Regionalization of future extreme hydro-meteorological events in Austria: Using weather type classification for down-scaling from global climate models to regional extreme events.

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Overview

Idea and concept

Data situation: Models and station data

Methodology

Results

Summary
Extreme meteorological events:

1. Extreme
2. Regional influence (topographical)
3. Synoptic situation

Causal weather events differ throughout the seasons and in different regions of Austria.

Occur in certain synoptic situations - weather types.
Idea and concept

**Future extreme events?**

*General flow* is represented in GCM, extreme precipitation on regional scale not well predicted

Establish *relation between circulation types and extreme events* in the past - same weather types then in the past cause extreme events in the future

If general flow well represented and a significant relation between extreme events and weather types is established > tell sth about *future extreme events* (the part caused by circulation).

**Probability forecast**
Data: Observation time series

~ 150 Stations with daily precipitation data of 40 years (1961 - 2000)

Regions defined upon climatology

Defining extreme events

More than 50% of the stations are in their upper percentiles
Data: Model data

Reanalysis data:
ERA 40 reanalysis

Global Climate Models 2061 - 2080:
ECHMA5 A1B & B1, HADCM3C A1B

WLK733: Mean direction of flow, cyclonality in different levels (A,C)
Methodology

Select extreme events from observation data

Appoint the WLK733 from ERA40 to each extreme event
- How frequently is an extreme event caused by a CT
Methodology

Frequency of CT in extreme events

Frequency of extreme events in CT

Effectiveness of a CT to produce an extreme event
Calculate frequency of CT in the GCM’s 20\textsuperscript{th} century control runs and in the 21\textsuperscript{st} century runs

Hypothesis: Changes in CT distribution cause changes in the extreme events distribution
Results: Effectiveness of CT

Most effective CT in Regions

- West Jahr
- Inneralpin Jahr
- Adria Jahr
Results: Change of CT in the future

Difference: \( (\text{freq(future)} - \text{freq(past)}) \times 365 \) change in days/year

- **A1B**
  - Expected change in extreme WL (ECHAM5 A1B)
  - Adrià Jahr
  - Innerlpin Jahr
  - West Jahr

- **B1**
  - Expected change in extreme WL (ECHAM5 B1)
  - Adrià Jahr
  - Innerlpin Jahr
  - West Jahr
Results: Change of CT in the future

Change of CT in the future

- Winter
- Spring
- Summer
- Autumn

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Summary

Most effective CT in Regions

No similar and significant trend for all the year, spring, autumn

In winter in the inner alpine region possibly an increase of extreme events (no significant negative trend in any of the CT causing extreme events)

Summertime decrease of extreme events seems likely, except for adriatic region

No general hint for increase of the CT’s that are efficiently responsible for extreme events
THANKS
for your attention