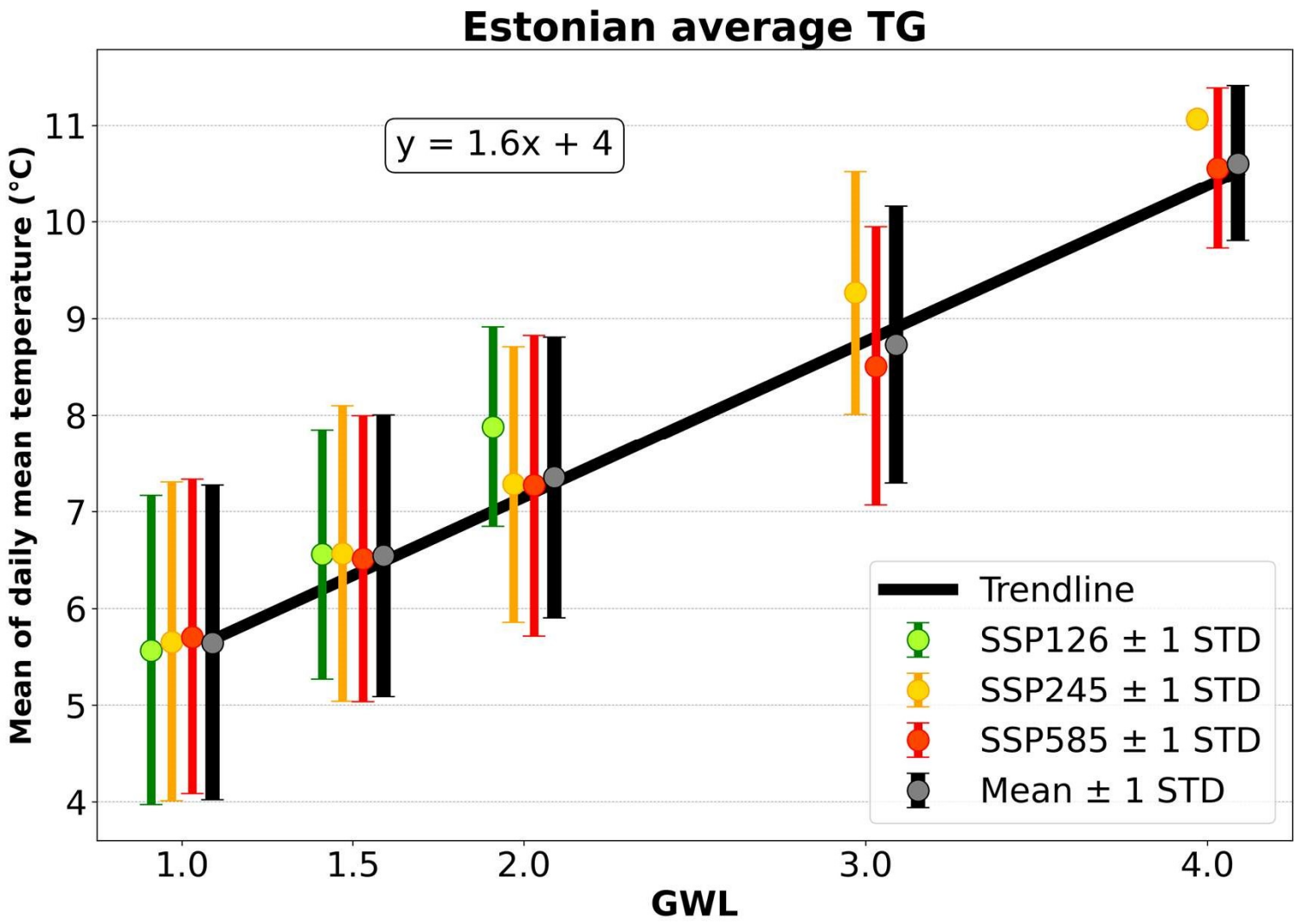

Years when GWL exceeds given value
Min and Max
SSP126 median and 10%-90% quantiles
SSP245 median and 10%-90% quantiles
SSP585 median and 10%-90% quantiles
25%-75% quantiles
Global Warming Level (GWL)
4.0
3.0
2.0
1.5
1.0
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Year



Difference between CMIP5 and CMIP6 mean temperature rise by GWL (°C)
Difference = CMIP5 – CMIP6



Seasonal and annual mean and rise of mean temperature by GWL (°C)

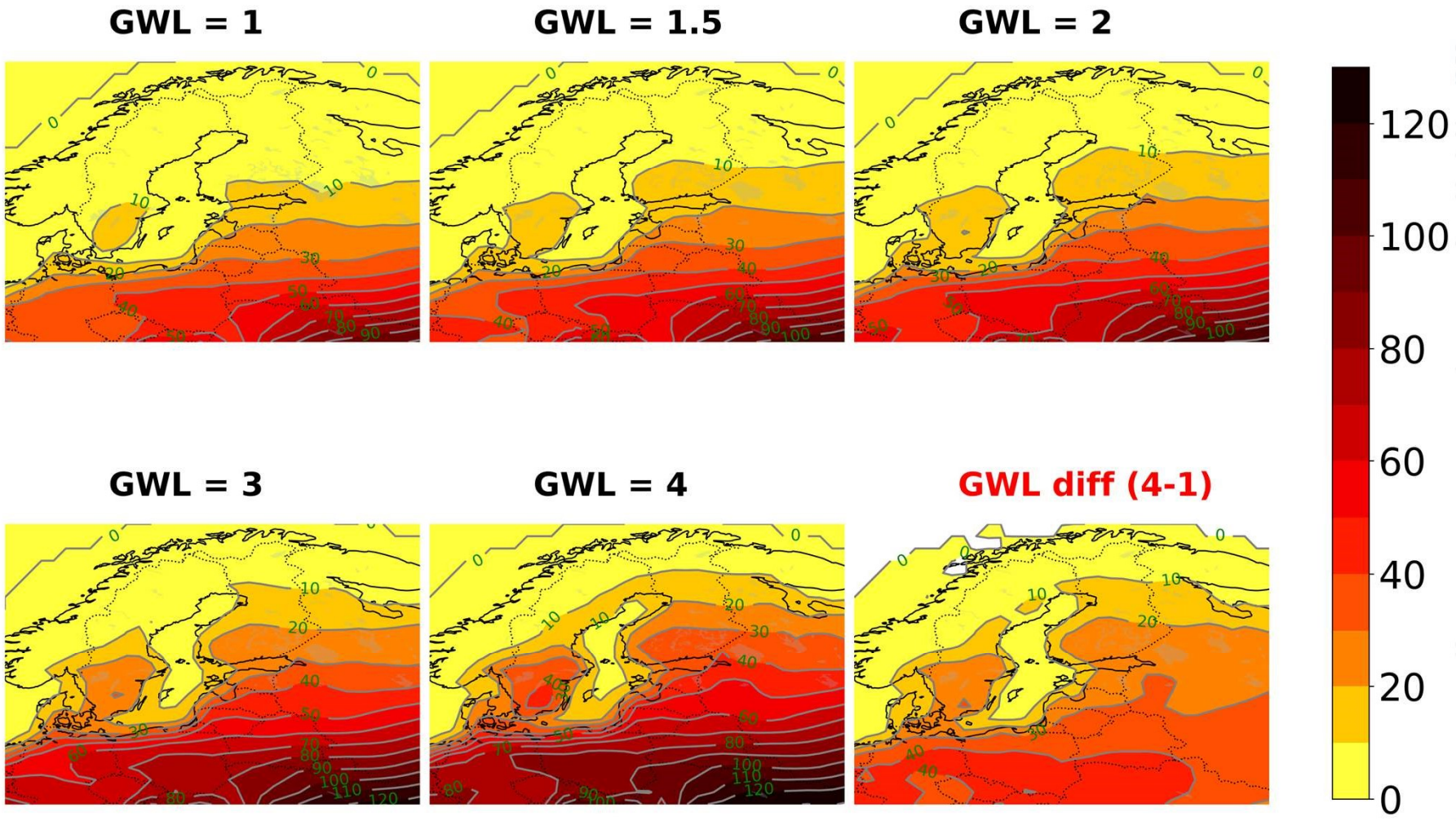


GWL	SSP			ALL
	126	245	585	
1	18	23	20	61
1.5	14	23	20	57
2	5	23	20	48
3	0	7	20	27
4	0	1	7	8

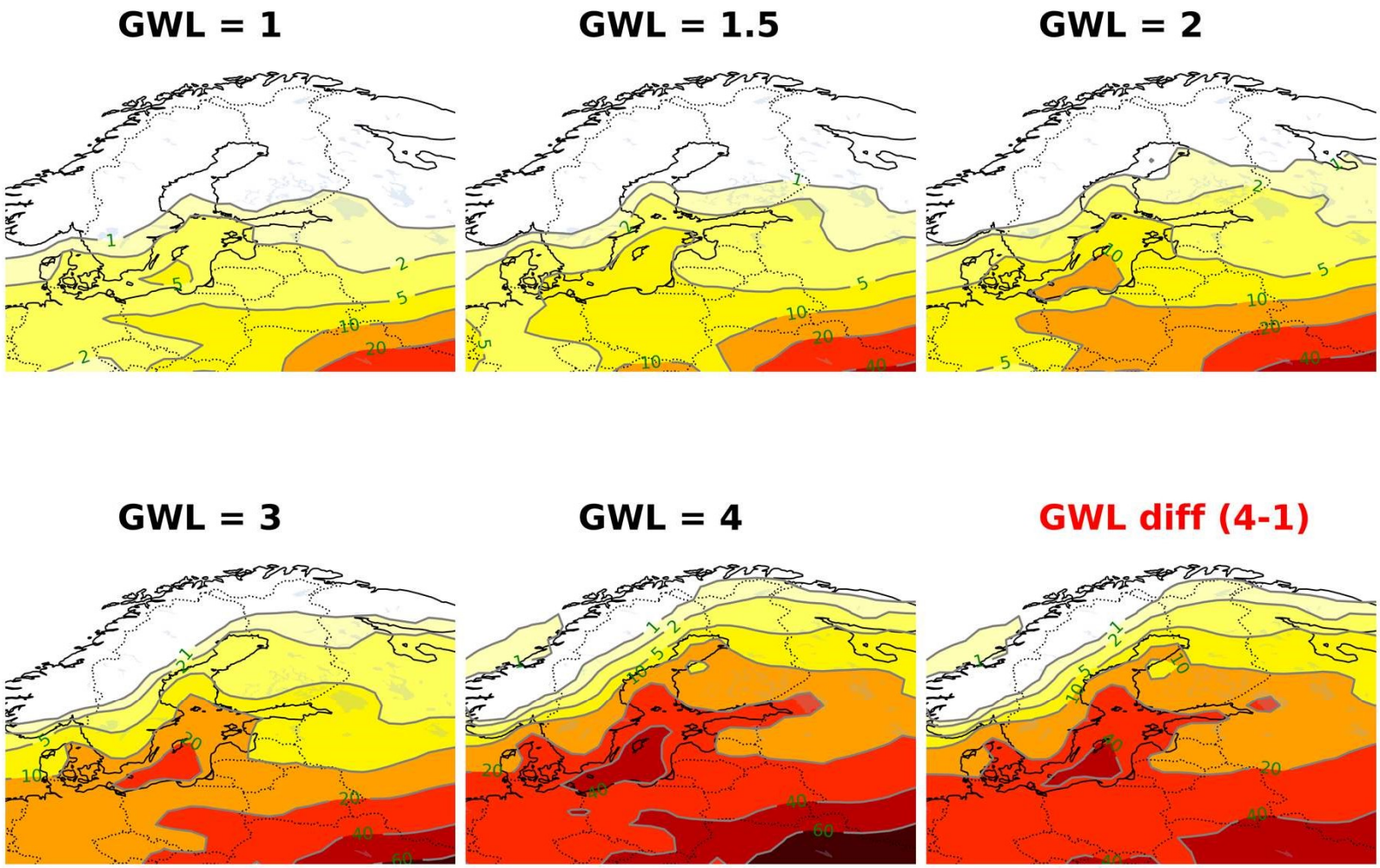
