Missing pieces:  
a modeler’s perspective  

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Climate model projections

Statistical refinement/downscaling

Impacts models
Excerpt from Fig. 11.2:
% change in JJA precip averaged over CMIP3 models

Fundamentally different over Sahel, S. Africa – but how do you assess the value of this kind of statistical downscaling
Utilizing the multi-model database:

What are the most relevant metrics?

Excellent simple example of useful metric: Hall and Qu (2006), Hall, Qu, Neelin (2008)

Seasonal cycle of snow cover good predictor of snow cover response to greenhouse gas increase

=> comparing control simulation of snowcover to obs is very relevant

Hall and Qu

Key is the ability to “predict the future of models”
The plan for CMIP5 (for the IPCC’s AR5) includes a “time-slice” component (for simulations of regional climate change weather extremes, air quality, cloud feedbacks) with high resolution atmosphere/land models.

How important are time-slices for reducing uncertainty in regional climate change projections?

GFDL will address this component in collaboration with DOE, which is offering substantial computer resources.

A horizontal resolution of 25km is our target given the size of these resources.
Winter mean precipitation in Western U.S
25 yr simulations.

DJF Precip (mm dy$^{-1}$)

200 km

50 km

25 km

PRISM observations
Simulation of global hurricane climatology, inter-annual variability and response to global warming

Ming Zhao, Isaac Held, Shian-Jian Lin, Gabe Vecchi

Hurricane tracks (1981-2005) upper: OBS, lower: C180 HiRAM
Inter-annual variability and decadal trends

red: observations
blue: ensemble mean
shading: (4 member) spread

Hurricane counts for each basin are normalized by a time-independent multiplicative factor.

Atmos-only time-slices have the advantage that they can be tested in this way against obs; But obviously does not work for fully coupled phenomenon such as ENSO.
Relative importance of time-slices and (coupled) seamless prediction?

Is relative success at regional seasonal/interannual prediction a good metric for judging the relative quality of models for regional climate change predictions/projections?

An open (important) question, in my opinion.

Is there USEFUL information on regional impacts that depends on predictions of internal variability – as opposed to understanding the forced response at regional scales? (Or is it naïve to separate the two?)

Also an open (important) question, in my opinion.
Coherent, transparent, open end-to-end archive (including algorithms rather than output for statistical refinement and impacts layers as far as possible)

Natural resource/goal of National Climate Service

Would allow immediate feedback on which new models developments are most relevant for impacts

Climate model projections (global, dynamical regional downscaling, timeslices)

Statistical refinement/downscaling algorithms

Impacts algorithms