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Global climate model evaluation and selection using the interactive tool GCMeval

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This abstract was originally submitted as a PICO session. Due to COVID19 all sessions are now given in the "Display" format. Because this format means less interactivity, we encourage you to try out the tool at <https://gcmeval.met.no>.

The following slides in this presentation serve as an introduction and background about the GCMeval tool.

We look forward to the live chat on Tuesday, 5 May 2020, 10:45–12:30.

We also have a complimentary Display at the CORDEX session ([CL4.12 - Regional climate modeling, including CORDEX](#)), for which we recorded a video presentation as well, available here:

https://www.youtube.com/watch?v=_iesUT5wsSY

Motivation

There are very many climate models available. Most users will have to make a selection, e.g. due to constraints on computational power, data size, manual analysis etc.

Considerations:

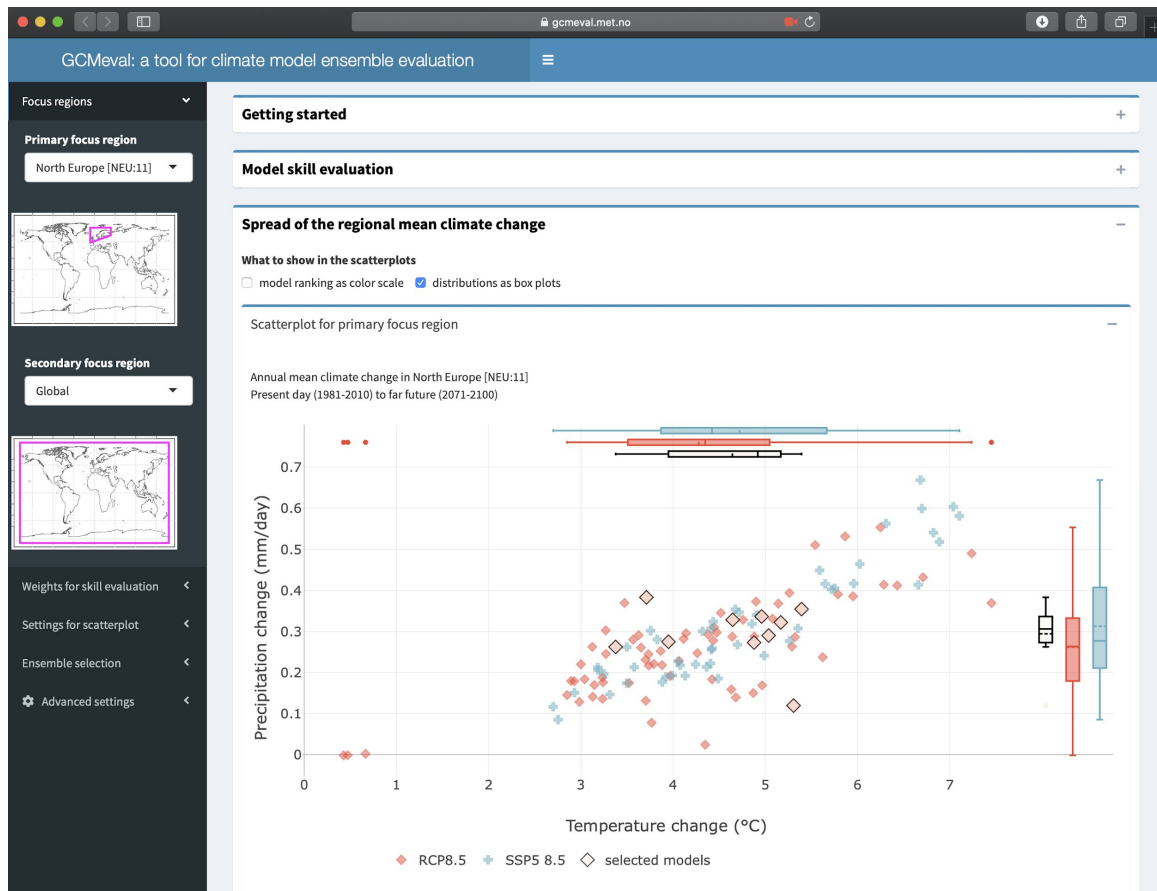
- The selection is sometimes subjective or biased.
- The selection process is sensitive to the choice of methods and reference data.
- The selected models should give a satisfactory representation of present-day climate.
- The selection should represent the spread of future outcomes.

Here we present an interactive online tool that helps users make informed decisions about climate model selection.

