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.

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)

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.

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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Table 1: List of precipitation and temperature indices.

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

Fig. 1: CLM computational domains and model orography.