Deriving user-informed climate information from climate model ensemble results

H. Huebener (Contact: Heike.Huebener@hlnug.hessen.de)
Hessian Agency for Nature Conservation, Environment and Geology

ReKliEs-De
Regionale Klimaprojektionen Ensemble für Deutschland

The ReKliEs-De project: goals

- Provide high resolution climate simulation results for Germany (and major river catchments draining into Germany) for impact research and policy information using RCP-Scenarios
- Provide robust information (ensemble)
- Provide and compare downscaling results from statistical and dynamical downscaling
- Determine the minimum ensemble size to obtain stable information (depending on the variable)
- **This poster: User feedback from the interim-workshop on information the users request from the project**

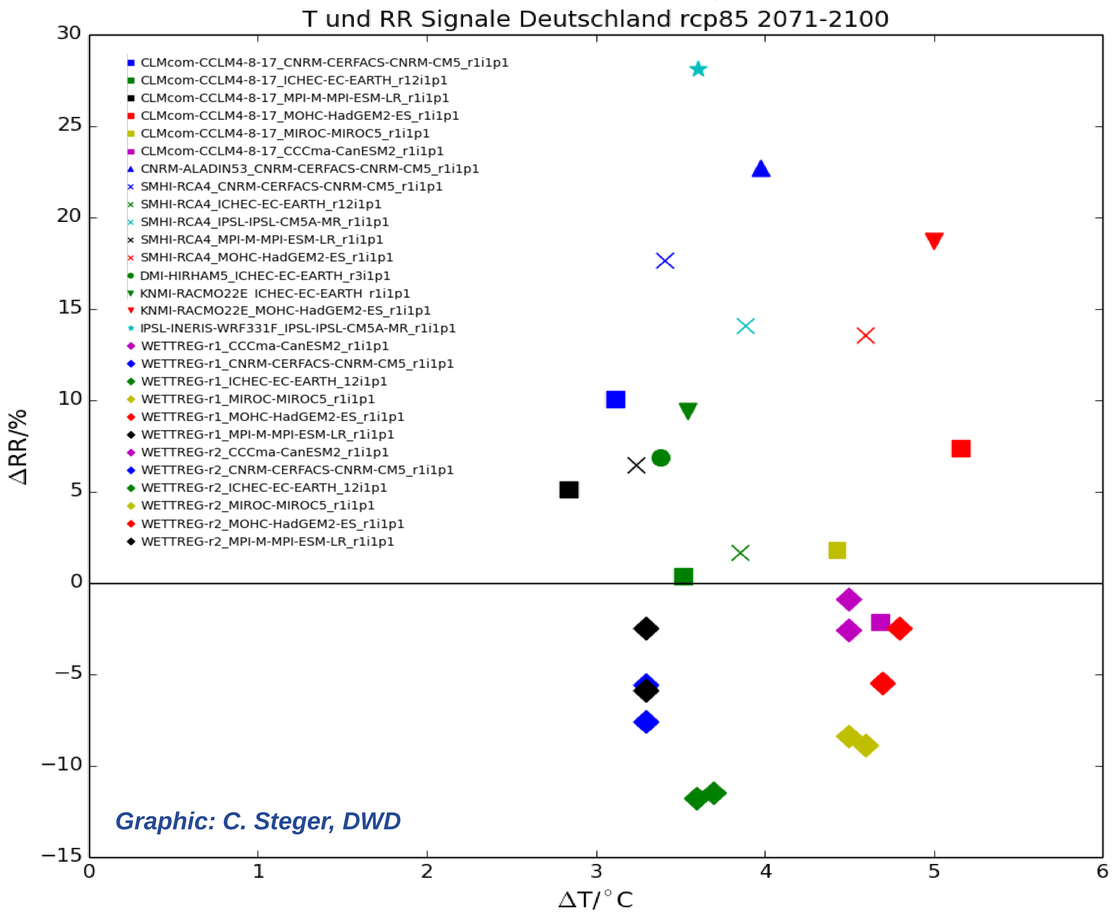
"Climate model fact-sheets"

User requests:
For GCMs, RCMs and GCM-RCM-combinations:

- pre-digested climate model information, e.g. climate sensitivity (ΔT/GHG), hydrological sensitivity (ΔP/ΔT) performance in representing weather types (particularly blockings), etc.
- Reliability / interpretation of model results for different variables or time horizons (e.g. differences of statistical versus dynamical RCMs)

Provide interpretation of results

Show and interpret general aspects of model results, systematic differences and resulting restrictions