Number of models for the GWL

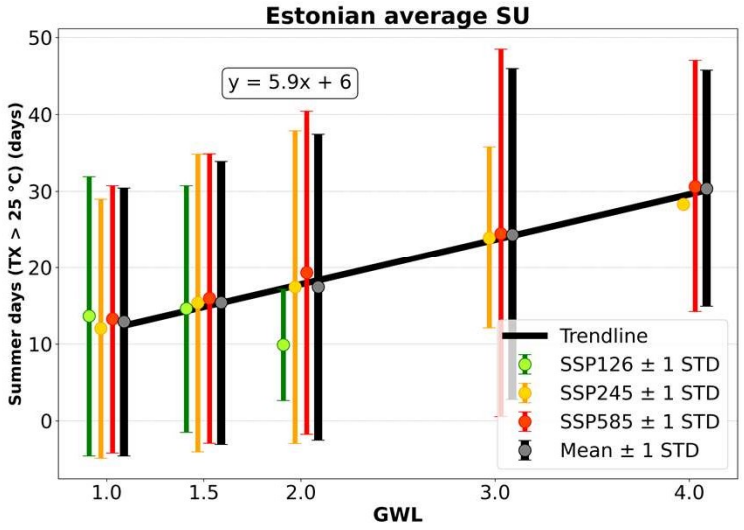
Estonia in calculations:
58 – 60 °N
22 – 28 °E

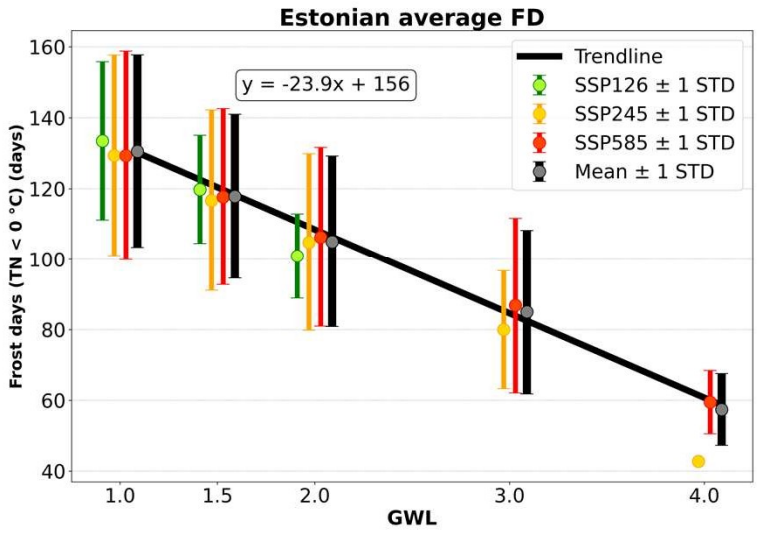
Summer days (TX > 25 °C) (days)

