

# Global climatology and trends in modeled Storm Prediction Center (SPC) risk categories

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Convective parameters  
processing powered  
by **thunderR** package



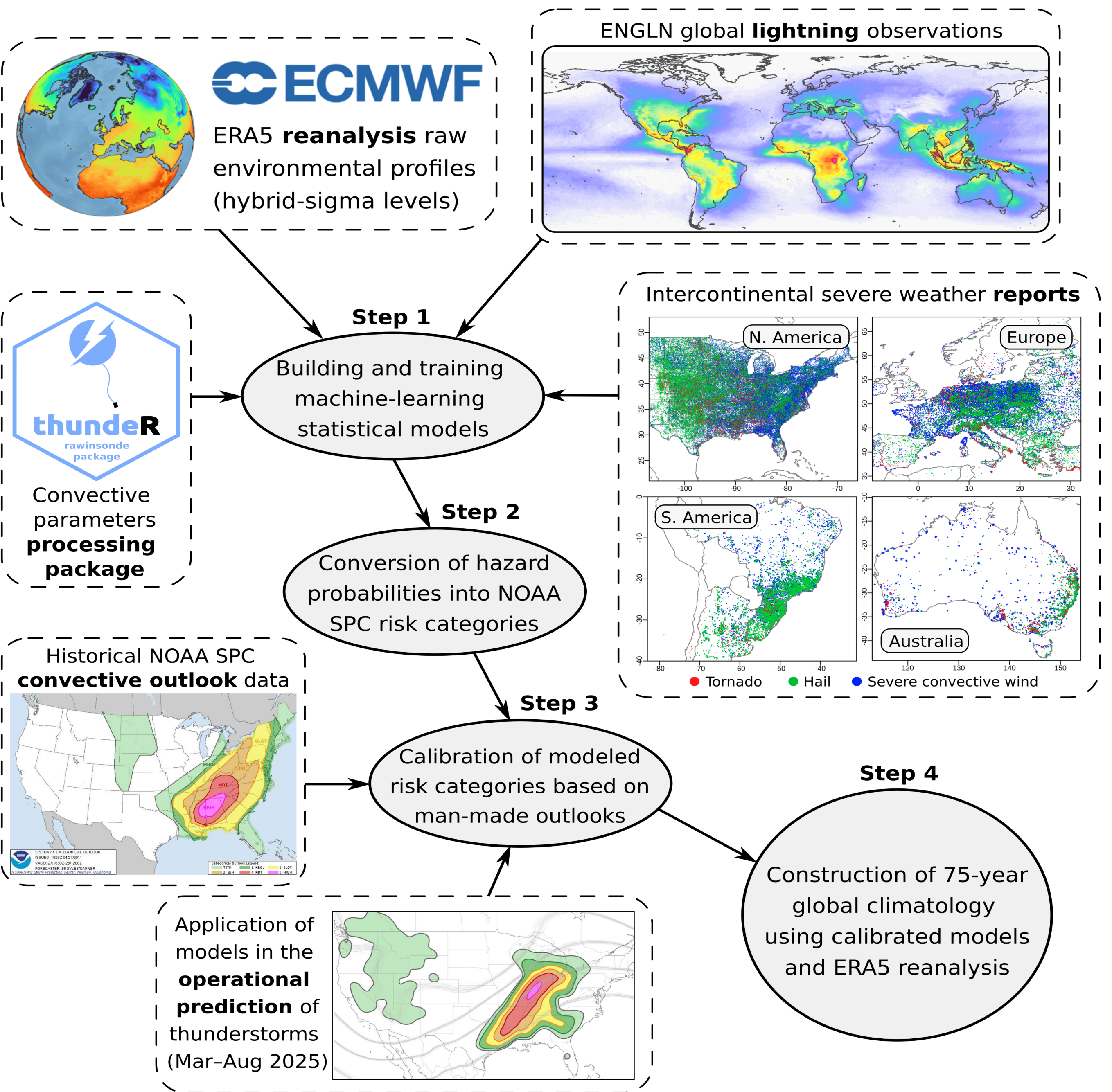
## Objective

Develop statistical models trained on intercontinental data to predict convective storm occurrence aligned with NOAA Storm Prediction Center (SPC) risk categories, and examine their climatology over a 75-year period. This work represents the first global application of SPC risk categories and evaluates their utility beyond the United States. Results of this work contributed to the development of ASTORP (Automated Severe Thunderstorm Outlooks from thunderR Package) forecasting tool.