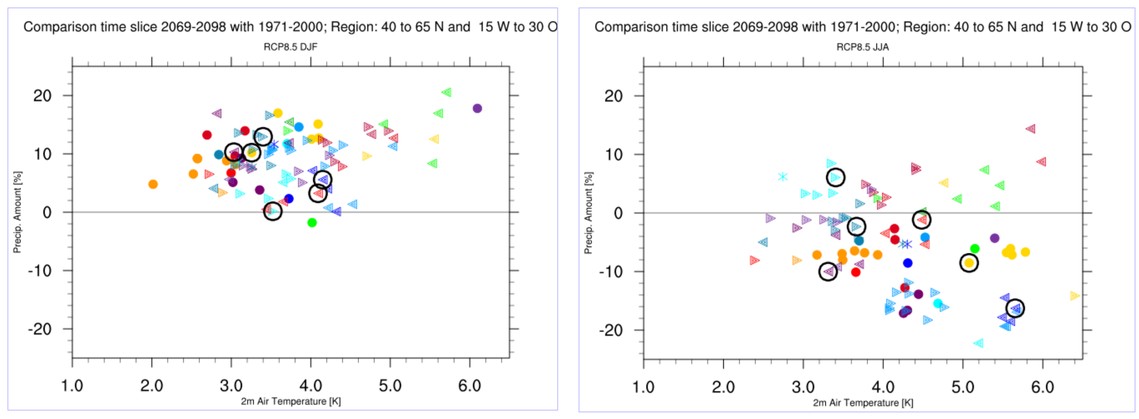


Graphic: C. Steger, DWD

Example: Climate change signals for T and P, 2071-2100 wrt 1971-2000, RCP8.5, for selected GCM (colors)-RCM (symbols) combinations. The statistical method WETTREG (diamonds) covers the temperature range well, but systematically simulates precipitation reduction, whereas the dynamical models (all other symbols) mainly simulate increasing precipitation. This is interpreted as stemming from the statistical method: resampling of future climate from past observations mainly selects dry days for higher temperatures. The dynamical models also simulate increasing specific humidity with rising temperatures, an effect that is plausible but cannot be captured by the statistical method. Additionally, downscaling results for colder GCMs tend to be on the cooler side of the distribution and vice versa.

Motivate the ensemble

Develop and explain criteria to select an ensemble or to exclude certain models from an ensemble



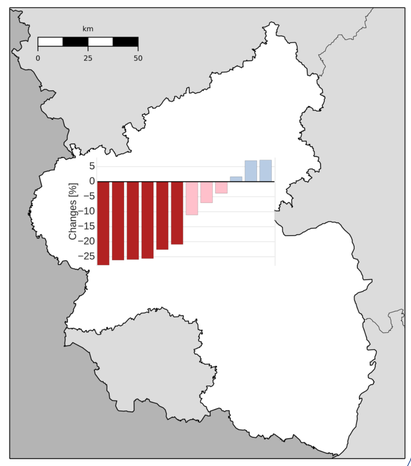
Example: We selected driving GCMs from simulated change signals in T and P (left: winter, right: summer) over „Central Europe". Goals: complement existing simulations (in EURO-CORDEX), capture large area of the T- and PR-distribution, avoid models that seem to provide unplausible trends. Selected CGM runs are indicated by circles.

Graphic: F. Kreienkamp, DWD

Working with ensemble results

- Display ensemble information as discrete model results (not necessarily identifiable)
- Provide information on significance
- Provide guidance on minimum ensemble size (depending on variable)
- User wish: pre-selected "Standard Ensemble"

Example: Change in summer precipitation (%) 2070-2099 wrt 1971-2000 (EURO-CORDEX simulations, RCP8.5) for Rhineland-Palatinate. Each bar represents an ensemble member, red indicates reduction, blue increase of rainfall, dark colors indicate significant, light colors indicates non significant changes.



Graphic: S. Pfeifer, GERICS

Further user feedback

Many impact systems are highly complex. Impacts might result from complex interactions of climate / weather with the system. Thus, identifying main drivers and their critical thresholds is sometimes not possible.

Possible solutions (user suggestions):

- Deeper analysis of impact systems necessary!
- Try to work with qualitative information, e.g. trends
- Use past extremes for sensitivity studies, e.g. repeat hot-dry year 2003 successively

Conclusions for climate modelers

- Provide easily understandable and condensed climate model information ("fact-sheets" or similar)
- Develop and communicate objective methods for ensemble selection / exclusion of models from ensemble
- Provide interpretation of model results! Clearly communicate pros and cons of different models and / or methods!
- Be brave: Clearly state your best assessment of the results, don't hide behind the scientific "it could also be completely different"

Further project information: http://reklies.hlnug.de

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