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Hessisches Landesamt
für Umwelt und Geologie

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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

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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

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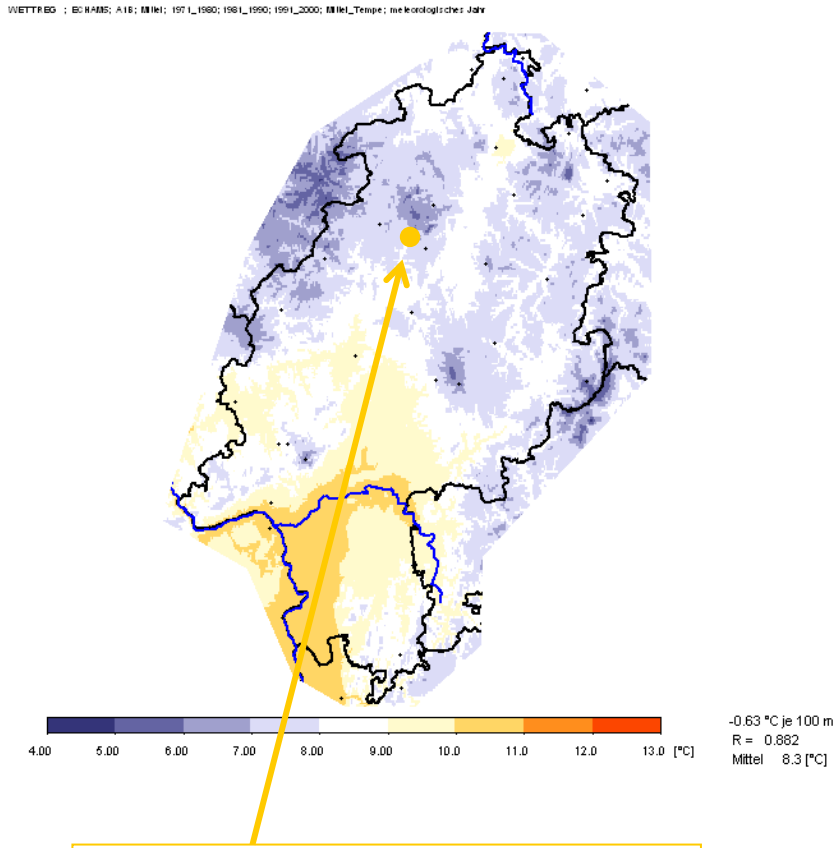
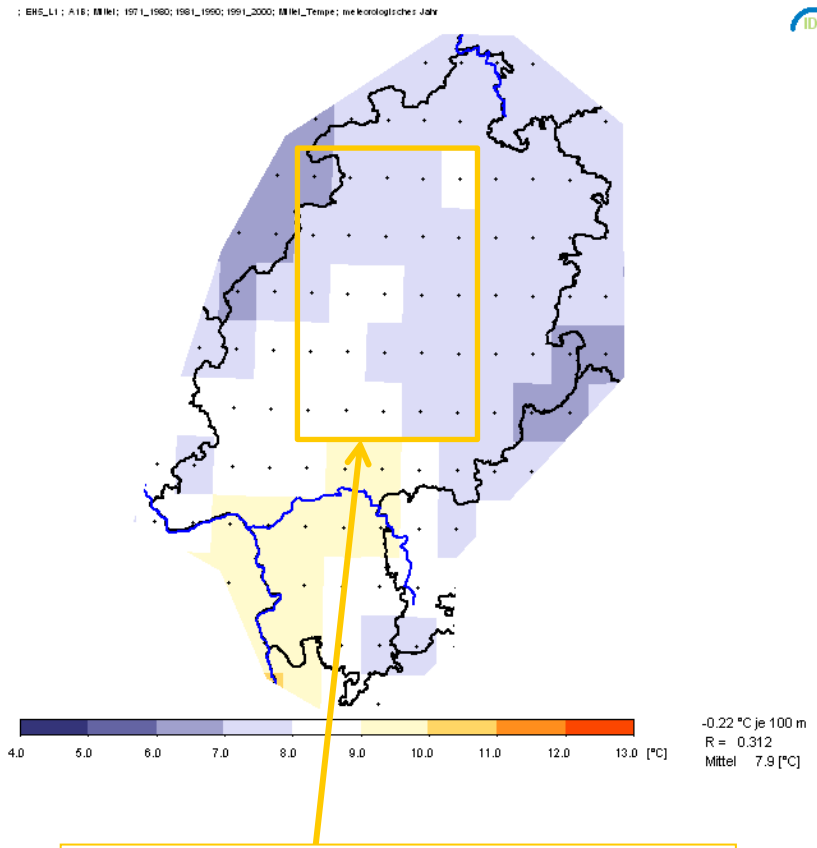
Spatial resolution



