EGU General Assembly 2022
Session CL4.8

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EGU
Outstanding Student Poster & PICO Contest

Supplementary display material

Internal variability of Arctic surface air temperatures at different levels of global warming

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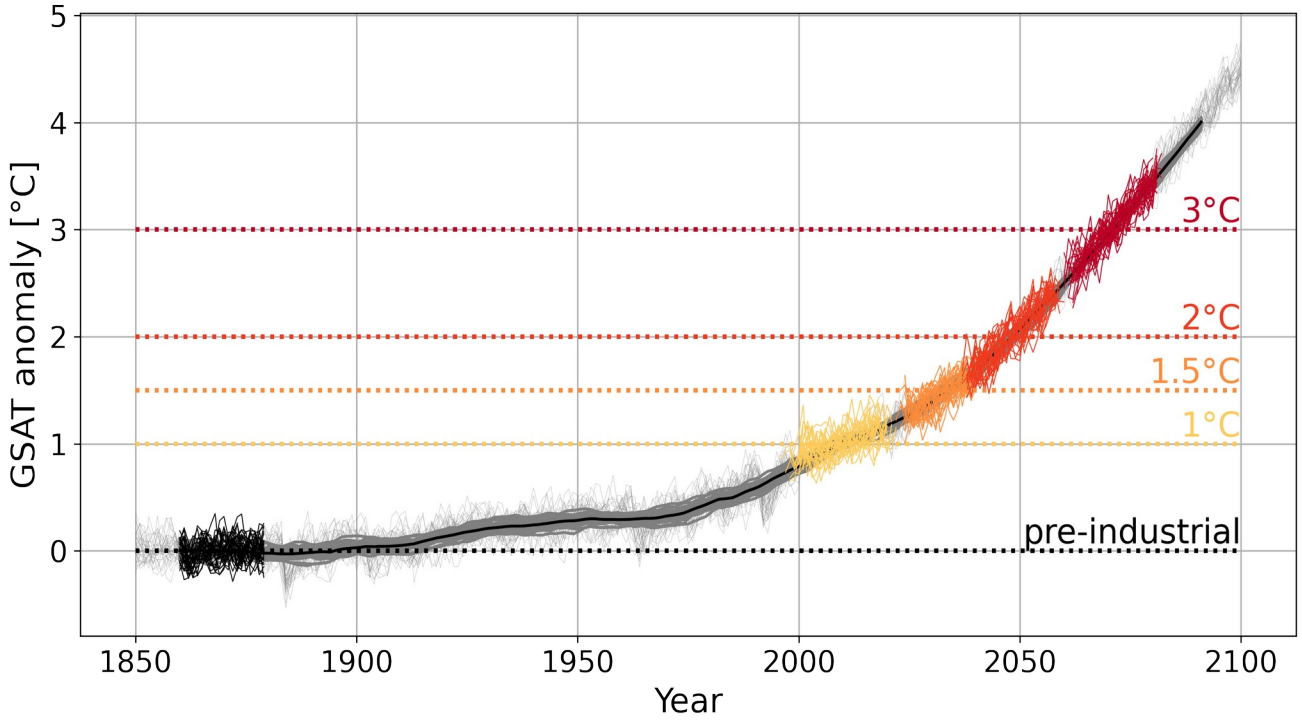
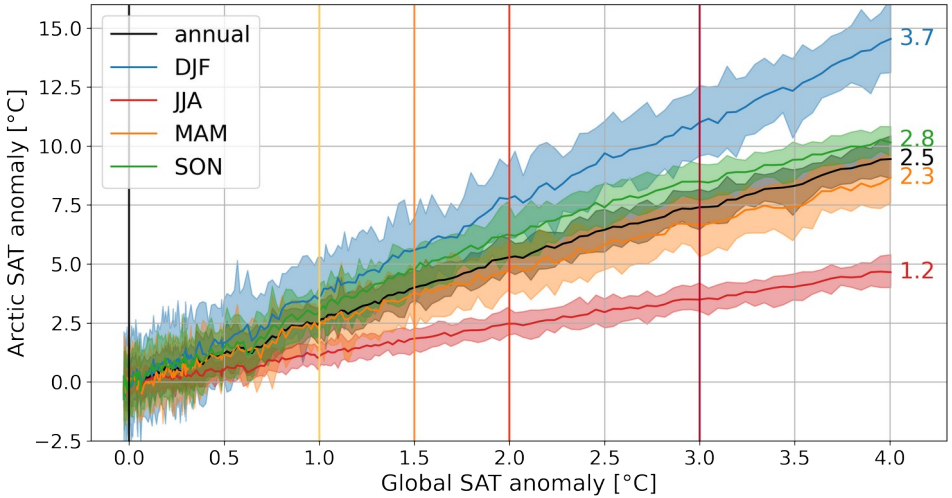
Method

