Uncertainty in IAMs

Massimo Tavoni
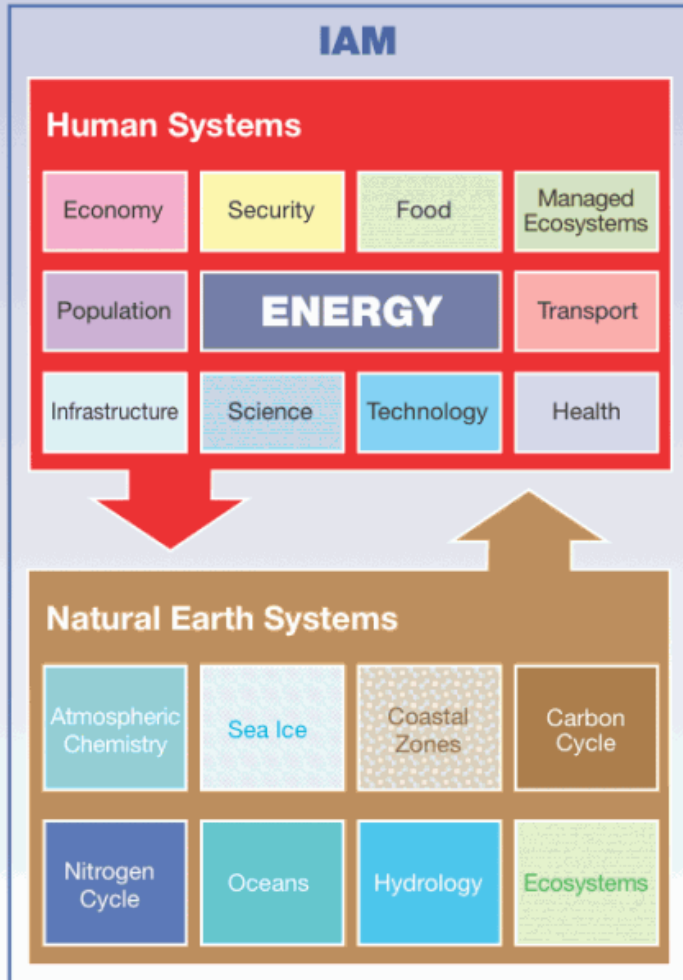
POLITECNICO DI MILANO

cmcc
Centro Euro-Mediterraneo
sui Cambiamenti Climatici

FONDAZIONE ENI
ENRICO MATTEI

IAMs

Typical IAM output

Change in Ensemble Mean Annual Runoff (mm/yr) $Q_{2095}-Q_{2005}$ (Emission Scenario A1fi)

Change in Ensemble Mean Annual Runoff (mm/yr) $Q_{2095}-Q_{2005}$ (Emission Scenario A2)

Change in Ensemble Mean Annual Runoff (mm/yr) $Q_{2095}-Q_{2005}$ (Emission Scenario B1)

Change in Ensemble Mean Annual Runoff (mm/yr) $Q_{2095}-Q_{2005}$ (Emission Scenario B2)

Biomass   Coal   Hydro   Natural Gas   Nuclear   Oil   Solar   Wind
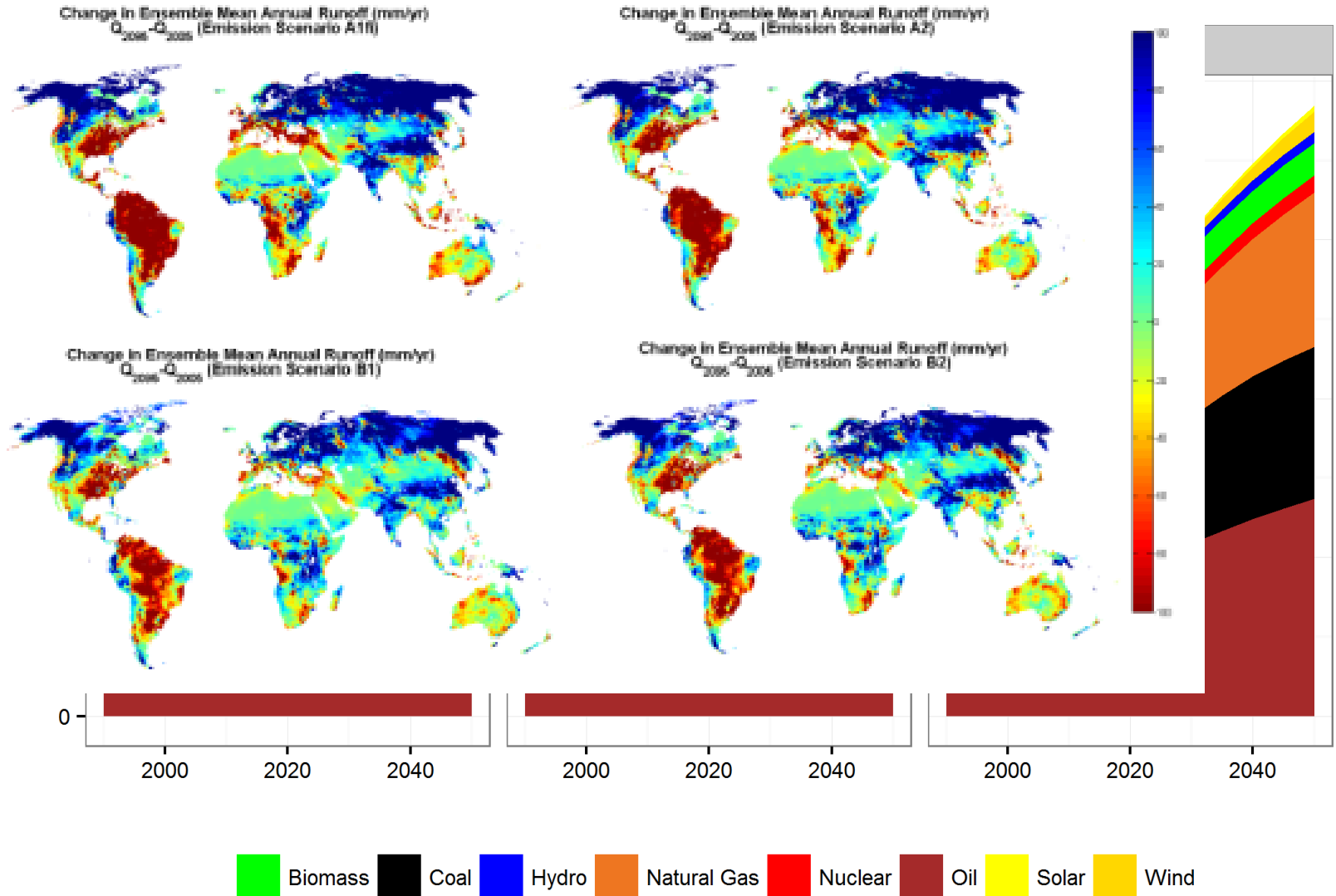
Scenarios