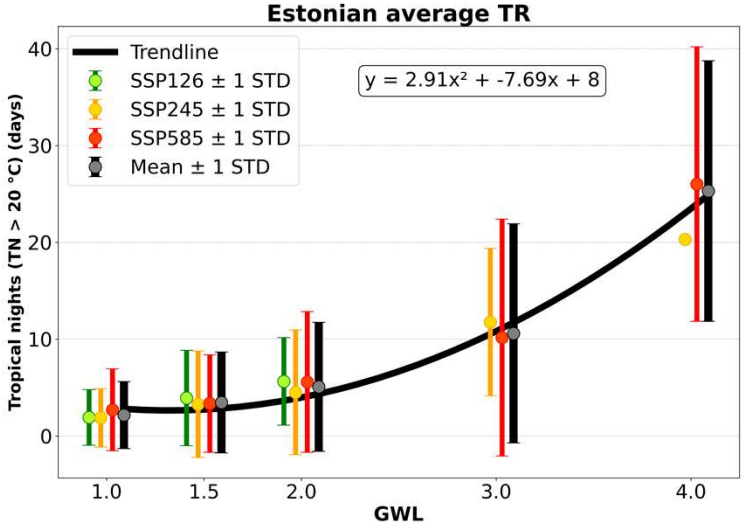


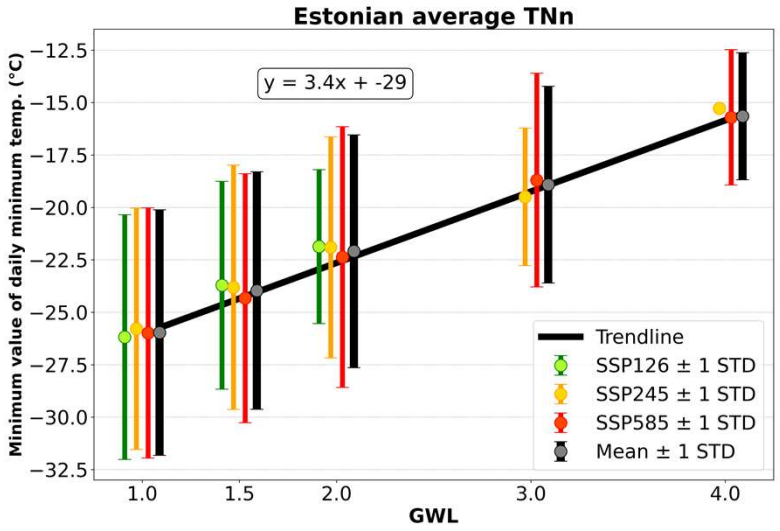
Tropical nights (TN > 20 °C) (days)

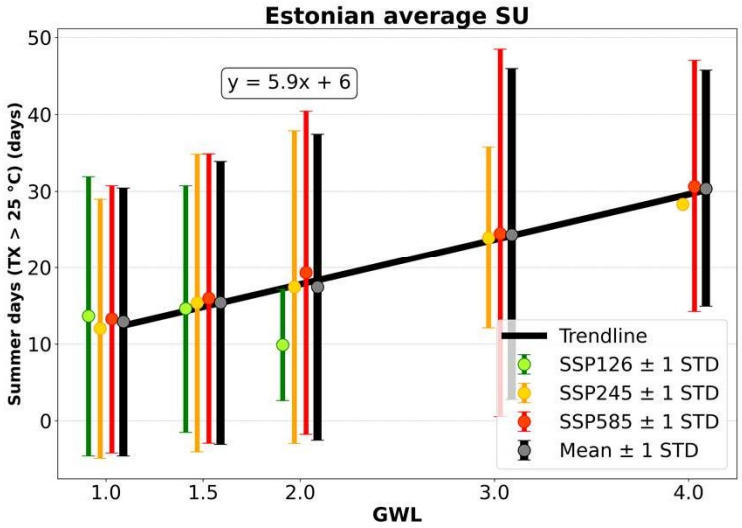


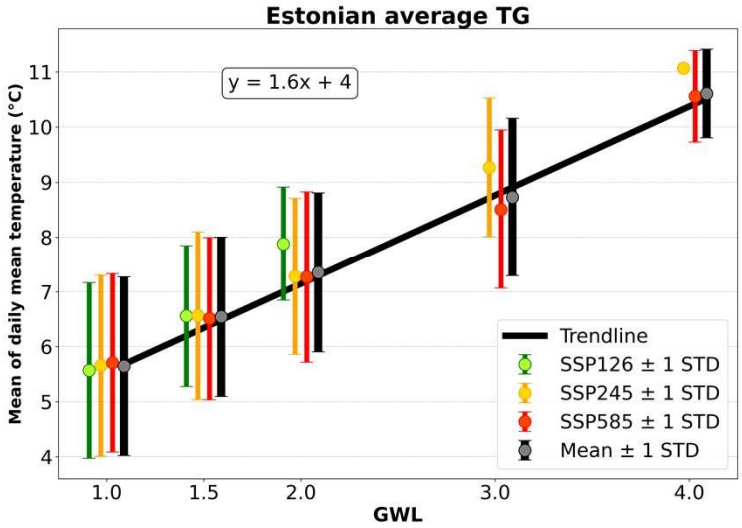

Estonian average SU
y = 5.9x + 6
Summer days (TX > 25 °C) (days)
GWL
Trendline
SSP126 ± 1 STD
SSP245 ± 1 STD
SSP585 ± 1 STD
Mean ± 1 STD