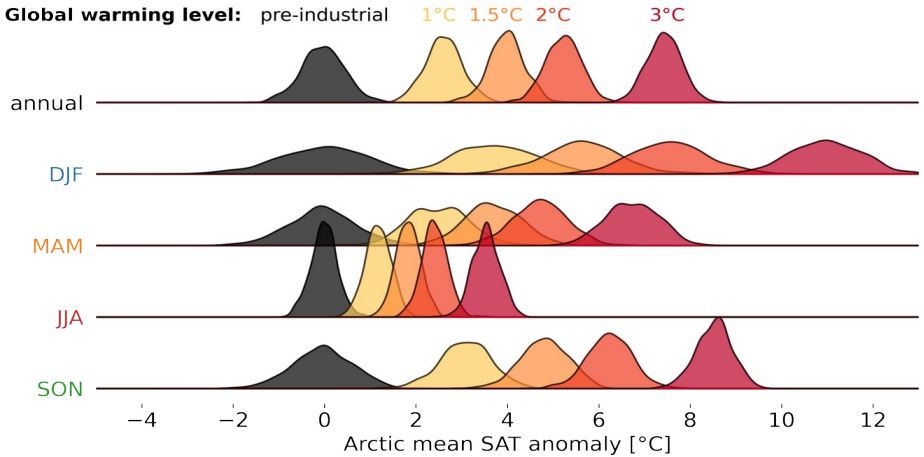
- Single-model initial condition large ensembles
- Here: MPI-ESM-LR (CMIP6 forcing, 30 ensemble members), analysis of other large ensembles in prep.
- Anomalies with respect to 1850-1900 (pre-industrial)