Model comparisons

Global Mitigation Costs (2010–2100)
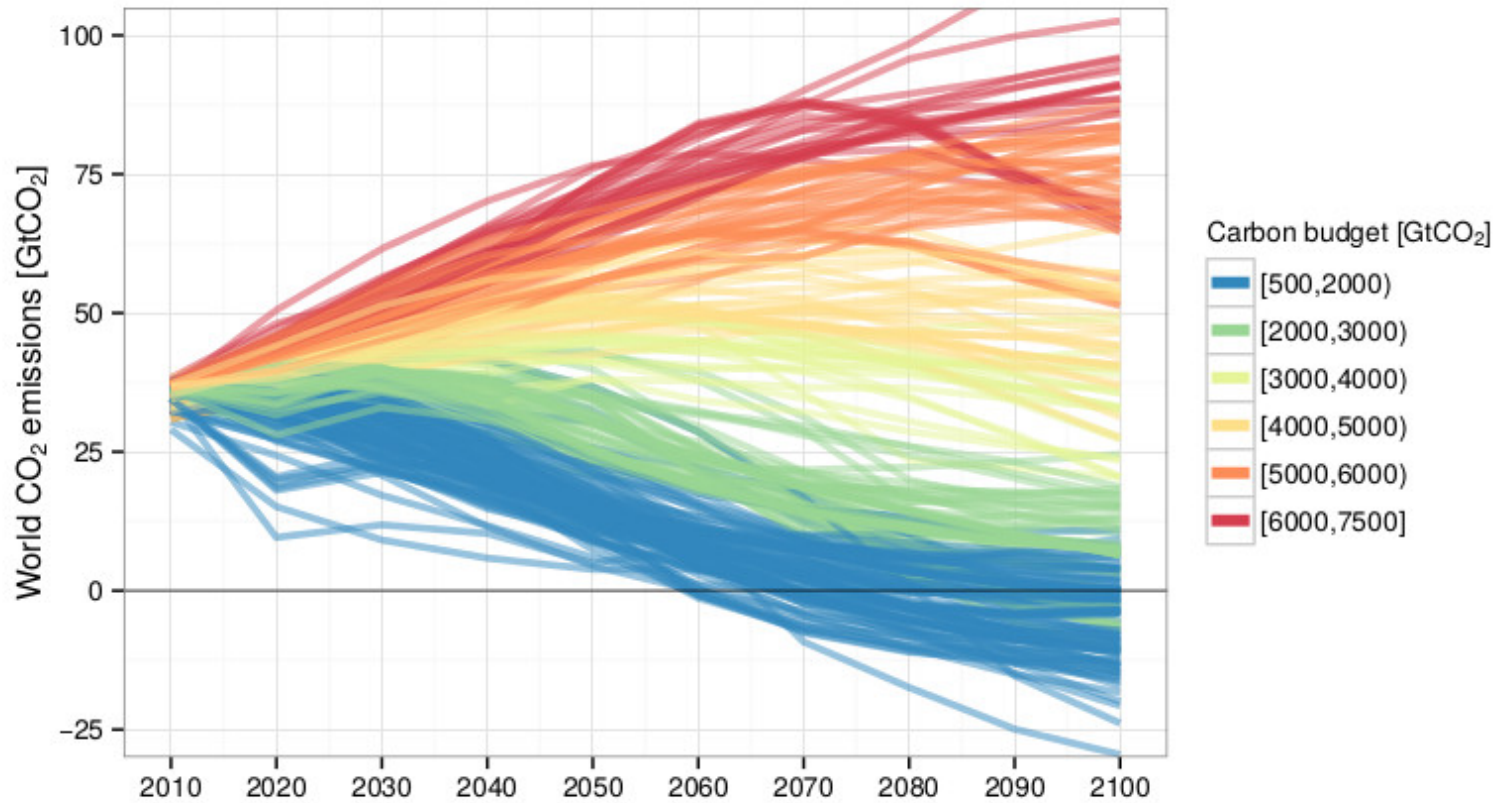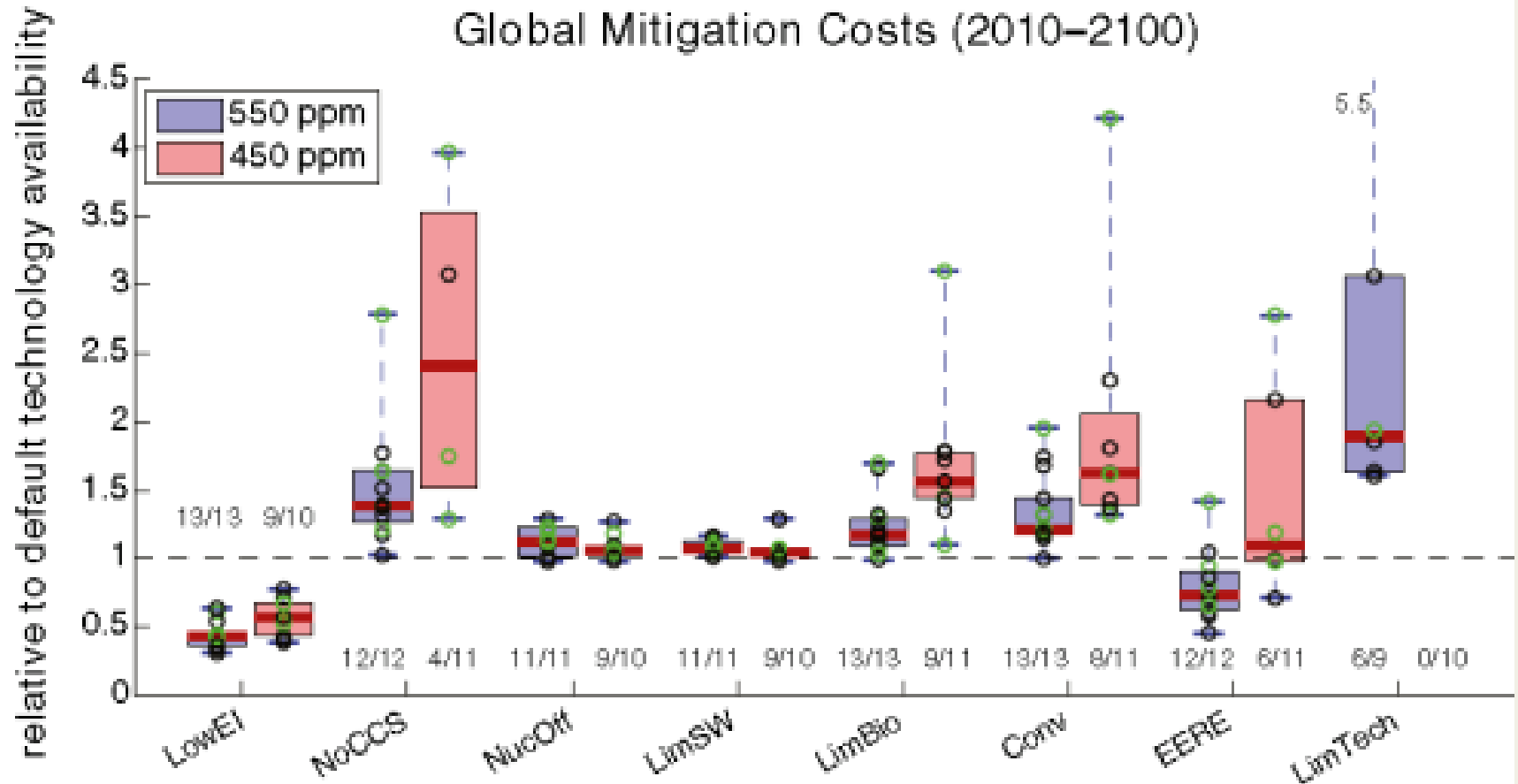
Which type of uncertainty?