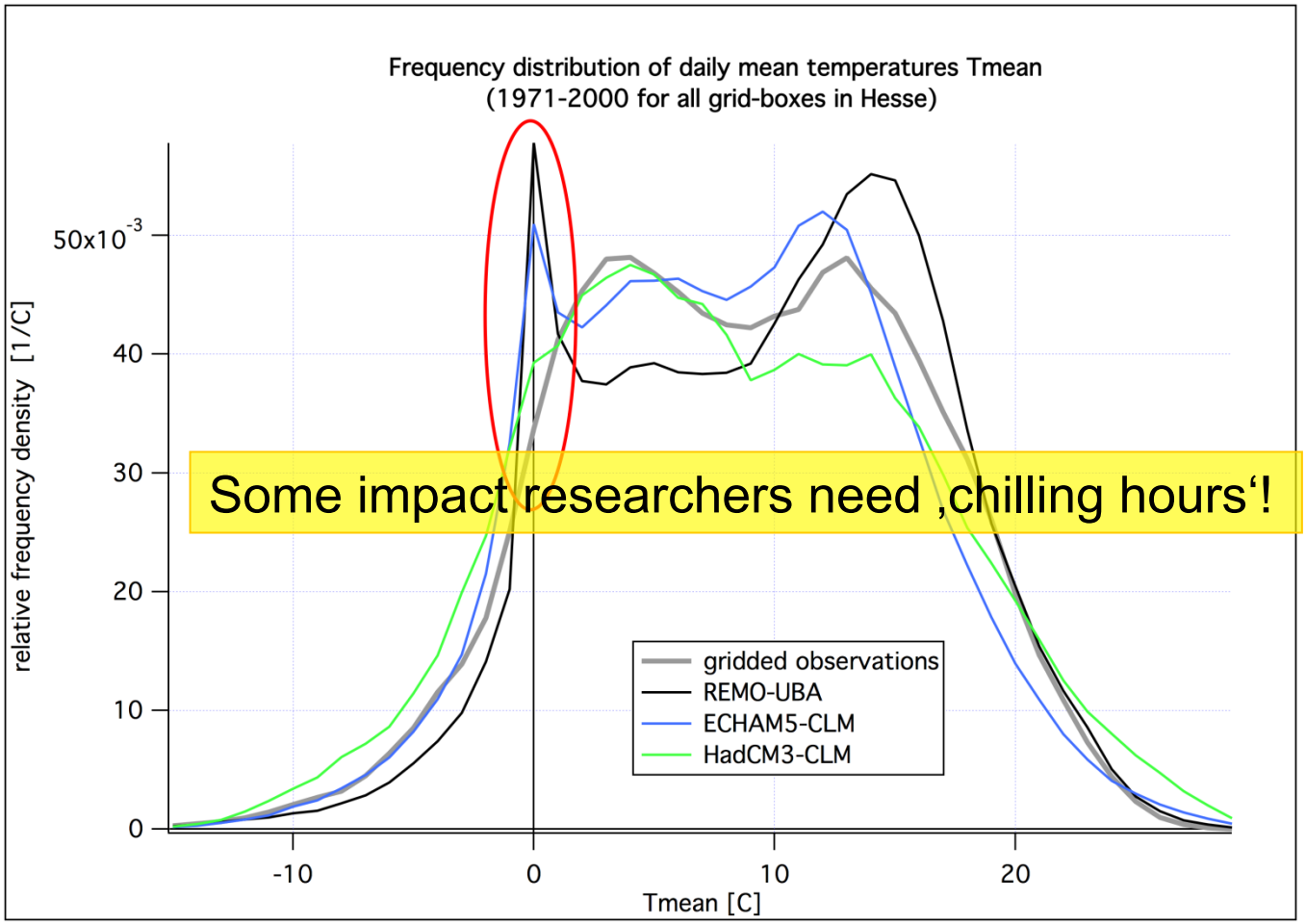


Impact researcher:
‚I need exactly this location'

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

Annual mean temperature, 1971 – 2000, two models

Example: the Zero-degree-problem



pdf of daily T_{mean}, one pixel in Hesse, obs (grey), 3 dynamical RCMs