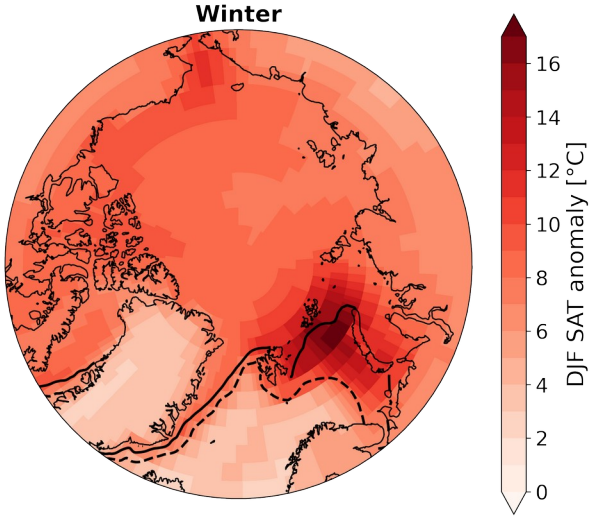


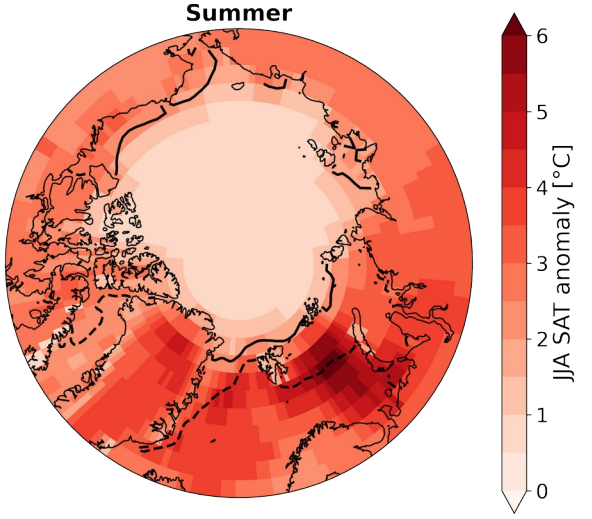
- Global warming level (GWL) sampling: 20-year period around the year of the 20-year rolling-average GSAT crossing the target GWL for each individual ensemble member (consistent with IPCC AR6, 2021)
- Linear detrending of temperature time-series in each GWL sample
- Comparison of transient (based on SSP5-8.5) and near-equilibrium climate states (based on SSP1-2.6) on slide 7ff.

Mean temperatures and seasonality (I)