Parametric uncertainty
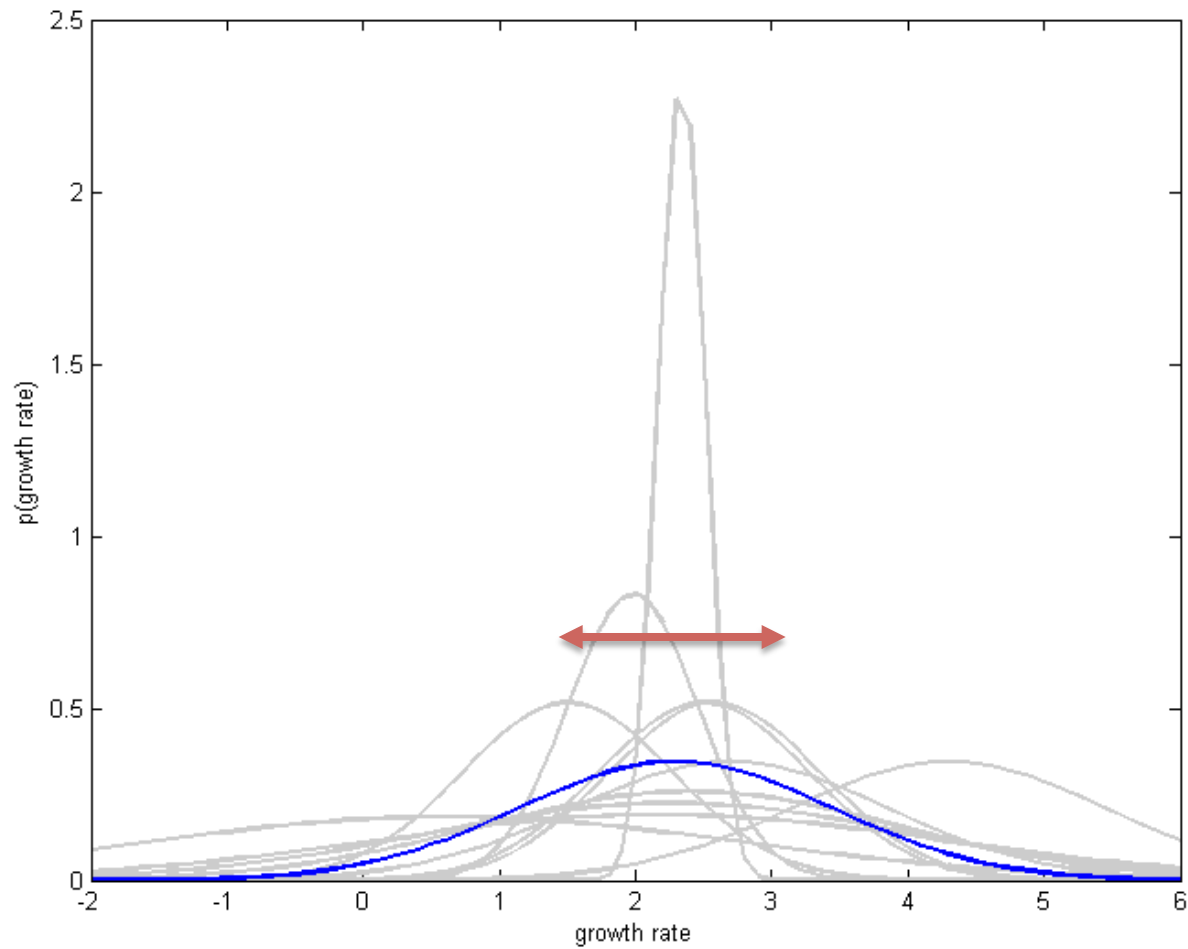
Model uncertainty