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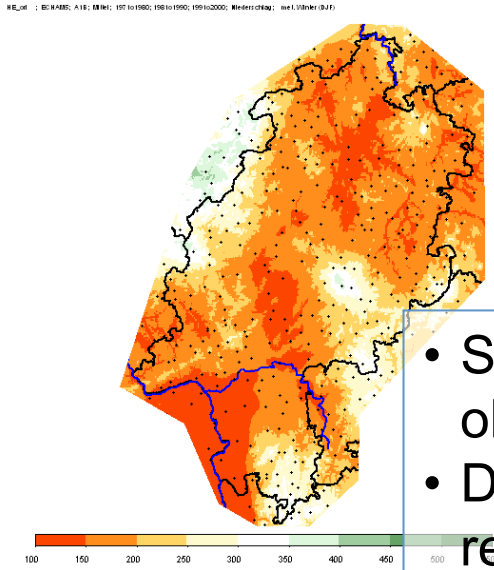
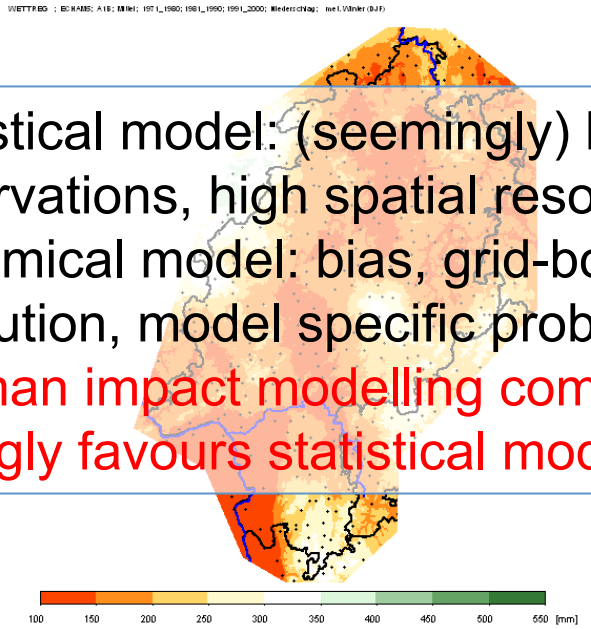
Statistical versus dynamical RCMs

Precipitation DJF, 1971 – 2000, Hesse, Germany



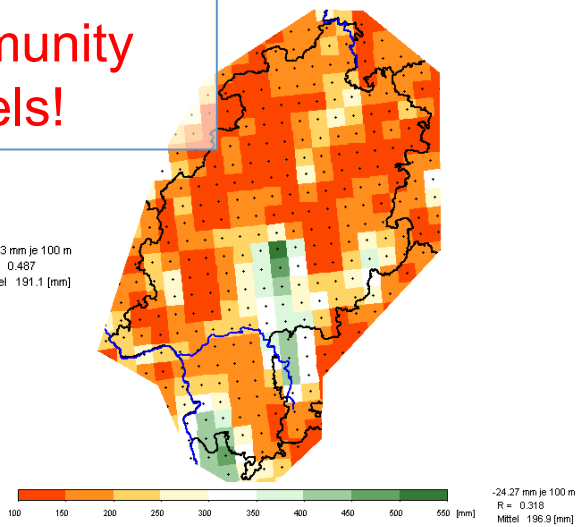
Original station data

- 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!