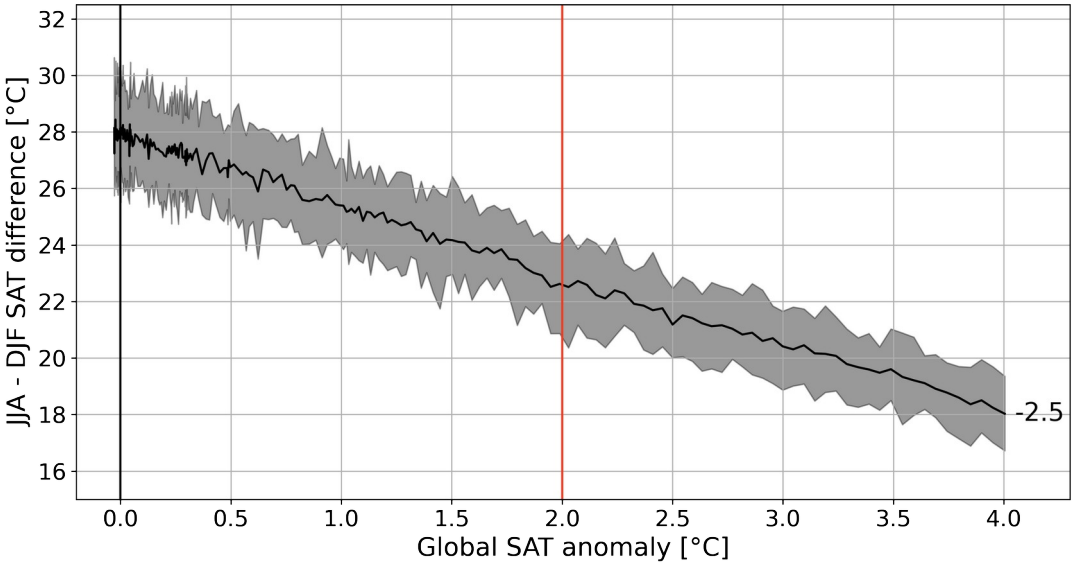


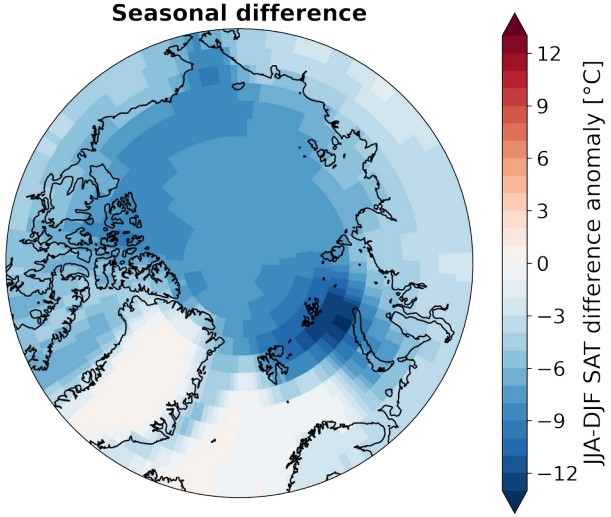






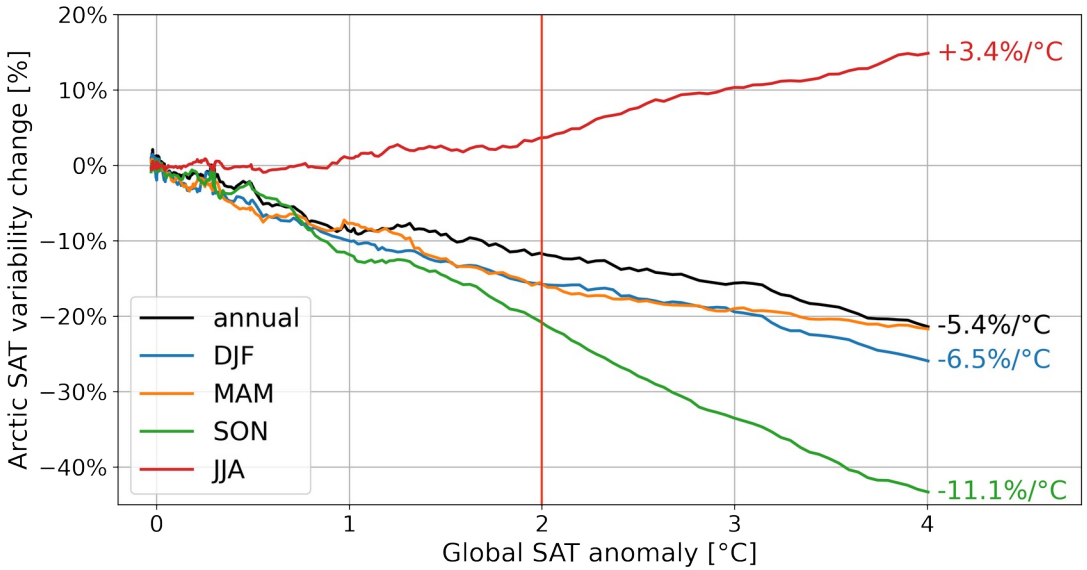
Mean temperatures and seasonality (II)

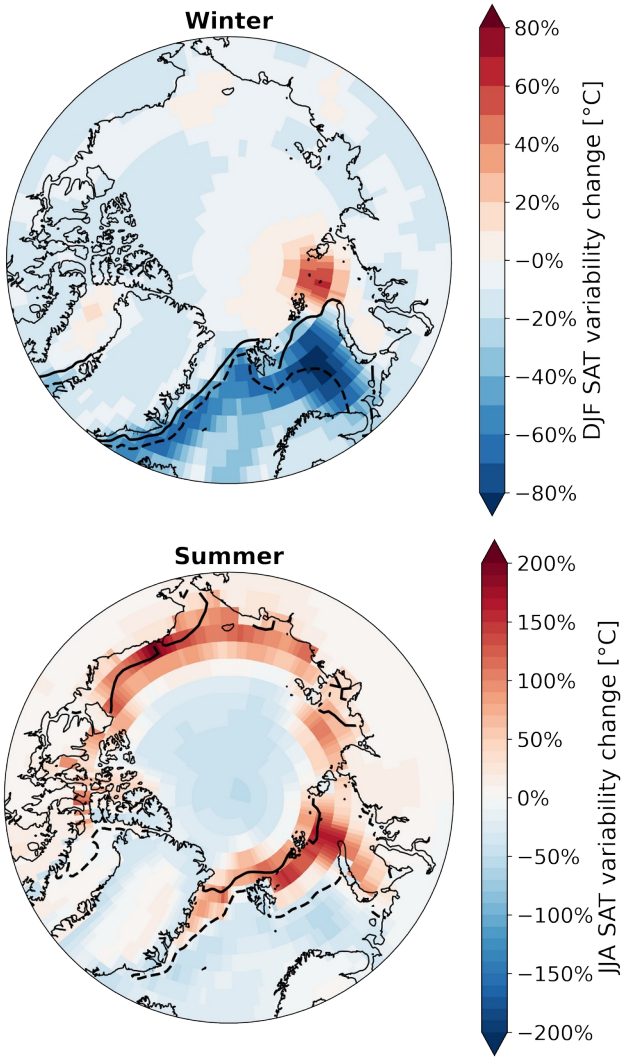




The amplitude of the seasonal cycle of Arctic SAT is decreasing by 2.5°C per degree of global warming.