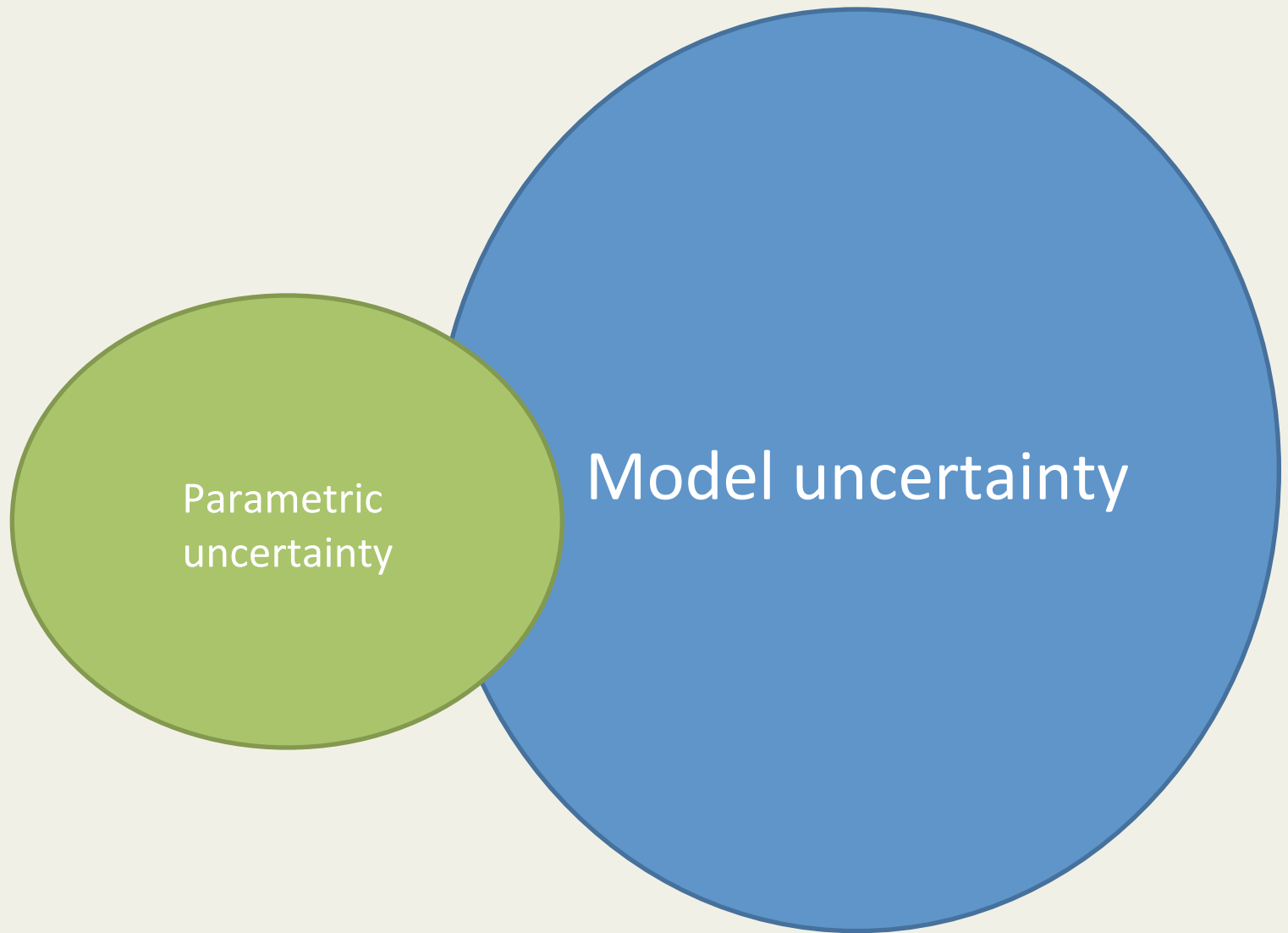
Economic growth
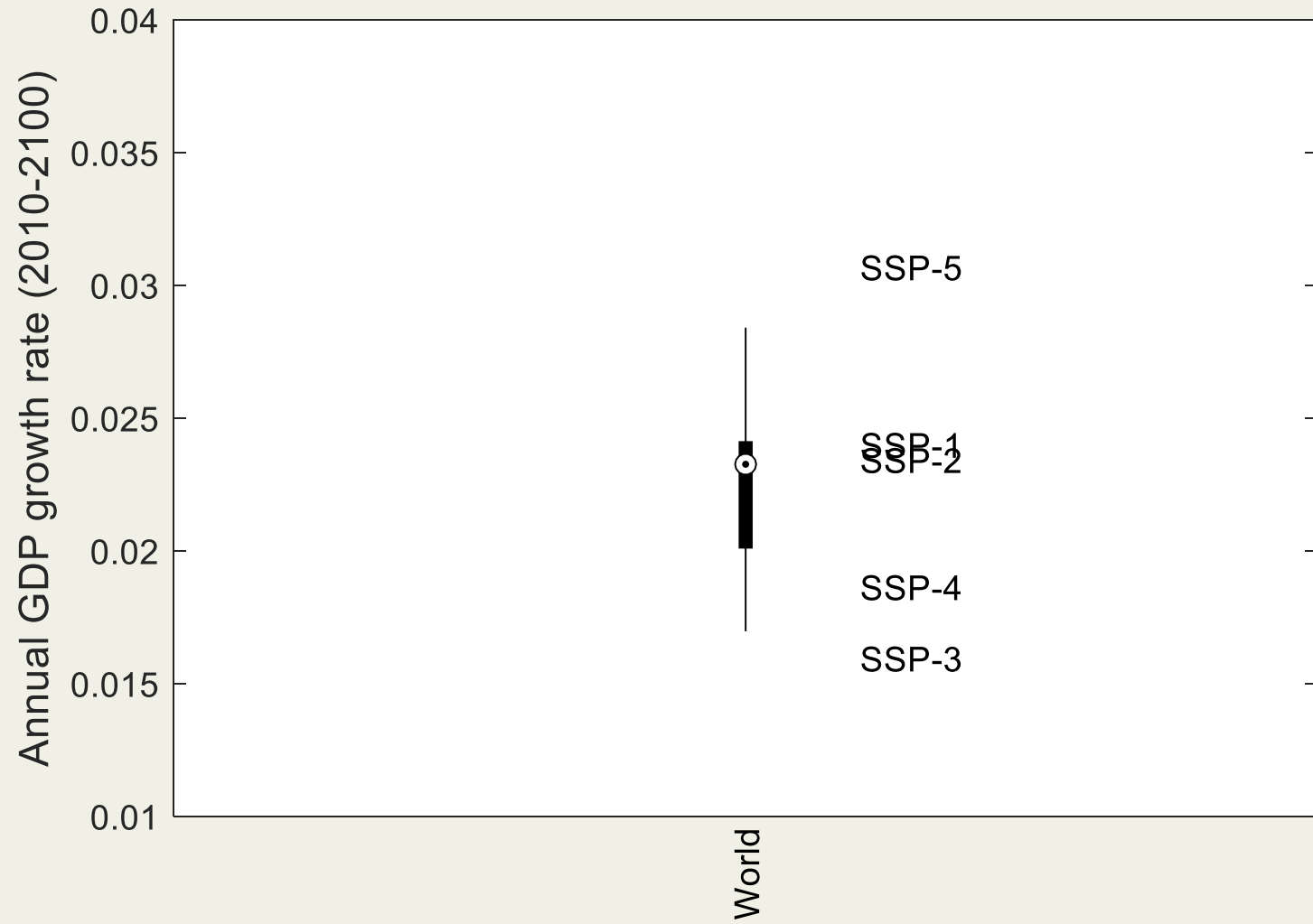
Economic growth