You can try it for yourself at <https://gcmeval.met.no>

Easy to use:

- Available online
- No data download required
- Works on mobile devices



Target users

- Have experience with climate model data
- Would like information for an initial selection before downloading model output
- Make their own detailed analysis
- Rely on multiple sources of data

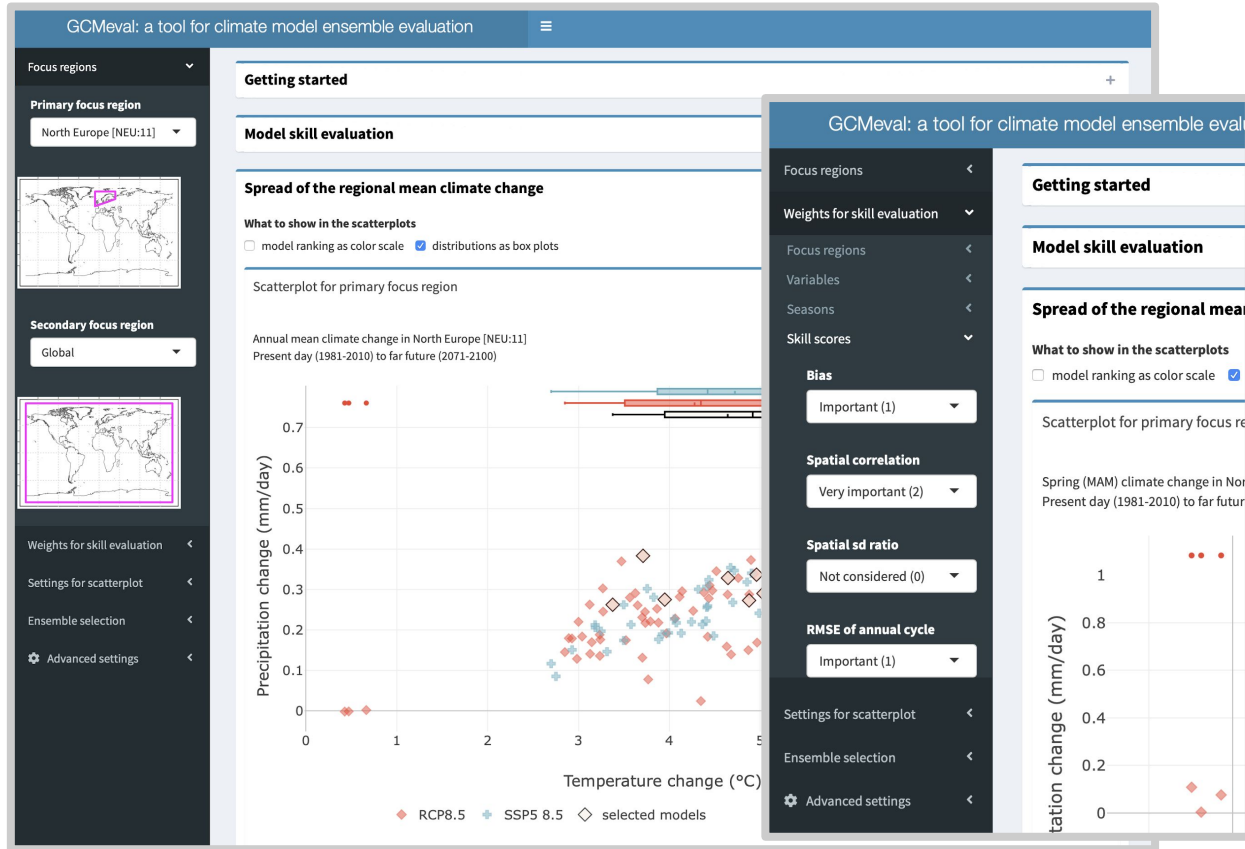
Examples:

- Researchers in academia, public and private sector
- Impact modellers, e.g. agriculture, forestry, hydrology
- Regional climate modellers
- Students and teachers

You can use GCMeval when you wish to

- get an overview of global climate model results
- visualise climate change for a certain region
- see which models reproduce the present climate well
- select a small subset of models and compare the projected climate change with the full ensemble

