Mind the gap

Communication between climate modelers and climate impact researchers

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Outline

- The Challenge:
  - Climate model results have their inherent strength and weaknesses ⇒ climate modelers recommend certain precautions and interpretation limits of the data
  - Climate impact researchers are not always familiar with these interpretation methods ⇒ in climate impact research, climate model results are often used ‘un-wisely’

- INKLIM-A: nearly 20 climate and climate impact research projects for Hesse ⇒ prescribed use of 4 climate models, two time slices

- First attempts at solutions

- Items to discuss
Typical climate impact researchers requirements

• High spatial and temporal resolution
• Short time horizon for research question (e.g. 2011 – 2040)
• Availability and easy access of climate projection data (not only for research, but also for planning, etc.)
• Data formats (ascii, geographical grid)
• Limited computing resources -> problems to use more than one model as input data
Spatial resolution

Impact researcher: 'I need exactly this location'

Climate modeller: 'Please use at least averages over 5x5 grid-boxes'

Annual mean temperature, 1971 – 2000, two models
Example: the Zero-degree-problem

Some impact researchers need 'chilling hours'!

pdf of daily $\text{T}_{\text{mean}}$, one pixel in Hesse, obs (grey), 3 dynamical RCMs
Statistical versus dynamical RCMs

Precipitation DJF, 1971 – 2000, Hesse, Germany

- Statistical model: (seemingly) best fit to observations, high spatial resolution
- Dynamical model: bias, grid-box resolution, model specific problems
- German impact modelling community strongly favours statistical models!

Original station data

Statistical model

- Statistical model: only statistical representation
- Dynamical model: physical representation

Dynamical model
Temporal research horizon

$\Delta P \text{ JJA, A1B scenario, 2031 – 2060 compared to 1971 – 2000 for two RCMs}$

-> Signal to noise ratio prevents clear interpretation of short time horizons for some quantities
Common misunderstandings or ‘un-wise’ use of model data

- Comparison of modelled future to observed present (no bias correction)
- Use of hourly simulated RCM precipitation intensity for erosion assessment
- Use of modelled river flow (prominent example: Rhine flows upstream in lowermost area!)
- Use of unsuitable temporal (one or few years) or spatial (one or few pixels) resolution
- Over-confidence in (single) model results
INKLIM-A:

• Inter-project data working group
• YES: We did some bias correction
• NO: We didn’t aim for optimal correction (avoid overconfidence)
• Next step: Help impact modellers coping with the data
Example: Bias-correction in INKLIM-A

- Correction for monthly values only (not optimized for daily values)
  - Might lead to inconsistencies between different fields (at least for daily values)
- Simple methods (additive correction for T, multiplicative correction for P)
- Several problems remain -> avoid overconfidence!
  - Need for detailed communication of data weaknesses for impact research question
  - Overall: assumption that 'error' is constant!
Example: Bias-correction in INKLIM-A

Example: $T_{\text{min}}$, one model, one grid-box, 1971 – 2000, monthly correction, spline interpolation, max and min for all grid-boxes in Hesse
The next step

Climate model output ≠ Impact model input

- Bias correction, provision of suitable data (format and variables), how to use ensembles data, discussion of model weaknesses and strengths
- Methodological development for use of model data and ensembles, handling of model deficiencies
Conclusion

• There is a gap between the climate model community (and climate model output) and the climate impact research community (and required impact model input)

• Responsibility of climate modellers to provide the necessary data and information to impact researchers (who are NOT climate modellers themselves!)

• Responsibility of impact researchers to develop /adopt analysis methods that cope with biased data and ensembles

Need for open and frequent face-to-face communication between climate modellers and impact researchers!
Thank you for your attention