Technolology deployment

Ranking of energy technologies
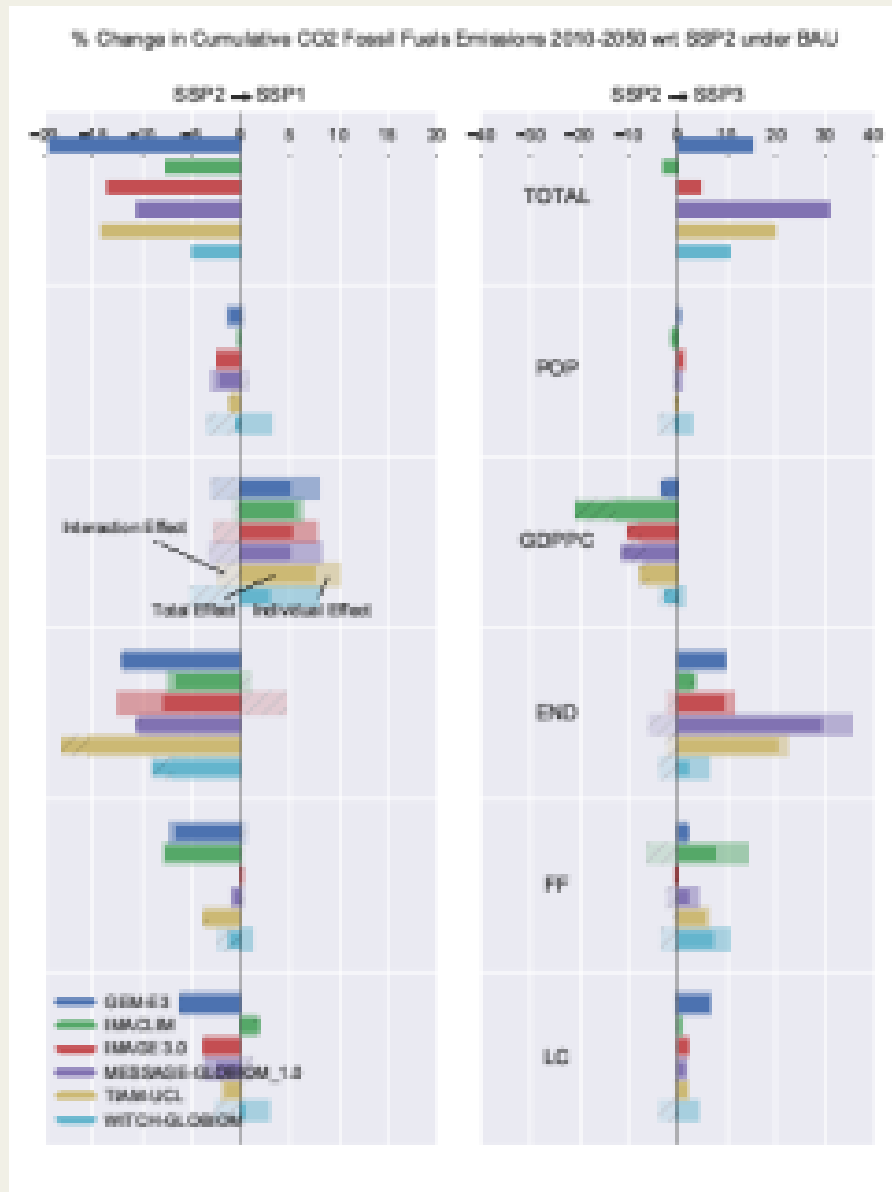(Based on share in electricity production)
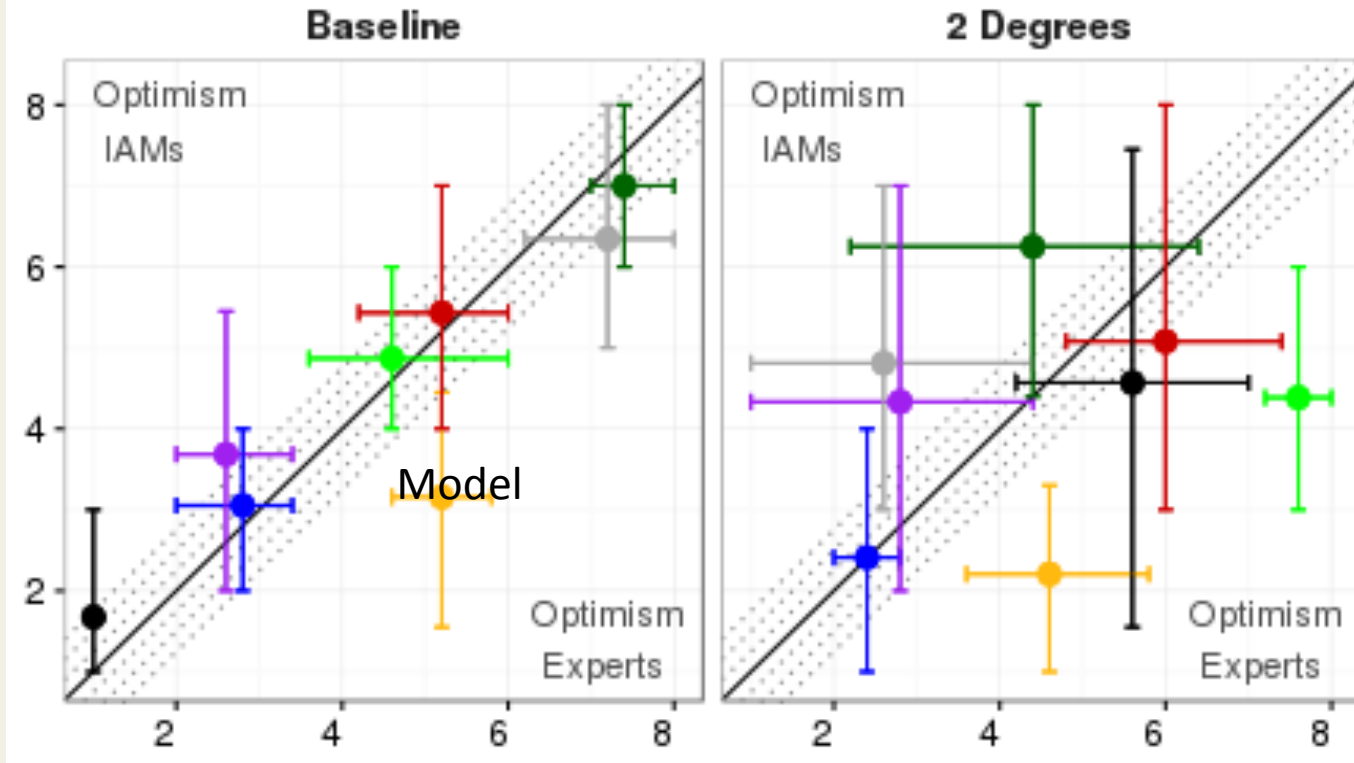
Method
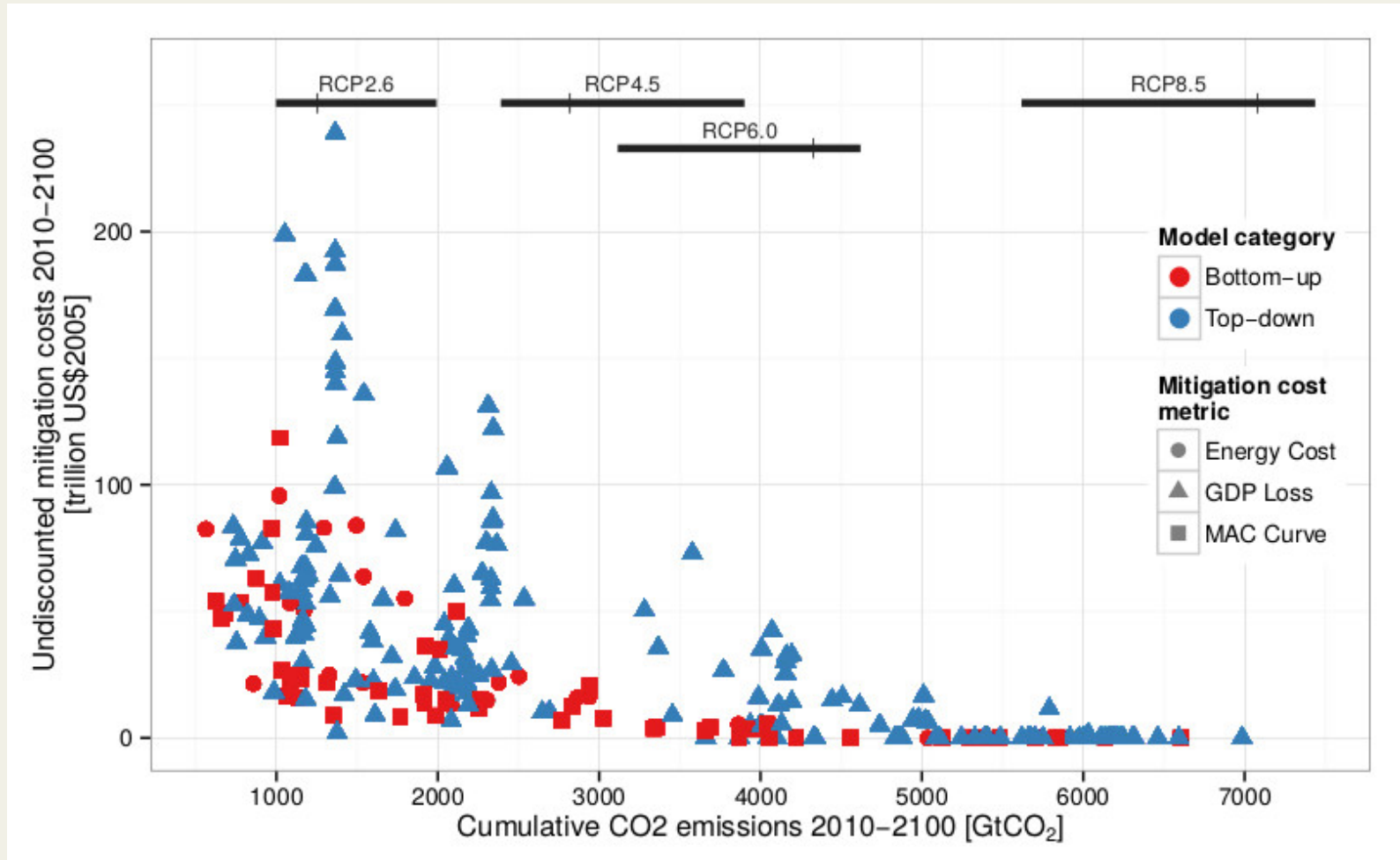Ask "technology experts" on expected deployment of technologies in 2050. Also confront with model results. Compare results experts/models