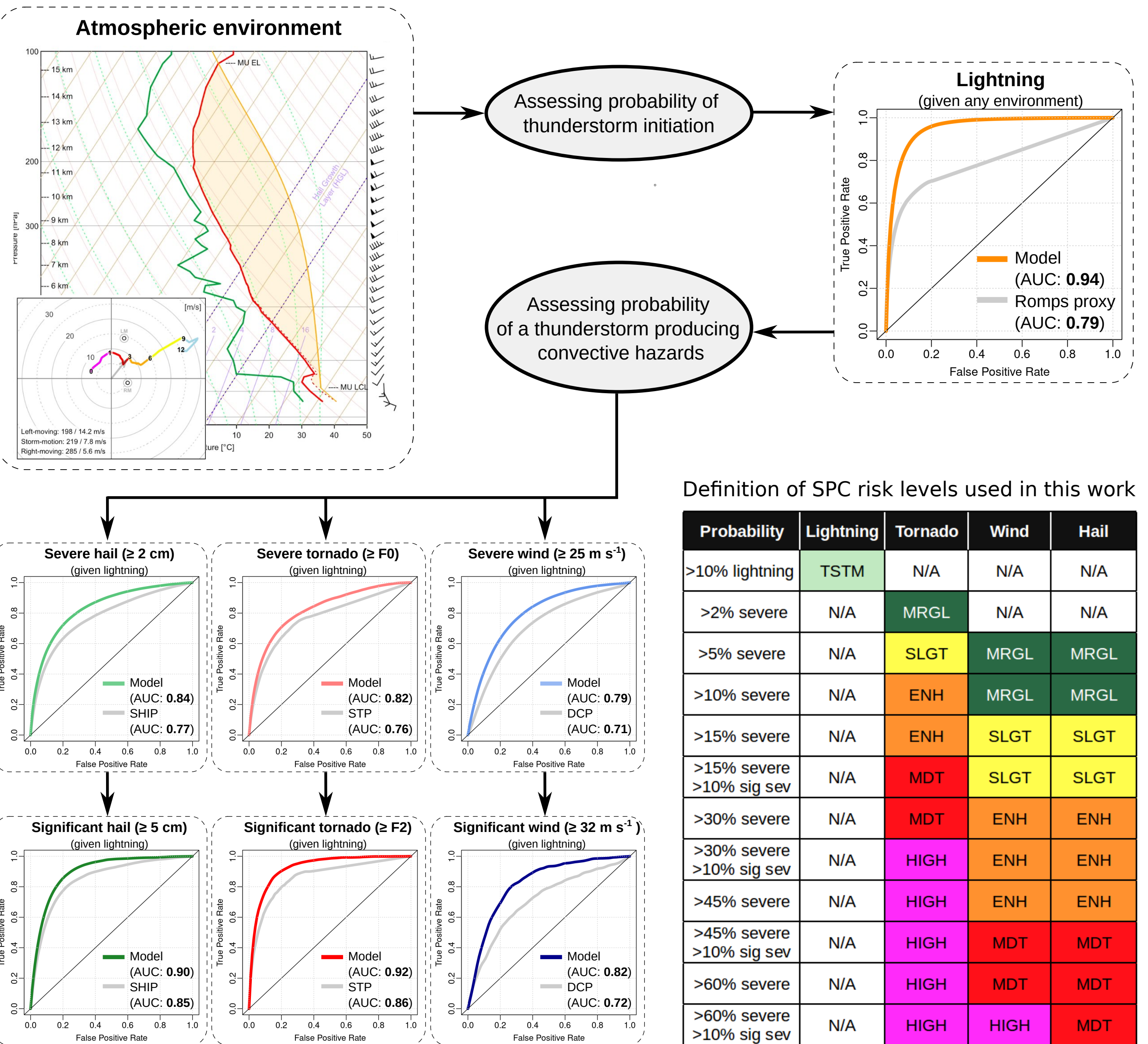
## Concluding remarks

- The United States experiences the planet's most extreme severe storm environments, with risk probabilities rarely observed elsewhere globally.
- Despite mixed trends in total thunderstorm hours, the relative contribution of severe thunderstorms has increased since 1950, strongly correlating with rising 2-metre temperatures—most prominently over Europe and Africa.
- Trends in the tropical zone require cautious interpretation due to temporal inconsistencies in ERA5 reanalysis over these regions.

## Methodology flowchart

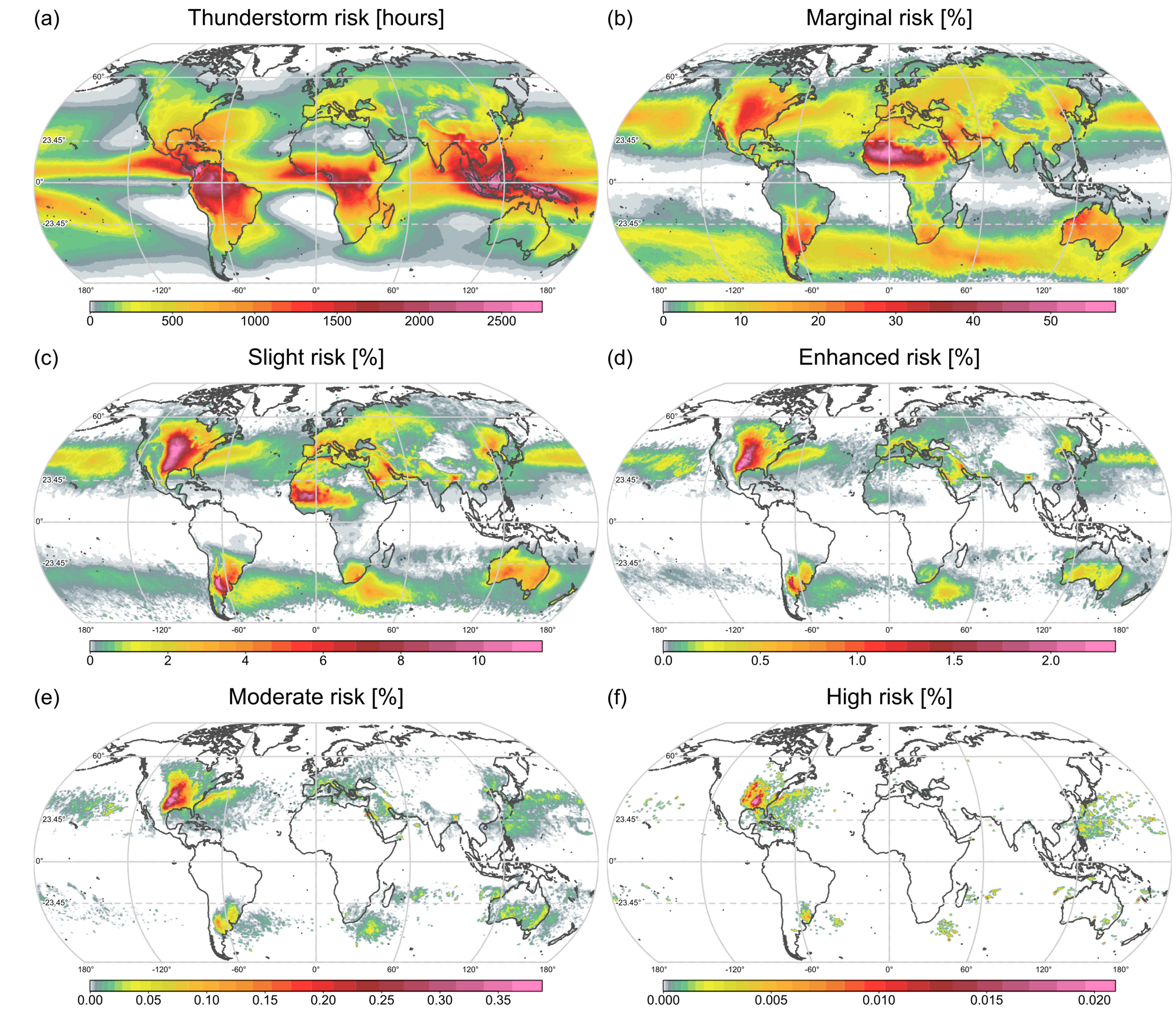


## Converting environment into risk category

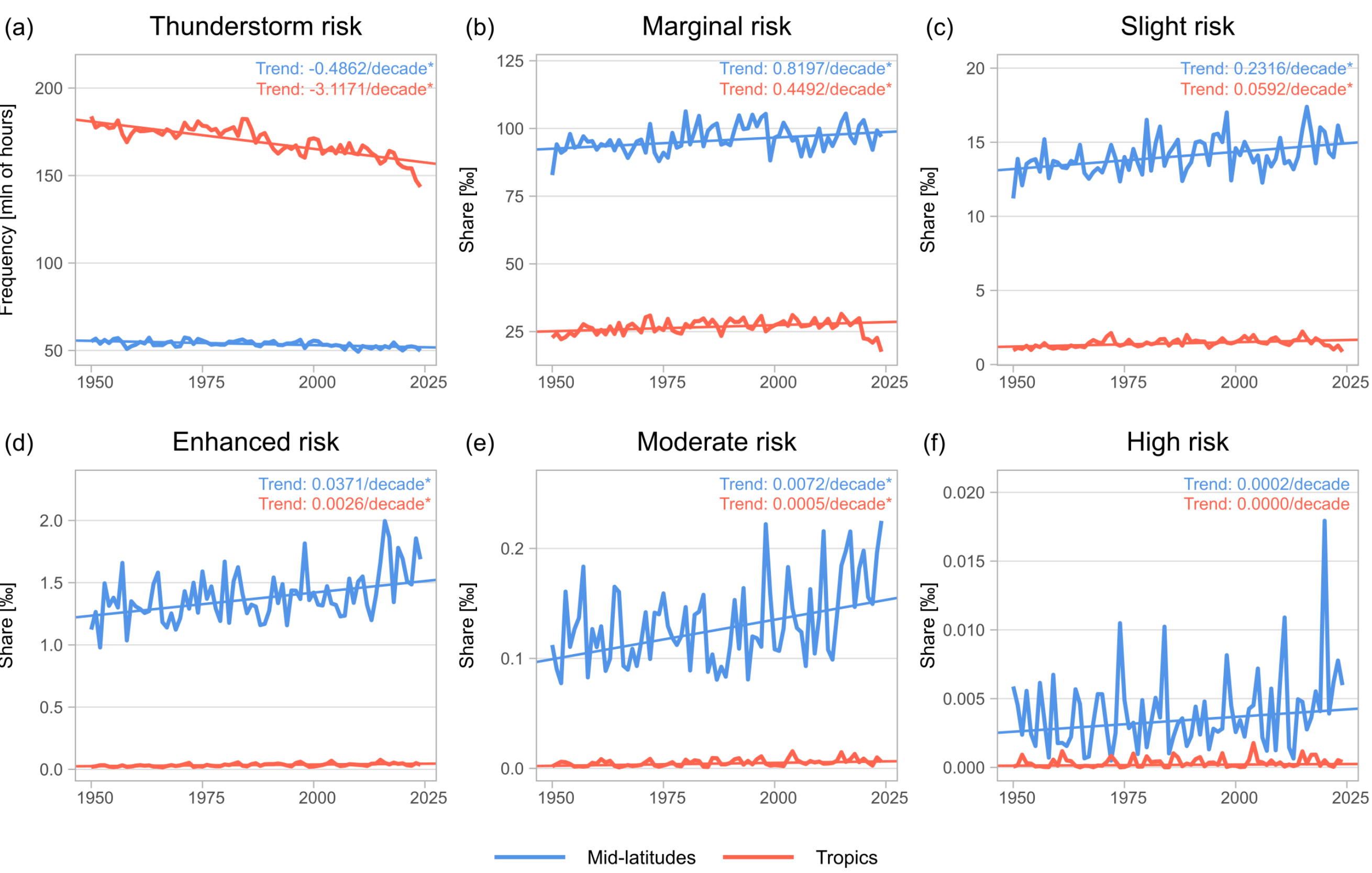


AUC scores were calculated for global domain. Abbreviations of proxies used for AUC comparison with obtained models are as follows: STP (significant tornado parameter), SHIP (significant hail parameter), DCP (derecho composite parameter), Romps proxy (CAPE times convective prcp.)