Inter-annual variability

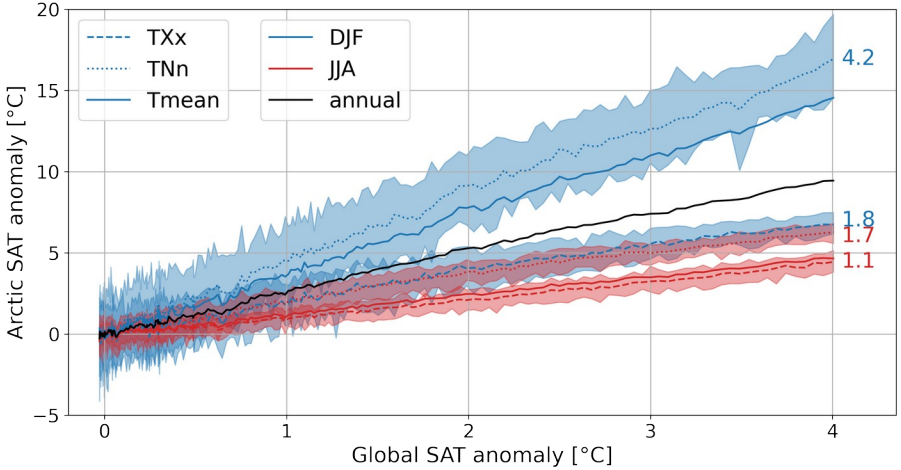


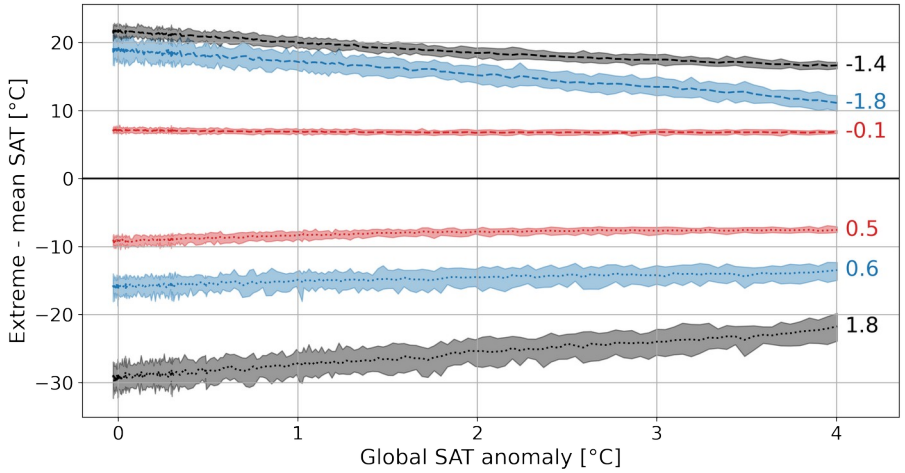


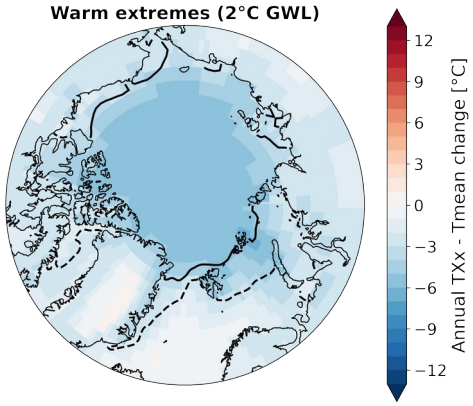
The inter-annual variability of Arctic SAT is decreasing in autumn, winter, spring and in the annual mean, but slightly increasing in summer.