Statistical model

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



Dynamical model

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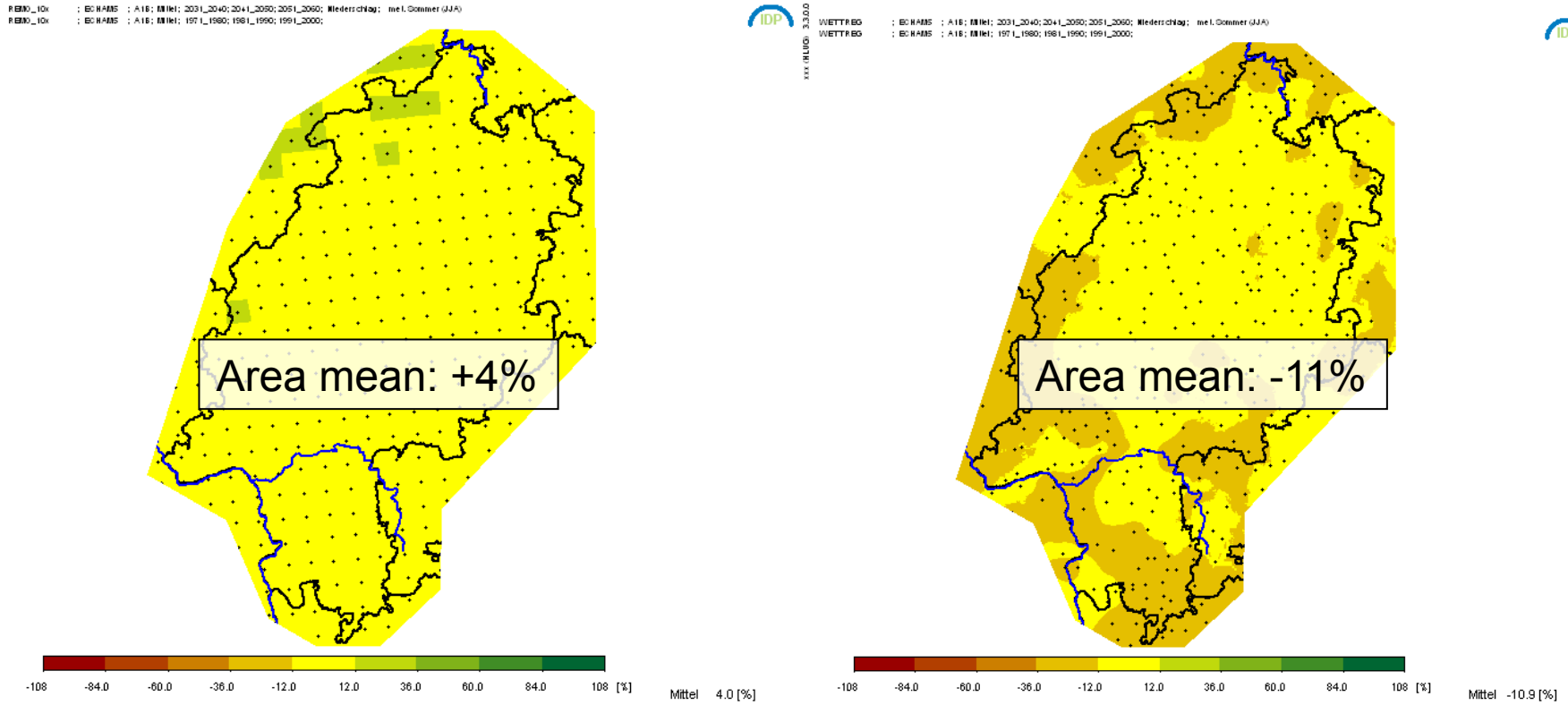
Temporal research horizon