GCMeval features: user options



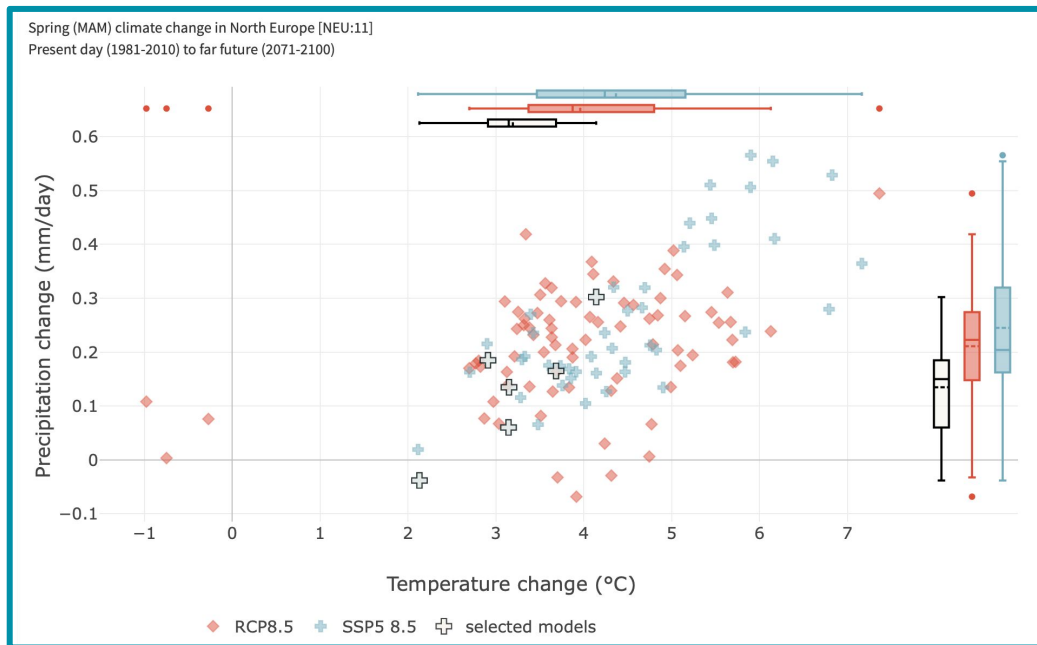
- User-selectable focus regions
- User-selectable weights: regions, seasons, skill scores, variables

GCMeval features: visualisation of results

Ranking of models based on comparison with reanalysis data for the present day (1981-2010)

Model name	Rank
CMIP6.ACCESS_CM2.r1i1p1f1	33
CMIP6.ACCESS_ESM1_5.r1i1p1f1	15
CMIP6.ACCESS_ESM1_5.r2i1p1f1	14
CMIP6.ACCESS_ESM1_5.r3i1p1f1	13
CMIP6.BCC_CSM2_MR.r1i1p1f1	48
CMIP6.CAMS_CSM1_0.r1i1p1f1	46
CMIP6.CAMS_CSM1_0.r2i1p1f1	47
CMIP6.CanESM5_CanOE.r1i1p2f1	32
CMIP6.CanESM5_CanOE.r2i1p2f1	30
CMIP6.CanESM5_CanOE.r3i1p2f1	27
CMIP6.CanESM5.r1i1p1f1	25
CMIP6.CanESM5.r2i1p1f1	29
CMIP6.CESM2_WACCM.r1i1p1f1	3

Spread of future projections - comparison between selected ensemble and full ensemble



Examples of questions addressed by GCMeval

Which models project decreasing spring precipitation over East Africa?

Which are the top 5 models in terms of reproducing spatial correlation of precipitation over Central Europe?

What is the difference in projected temperature between RCP8.5 and SSP585 scenarios for Southeast Asia?

Is there a model consensus on sign of precipitation change over the Amazon?

Which models should we select to span 75% of the spread in future temperature projections for Northern Europe?

I already have models x, y and z in my impact study. Which model should I include next in order to increase the future spread?

Limitations

- Monthly means only, so the user may need to perform own analysis if concerned about e.g. extremes, inter-annual variability or daily cycle
- Pre-defined regions (IPCC AR5) may or may not correspond to your region of interest
- Currently using scenarios RCP4.5, RCP8.5 and SSP585 (more considered soon)
- Not all model simulations included (more are being added)

Nevertheless, we hope you may find this tool useful, for example for getting an initial overview before downloading model data and making your own detailed analysis.

More information

Use GCMeval online now:

<https://gcmeval.met.no>

Peer-reviewed article in Climate Services:

<https://doi.org/10.1016/j.cliser.2020.100167>

(open access)

Source code available on Github:

<http://github.com/metno/gcmeval>

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GCMeval – An interactive tool for evaluation and selection of climate model ensembles

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Abstract

We present an interactive tool for selection and evaluation of global climate models. The tool is implemented as a web application using the "Shiny" R-package and is available at <https://gcmeval.met.no>. Through this tool, climate models of the CMIP5 and CMIP6 ensembles can be ranked and compared based on their representation of the present climate, with user-determined weights indicating the importance of different regions, seasons, climate variables, and skill scores. The ranking can be