Visual Summaries of Ensemble Regional Projections: A Distillation Problem

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Overview

- Visualisations are an important means of communicating climate information.
- In a number of recent projects we have found it necessary to produce visual summaries of ensemble projections of varying complexity.
- Here we show some of the examples we’ve produced and discuss the reasoning behind the choices made.
Summary Plots as a Distillation Problem

Drawing out key messages:

• Making appropriate choices can enhance the dissemination of key messages
• Some choices can be misleading!

Making sense of multi-method information:

In more ‘complex’ cases, we can use summary plots as a means of showing how the types of information relate to one another.

• Ranges from more than one GCM ensemble (MME/PPE)
• How does range across a sub-set compare with full ensemble, what is impact of downscaling?
Example 1: Extremes indices in CMIP5 projections

(See Fig 21-7/8 in IPCC AR5 WGII, Ch 21)
Key Messages:

East and Sahelian Africa: signal for increases in heavy rainfall is consistent across ensemble members.

Southern and West Africa: most of the available scenarios indicate increases, but those increases are smaller, and for some members of CMIP5 heavy rainfall events decrease overall. There are also some regional exceptions in Southern Africa.
Example 2: Downscaled CMIP5 projections for Singapore National projections

Example for mean wet-season (NDJ) rainfall (mm per day)

9 CMIP5 models sub-selected to span projections of future mean climate but avoid least realistic models.

Extend method to show:
- Full CMIP5 GCM range, 9-member GCM subset.
- Impact of downscaling to 12km on projection range

Also added an indication of natural variability (1-sigma) based on 20-year periods in pi-control runs for some CMIP5 models.
Key messages:

Downscaled rainfall projections of wet season rainfall across southeast Asia, including Singapore, are uncertain in nature. Projections for rainfall within both the 9 downscaled experiments and the CMIP5 ensemble span both positive and negative changes by the 2080s and therefore represent a high degree of uncertainty in the ensemble median changes seen in the central map.

Projected changes for the near term (2020s) remain small compared with natural variability in most models.
Example 3: PARCC West Africa

Project made use of existing downscaled projections for Africa:

- 5 members of HadCM3 PPE, downscaled with PRECIS, SRESA1B (Buontempo et al., 2015)

Showing CMIP5 range for wider uncertainties, but also as a reference point.

An alternative composition for these plots in order to:

- Depict a range of plausible outcomes – show maps for the models indicating ‘high’ and ‘low’ future rainfall.

- Show natural variability more explicitly - shown using an example time series.
Example 3: Parcc West Africa

Seasonal Total (JAS) Rainfall Projections for Chad

**Key messages:**

Rainfall projections for Chad contain a high level of uncertainty, both within the downscaled experiments depicted here and the wider CMIP5 ensemble. Results from the five RCM experiments suggest increases in precipitation within the southern tropical regions of Chad, however the wider CMIP5 results indicate both positive and negative changes in precipitation for the country.
Motivation for this paper/talk is to share our experiences/thoughts and generate discussion, not to be prescriptive!

Have aimed to:

- Represent information faithfully
- Draw out key messages
- Show where key messages come from (e.g. Through multiple ranges of projections)

Figures designed to be intuitive and informative but are still complex – the figures have information at a number of different levels. May require explanation, time to absorb - this is OK.
Choices in construction of figures are bespoke to specific projects – different data, different emphases, different user groups.

Some common themes:

- Placing examples of spatial patterns with spatially reduced data to show uncertainty seems to be intuitive to interpret
- Showing some indication of natural variability useful for interpretation
- Attempted to use intuitive colour schemes, signals to reader.

Illustrate process of arriving at a range of projections, and how ranges relate to one another

- important for interpreting e.g. different studies based on different subsets, or comparing results with IPCC/CMIP5 ranges.
Questions and Answers

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References:


Example 1:


Example 2:


See also:


Example 3:


See also:
