Hot Spots of Global Temperature of Emergence of several Climatic Impact-Drivers (CIDs) for the CORDEX regions

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Introduction

The time of emergence (ToE) of a specific climatic impact-driver (CID) in a particular region is crucial information for stakeholders. ToE represents the moment when a distinct signal emerges from natural variability, serving as an indicator of the magnitude of climate change and playing a significant role in a risk framework for mitigation purposes. We use Global Temperature of Emergence (GToE), where time is replaced with the global mean temperature. This approach eliminates dependence on model differences and emission pathways.

Methodology

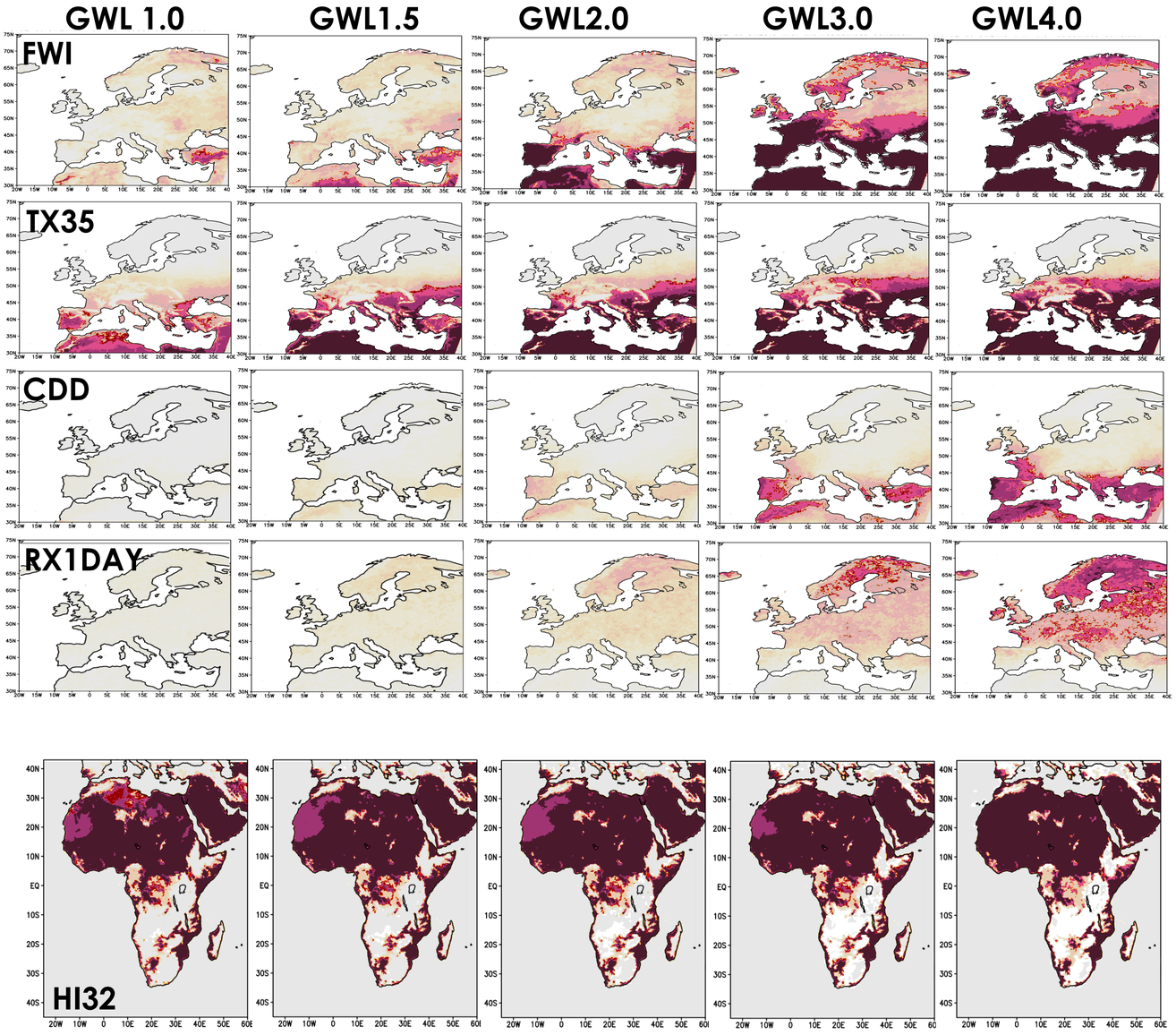
- GToE defined by Global Warming Levels (GWLs) relative to 1850-1900 temperatures.
- We assess the probability of reaching specific GWL thresholds:1.0, 1.5, 2.0, 3.0, and 4.0 for each CIDs.
- Signal-to-noise ratio exceeding of a specific threshold (Hawkins and Sutton,2012), enriched with "change robustness".
- Robustness defined as ≥66% models with signal-to-noise ratio >1 and ≥80% agreement on change direction.
- Signal-to-noise ratio calculated for each model using change-to-standard deviation ratio of non-overlapping 20-year means, referencing standard deviation to 1970-1999.