Van Sluisveld et al., Expert elicitations on future patterns of energy system change (in prep)

Diagnostics
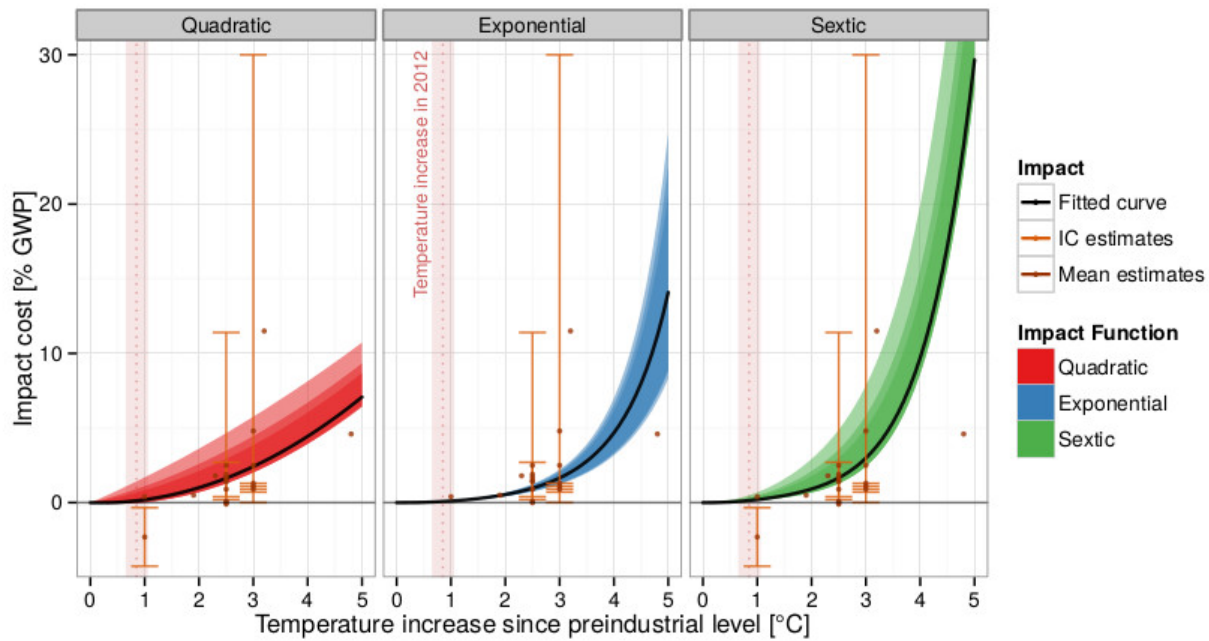

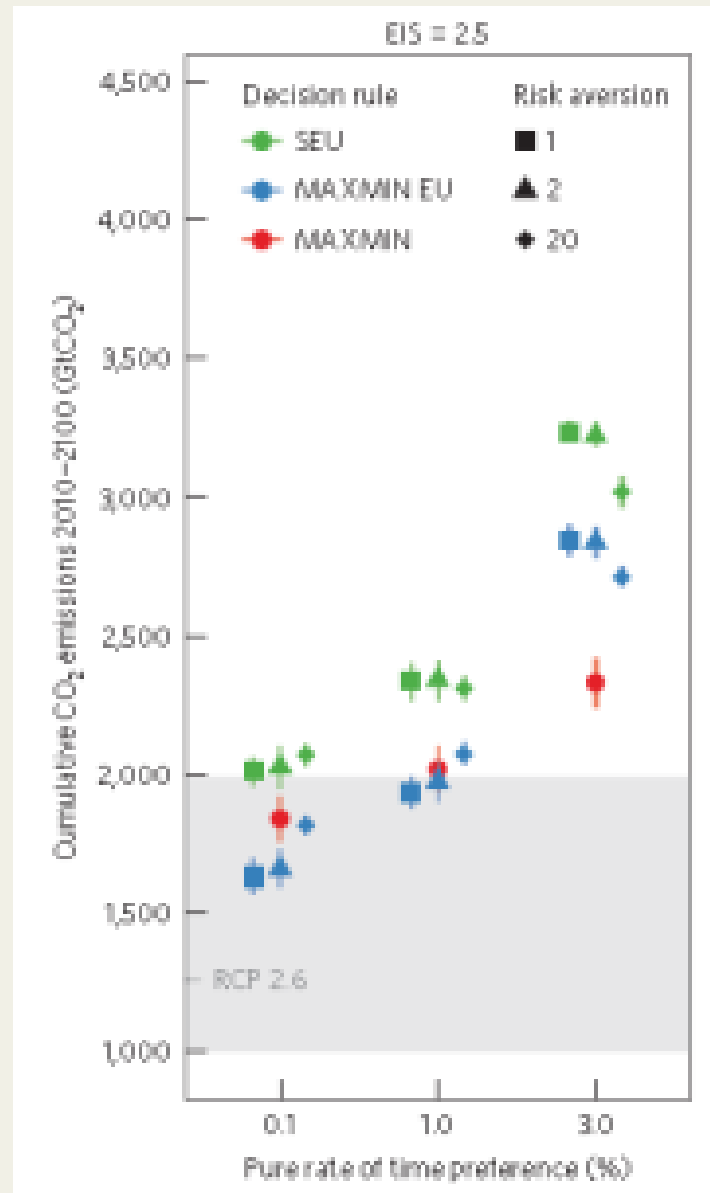% Change in Cumulative CO2 