# GCM-based future projections of European summer weather types obtained by **Self-Organizing-Maps and a novel GCM selection technique** EGU23-8934

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## 1. Motivation

- The interdisciplinary research project "BayTreeNet" examines the reactions of Bavarian forest ecosystems to climate dynamics.
- In the mid-latitudes, local climate phenomena often show a strong dependence on the large-scale climate weather types (WT).
- WT significantly determine the climate of a region through their frequency and intensity.
- Different WT show various weather conditions at different locations.
- The meaning of every WT is the physical basis for the climate forest growth relationships.
- The response of forests to individual WT at different forest sites in Bavaria are investigated.



- Three new WT (01; 05; 09; highlighted with orange boxes) in summer developing from 2020 onwards with increasing probability
- These new WT replace the current WT at the end of the 21<sup>st</sup> century

## **GCM** Selection

Evaluation, with respect to a reanalysis product observational and/or data, the ability of GCMs to reconstruct the mean state of the climate and the space-time climatic anomalies for the atmospheric state variables (PICKLER & MÖLG 2021).

Top ranked model for Bavaria: MPI-ESM1-2-LR\_r29i1p1f1



## 2m air temperature anomaly and intensity for 12 WT



Fig. 7: Composite Mean Analysis for frequency, duration and 2m air temperature for 1990-2100. MPI-ESM1-2-LR Model (ssp5-8.5). 5 % significant trends are marked with black square.



Fig. 6: a) 2m air temperature anomaly (reference period 1990-2019) in central Europe and b) 2m air temperature intensity for 1990-2100. MPI-ESM1-2-LR Model (ssp5-8.5).

- WT have positive temperature Almost all anomalies in central Europe (reference period: 1990-2019)
- The 3 new WT show strong positive temperature anomalies
- All WT have significant increasing temperatures
- The 3 new WT show the highest temperatures

- Duration between 2.5 and 5 days Between one and four events per season
- Three new WT increasing in frequency with extreme hot and dry conditions
- frequency & duration



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## 4. Summary

- Twelve summer WT occurrence between 5% and 10%

Positive correlation and connection between temperature anomalies and