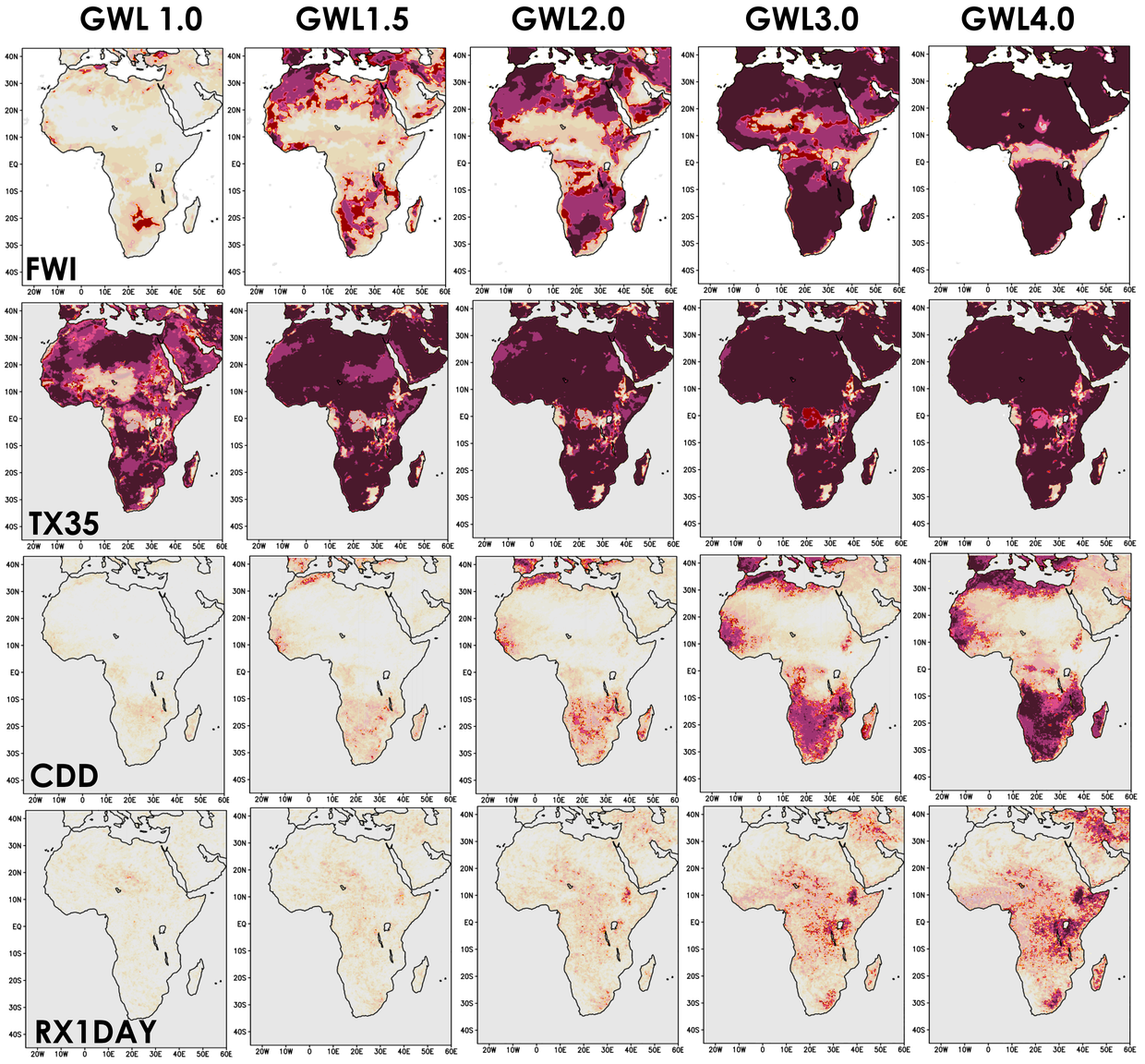
Index	Descrption	Inputs
CDD	Consecutive Dry Days	pr
RX1DAY	Maximum 1-day precipitation	pr
TX35	Number of days w/Tmax>35C	tasmax
FWI	Fire Weather Index	tas,hurs, pr, sfcWindmax
HI32	Number of days w/ NOAA Heat Index >32C	tas, hurs

CORDEX DOMAINS:
EUR-11 – 67 Members
AFR-22 – 10 Members

Results

Probability of reaching a specific GWL threshold for each CID enriched with the condition of robustness





Conclusions

- ✓ As expected the probability of crossing a certain threshold increases with the increase of GWLs.
- ✓ In EUR, there are regions where high probability is shown even at lower GWLs and those indicate "CID hot spots" in the domain, such as in the Mediterranean for example, but also in Scandinavia.
- ✓ In AFR, the indices FWI, TX35 and HI emerge very early, and in some regions they have already emerged (Prob close to 1 at GWL = 1.0).
- ✓ CDD becomes significant at GWL = 3.0 in southern Africa and in the mediterranean coast, and the western portion of the continent.