ΔP 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

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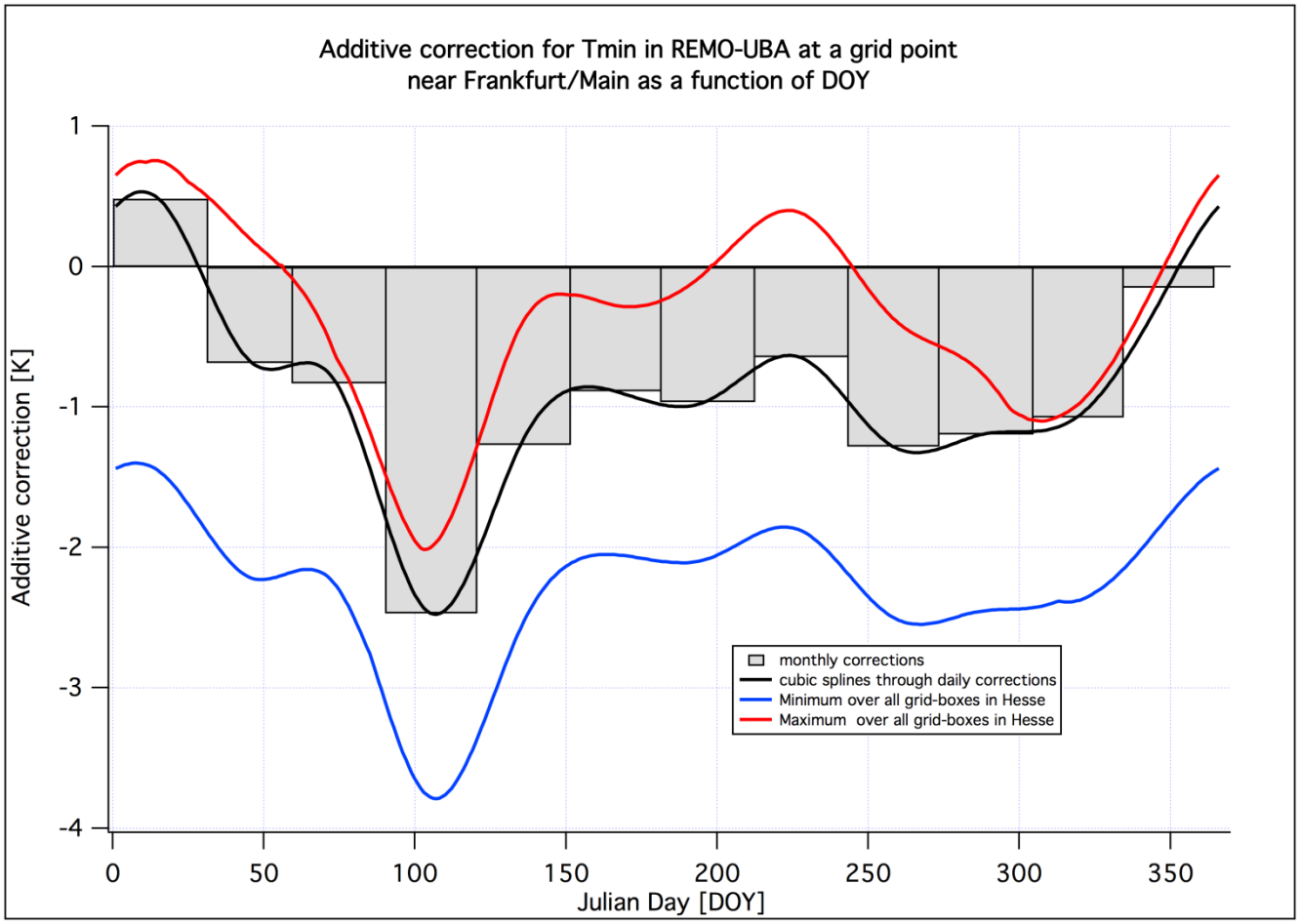
INKLIM-A:

- 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

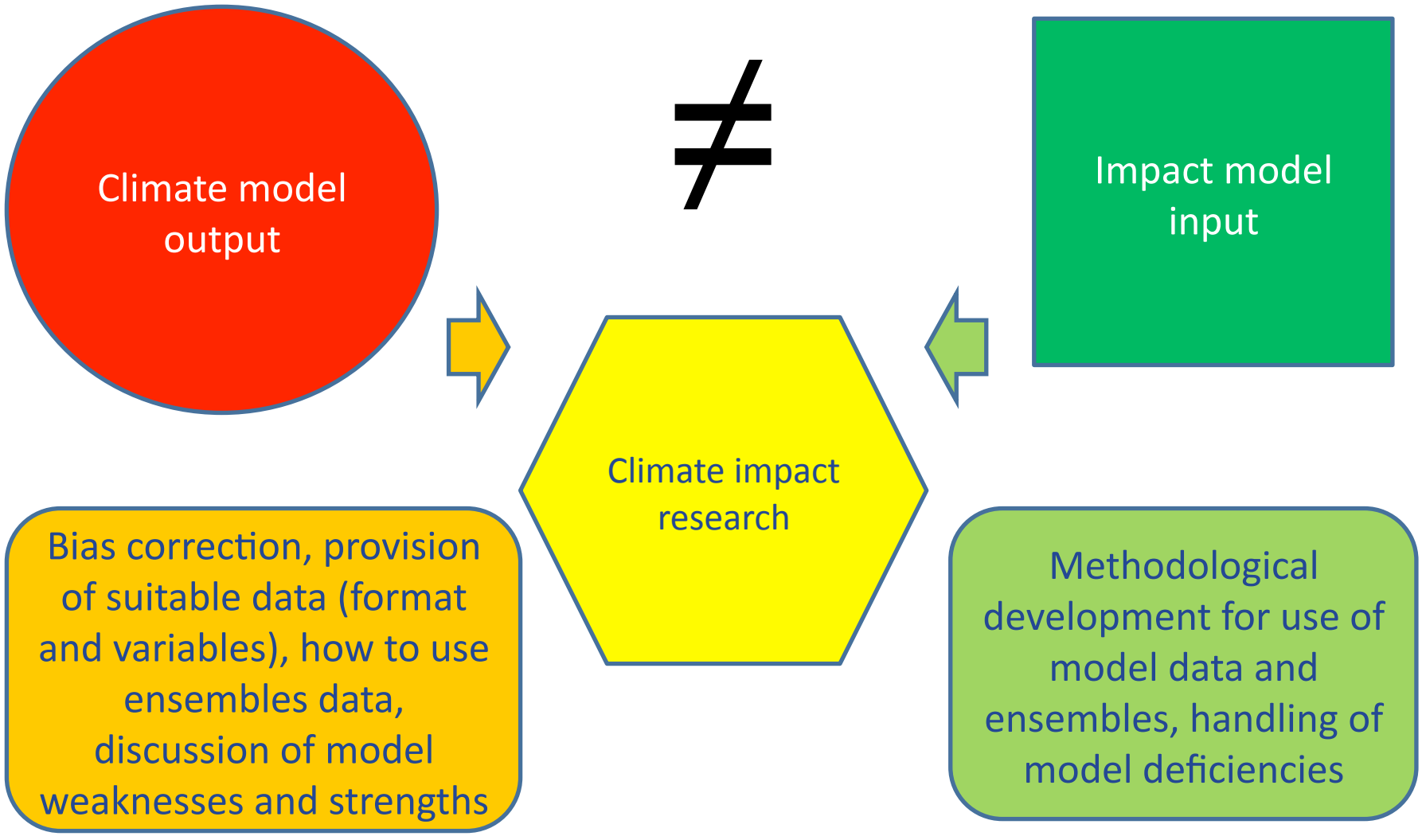
- Correction for monthly values only (not optimized for daily values)
- ➢ Might lead to inconsistencies between different fields (at least for daily values)
- Simple methods (additive correction for T, multiplicative correction for P)
- Several problems remain -> avoid overconfidence!
- ➢ Need for detailed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

Example: Bias-correction in INKLIM-A



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

The next step



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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!

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Thank you for your attention