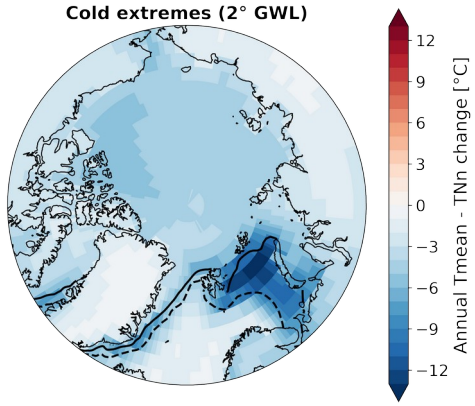
Extreme temperatures

TXx: Seasonal maximum of daily maximum temperature **(warm extremes)**
TNn: Seasonal minimum of daily minimum temperature **(cold extremes)**



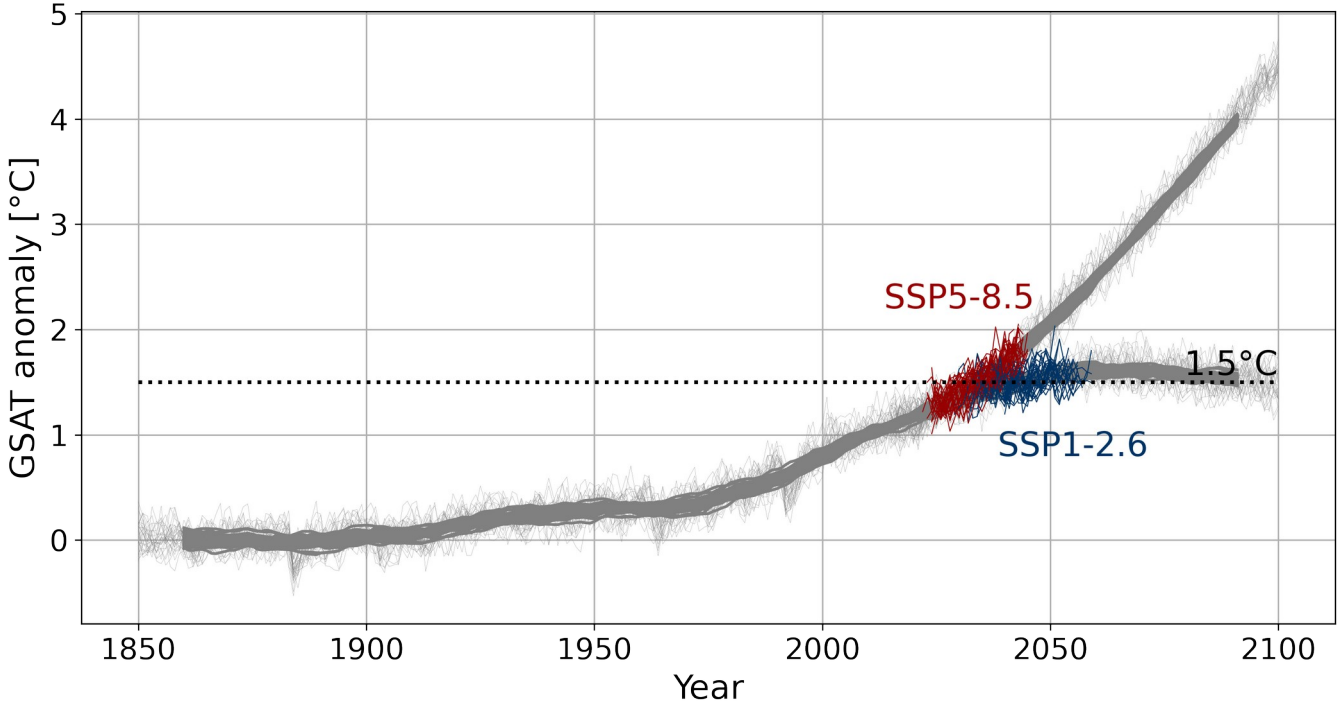






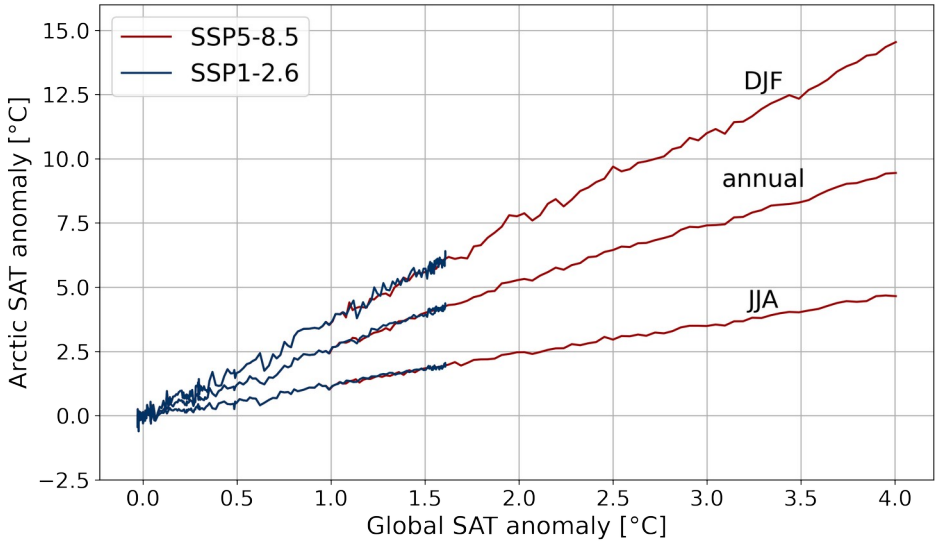