Estonian average FD
y = -23.9x + 156
Frost days (TN < 0 °C) (days)
GWL
Trendline
SSP126 ± 1 STD
SSP245 ± 1 STD
SSP585 ± 1 STD
Mean ± 1 STD


Estonian average TR
y = 2.91x² + -7.69x + 8
Tropical nights (TN > 20 °C) (days)
GWL
Trendline
SSP126 ± 1 STD
SSP245 ± 1 STD
SSP585 ± 1 STD
Mean ± 1 STD


Estonian average TNn
y = 3.4x + -29
Minimum value of daily minimum temp. (°C)
GWL
Trendline
SSP126 ± 1 STD
SSP245 ± 1 STD
SSP585 ± 1 STD
Mean ± 1 STD





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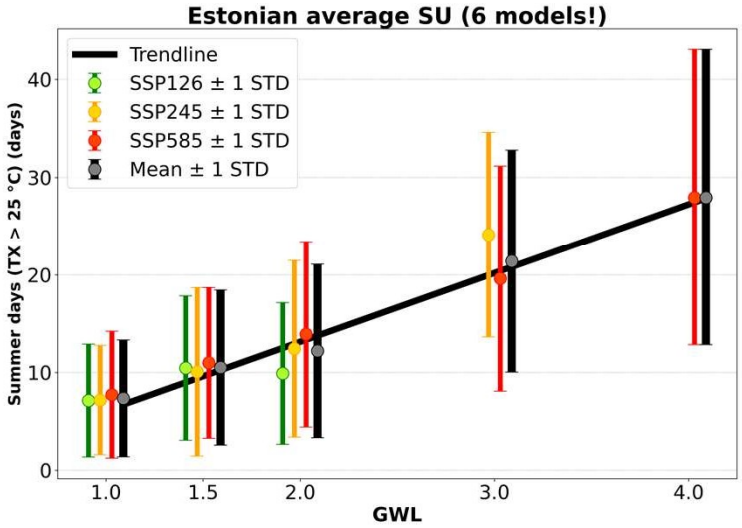

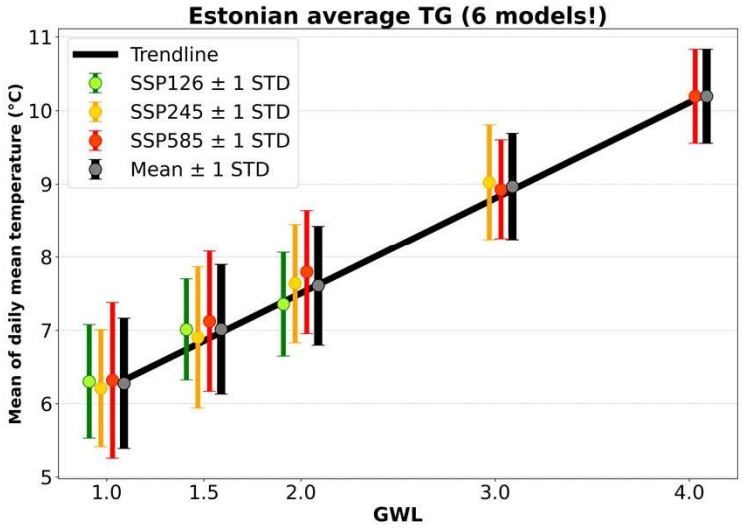

Conclusions:

- GWL-based regional climate projections are not directly affected by systematic differences between models.

- GWL-based climate projections are not bound to specific SSP/RCP-s, so there is no need to justify why exactly one SSP/RCP has been selected.

- Yearly average temperature in Estonia is warming 1.6 times faster than the global average. Yearly minimal temperature in Estonia is warming 3.4 times faster than the global average.

- With global temperature rise by 1 °C, there will be averagely 6 summer days more and 24 frost days less in Estonia.

Thank You!

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