Fossil Fuels Emissions 2010-2050 wrt SSP2 under BAU
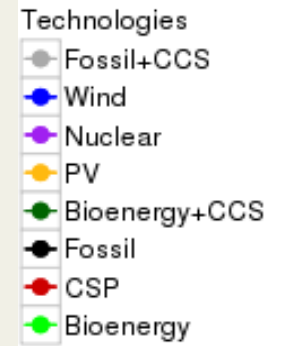
Mitigation costs
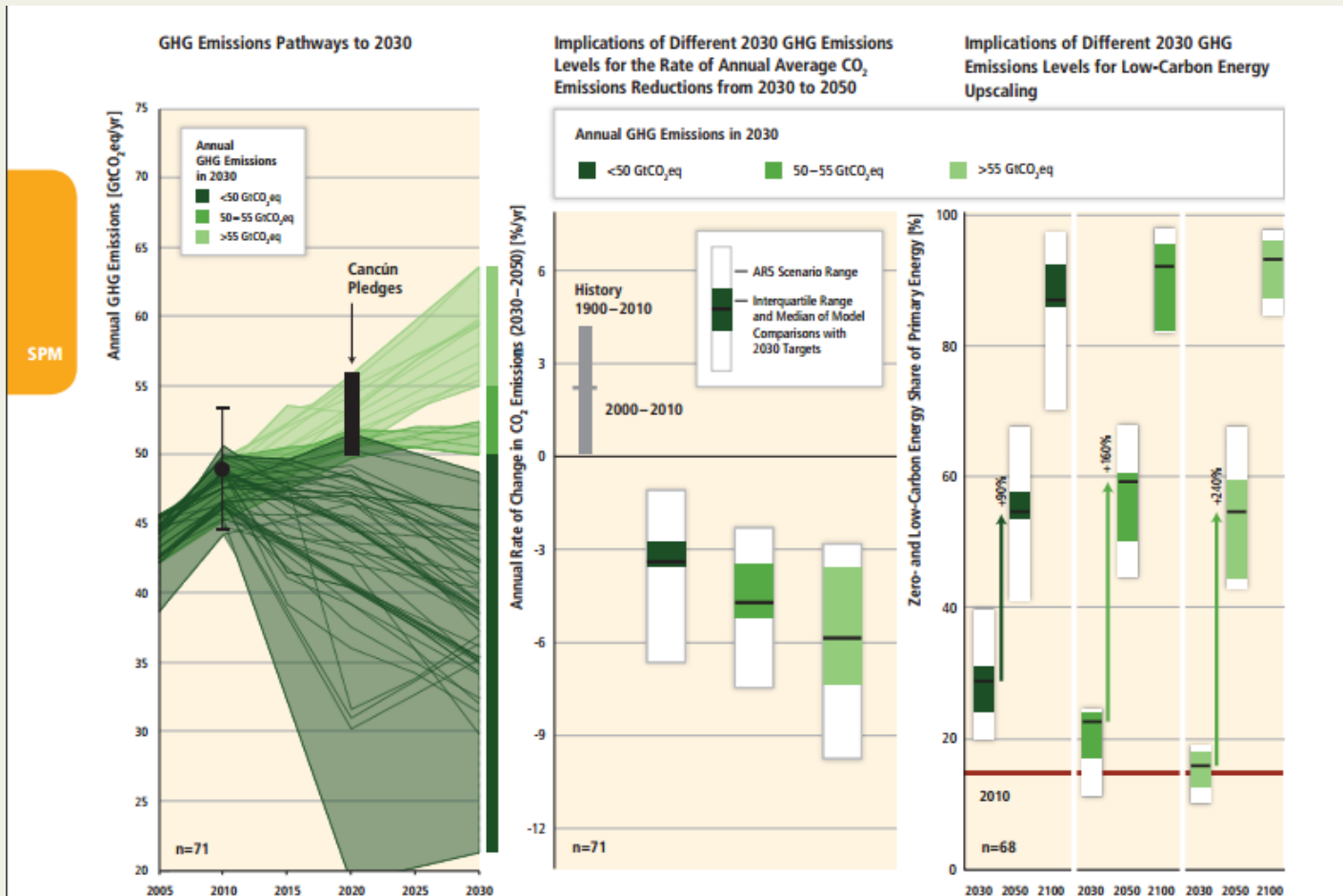
Impacts
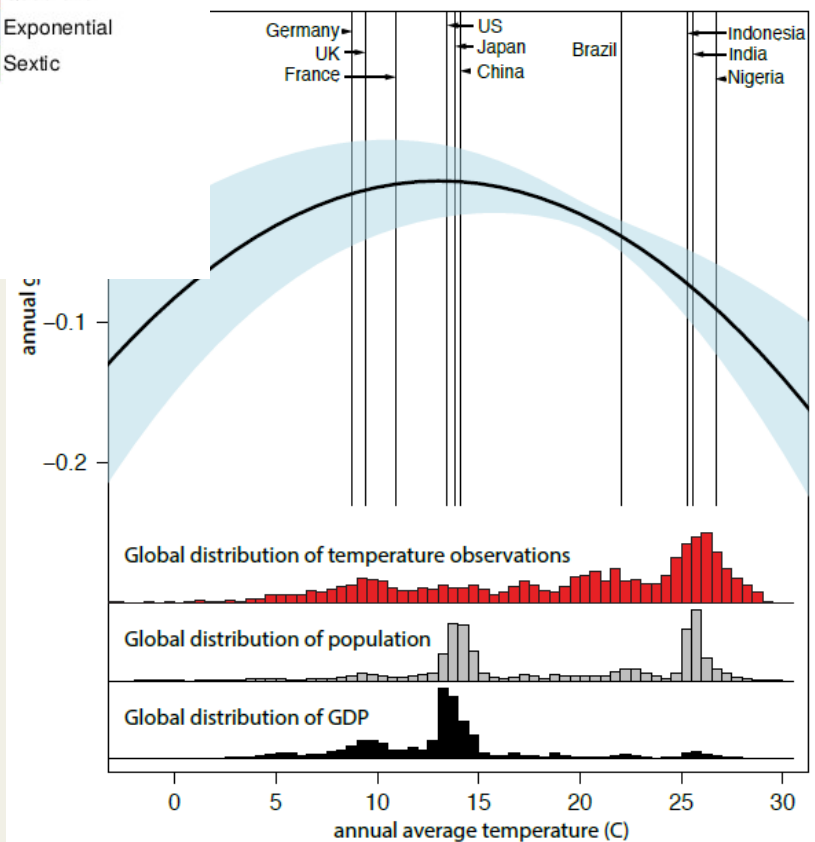
Decision criteria

