Regional climate model projections for the upper Danube and upper Brahmaputra river basin*

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INTRODUCTION

To investigate hydrological impacts of projected climate changes on the regional scale, different ECHAM5 IPCC SRES scenarios have been dynamically downscaled from 1.875° to 0.44° in the upper Danube and the upper Brahmaputra river basin (UDRB and UBRB resp., Fig.1). The downscaling has been carried out with the regional climate model CLM (www.clm-community.eu) for the scenarios A1B, A2, B1 and commitment.

METHODS

Different seasonal precipitation and temperature indices (Table 1) are calculated for the time period 1960-2100 and evaluated for linear trends. The UBRB is further split into three smaller areas of interest with regard to altitude: The high Tibetan plateau, the low floodplains and the mid-latitude region in between.

Name	***Description***	***Unit***
precip	Precipitation amount	mm/season
FRE	Wet day frequency	1
INT	Wet day intensity	mm/d
PX5D	Max. 5-day precip.	mm
CDD	Longest period of consec. dry days	d
T2M	Mean 2m temperature	°C
T2MIN	Mean daily min. temp.	°C
T2MAX	Mean daily max. temp.	°C

Table 1: List of precipitation and temperature indices.

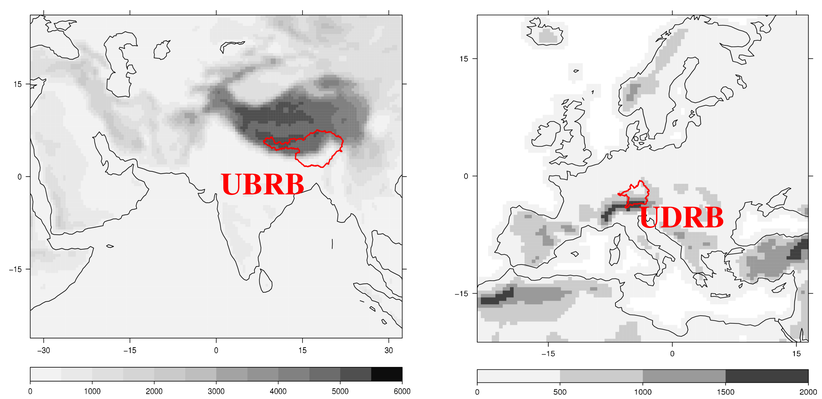

Fig. 1: CLM computational domains and model orography.

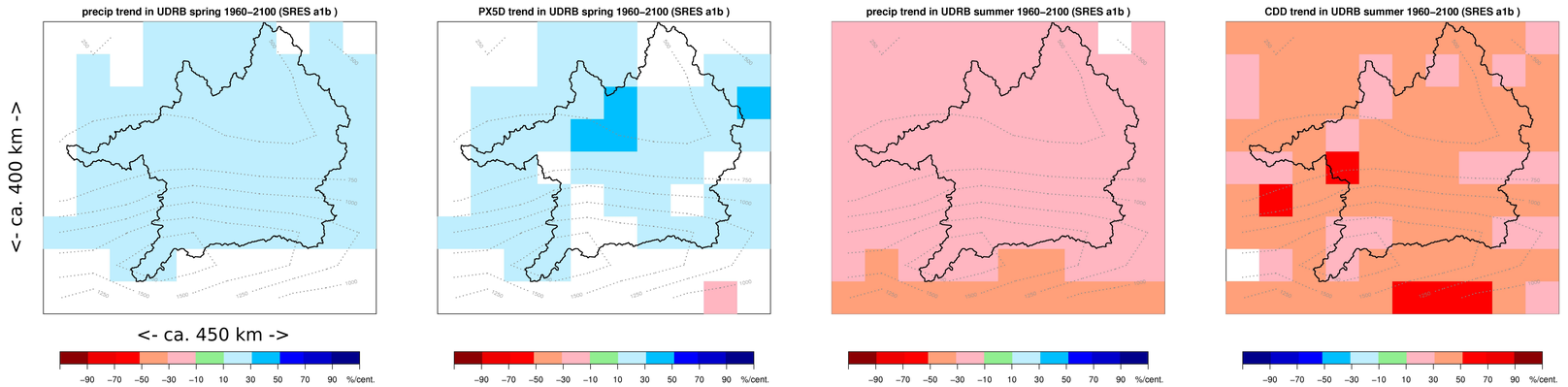

Fig. 2: Projected linear trends (sign. at 0.05 level) of spring (MAM) precipitation and max. 5-day precipitation, and summer (JJA) precipitation and consecutive dry days (from left to right) in the UDRB for the A1B scenario and the time period 1960-2100.