The difference between extreme and mean temperatures decreases.

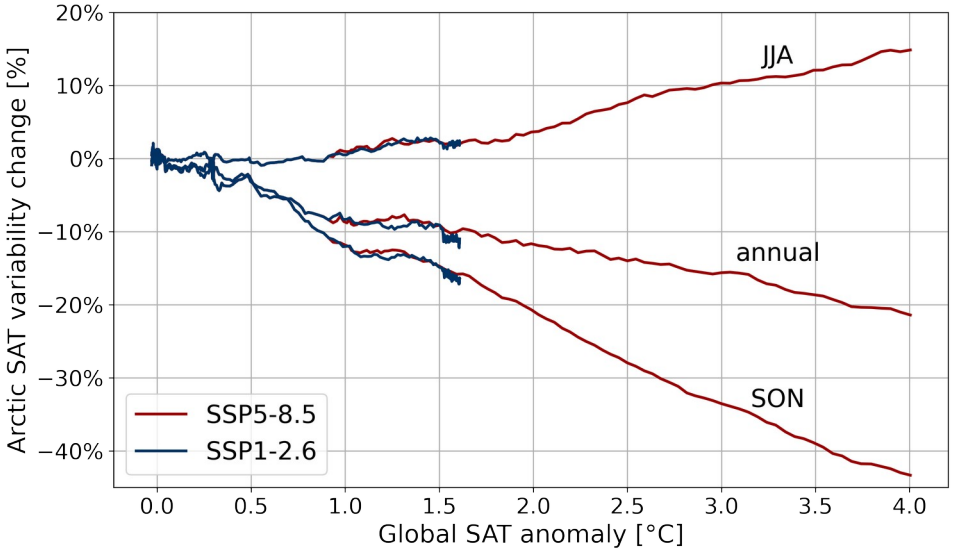
Scenario dependency (transient vs. near-equilibrium climate states)



→ Comparison of Arctic temperature response in scenarios SSP5-8.5 and SSP1-2.6 (transient response and 1.5°C GWL)