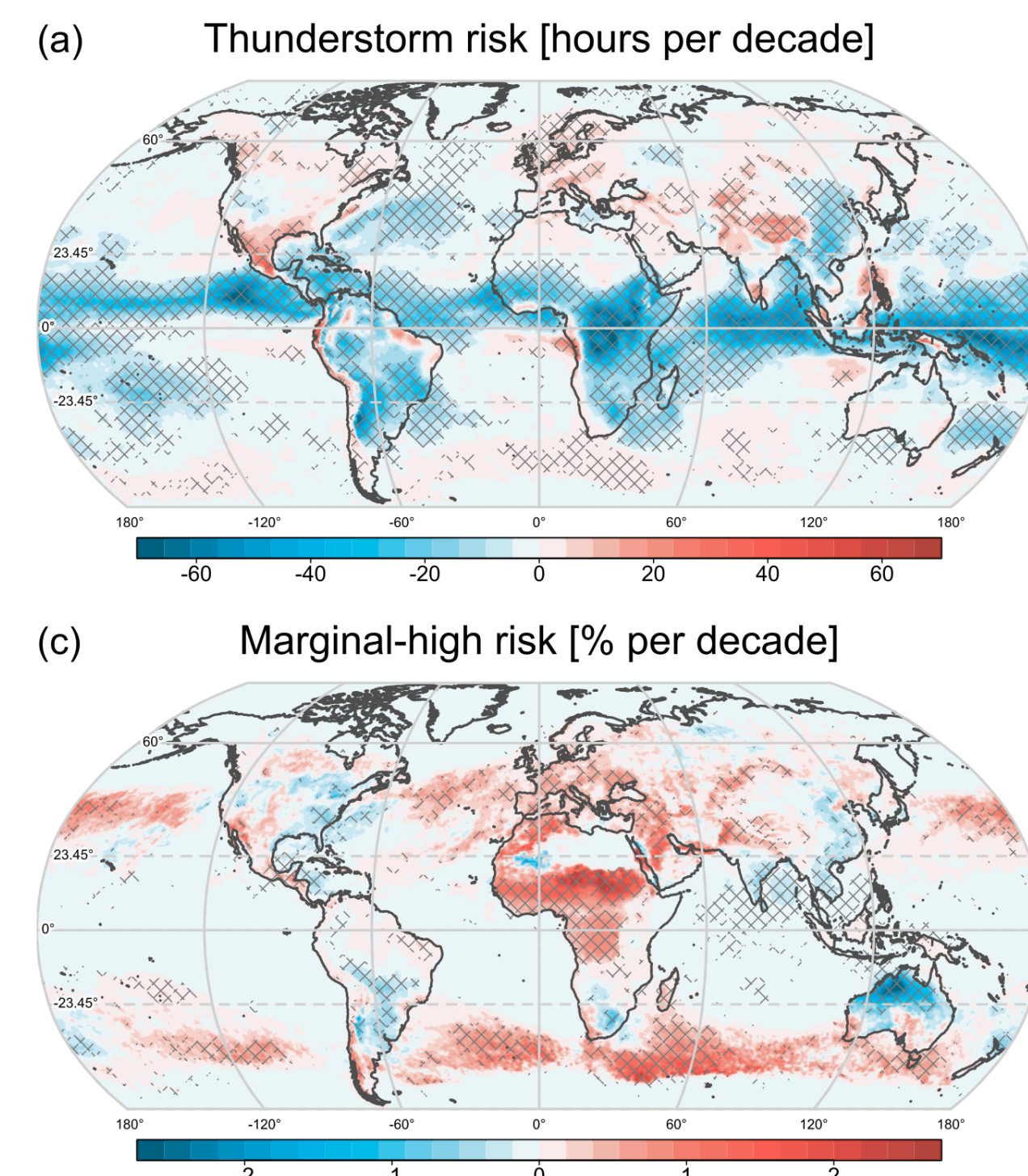
## Climatology of modeled SPC risk categories (1950-2024)



## Multiannual variability in SPC risk categories



## Long-term trends



## Correlation with 2-metre air temperature