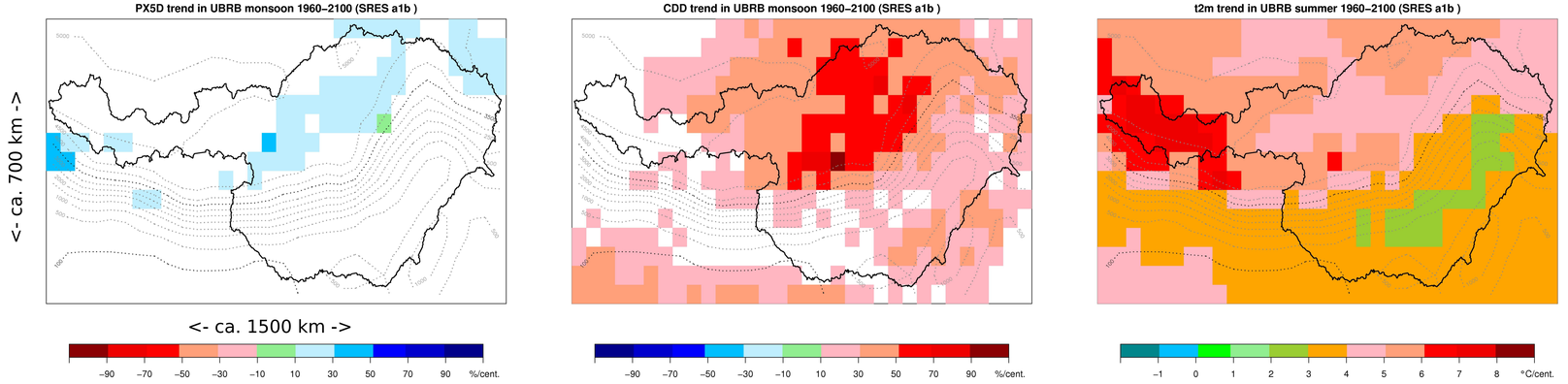

Fig. 3: Projected linear trends (sign. at 0.05 level) of monsoon (JJAS) max. 5-day precipitation and consecutive dry days, and summer (MAM) 2m temperature (from left to right) in the UBRB for the A1B scenario and the time period 1960-2100.

RESULTS

- Generally (not shown):
  - Largest trends: A1B, followed by A2, B1 & COM
  - Higher increase in T2MAX than T2M, smaller in T2MIN
  - Trends in precip. indices less clear than in temp. indices
  - Trends in precip. indices less clear in UBRB than in UDRB
  - Largest trends on Tibetan Plateau, smallest in floodplains
- Large regional and seasonal differences (Figs. 2 and 3)
- T2M: +1°C to +4°C per century in UDRB, +2°C to +5.5°C per century in UBRB (A1B, A2 & B1)
- precip: +15% per century in spring, -15% per century in summer (A1B, A2 & B1) in UDRB. Approx. same trends for PX5D and CDD, resp.

RESULTS (continued)

- Tibetan Plateau:
  - Positive X5D trend in monsoon (A1B, A2 & B1)
  - Positive CDD trend in monsoon (A1B, A2, B1 & COM)

CONCLUSIONS

- Projections indicate:
  - Increase in temperature variability
  - Increasing flood risk in the UDRB in spring
  - Increasing drought risk in the UDRB in summer
  - Tibetan Plateau highly sensitive to climate changes
  - Trends depend on altitude and SRES scenario

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