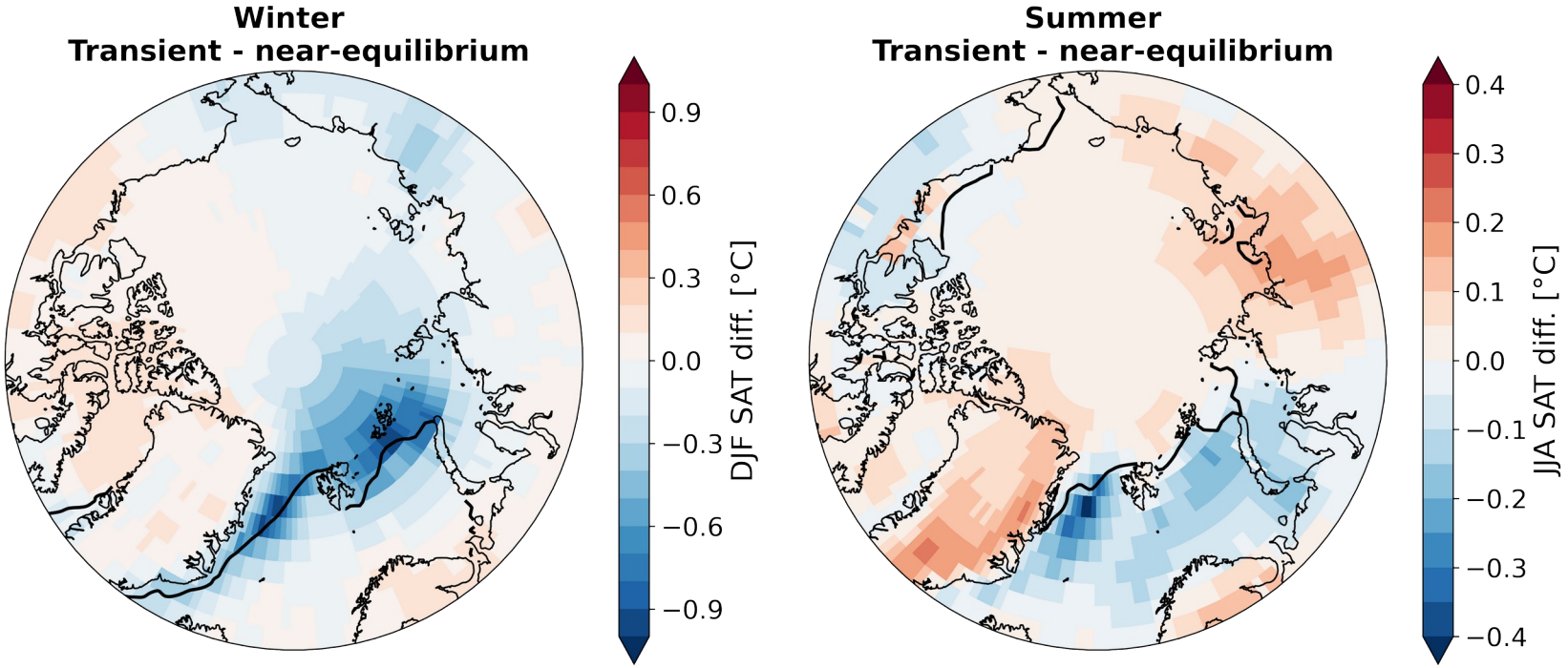
Scenario dependency (transient vs. near-equilibrium climate states)





Response of Arctic-mean temperatures to global warming largely scenario-independent.

Scenario dependency (transient vs. near-equilibrium climate states)



Differences in the local temperature response in a transient vs. near-equilibrium climate state (land/ocean/sea ice contrast).

Conclusions

- Less temperature variations in a warmer Arctic climate:
  - The seasonal temperature contrast is decreasing.
  - The inter-annual temperature variability is decreasing (except for summer).
  - Extreme temperatures become less intense relative to the new mean state (particularly in winter).
- The local temperature response varies largels for different regions → strongest changes in the areas where sea ice is lost.
- The Arctic-mean temperature response is largely scenario-independent but there are differences in the local temperature response in a transient and a near-equilibrium climate state.

For questions and comments, please contact me:

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