Complexity vs uncertainty

van Zelm et al

Complexity vs uncertainty

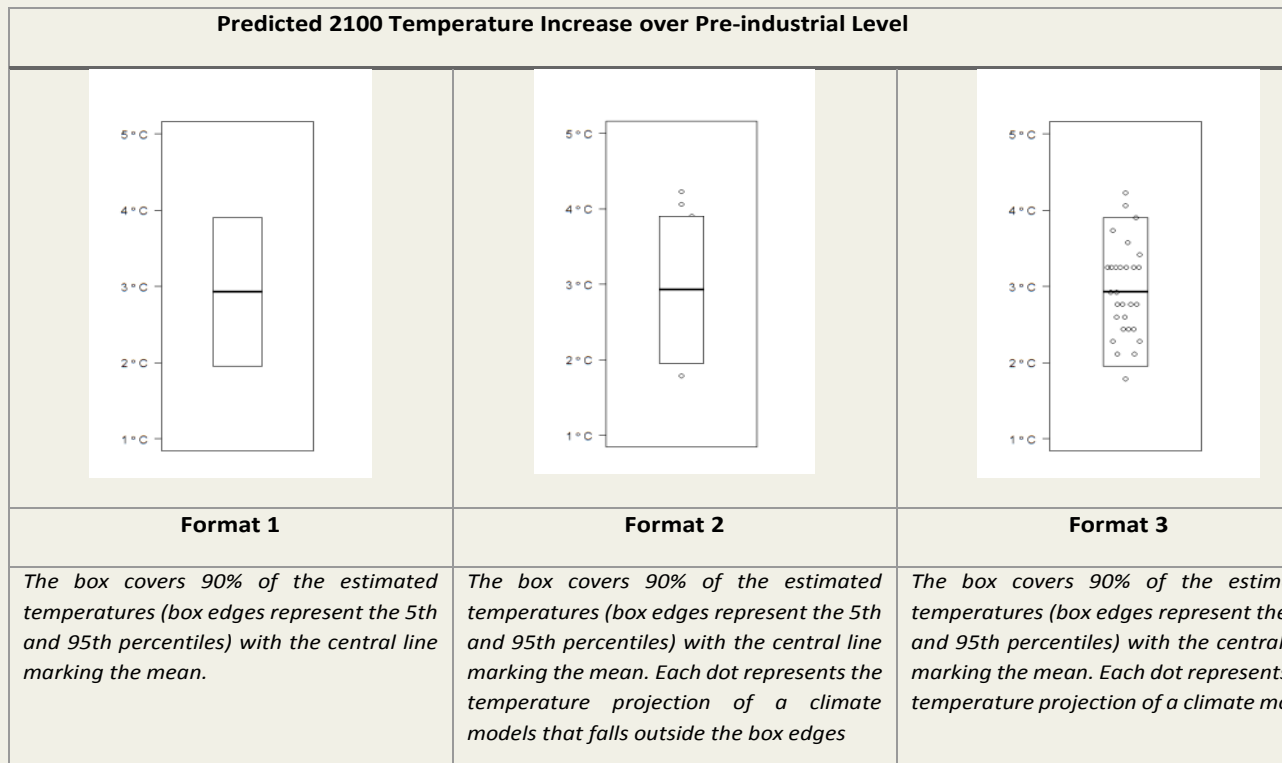Schoups et al
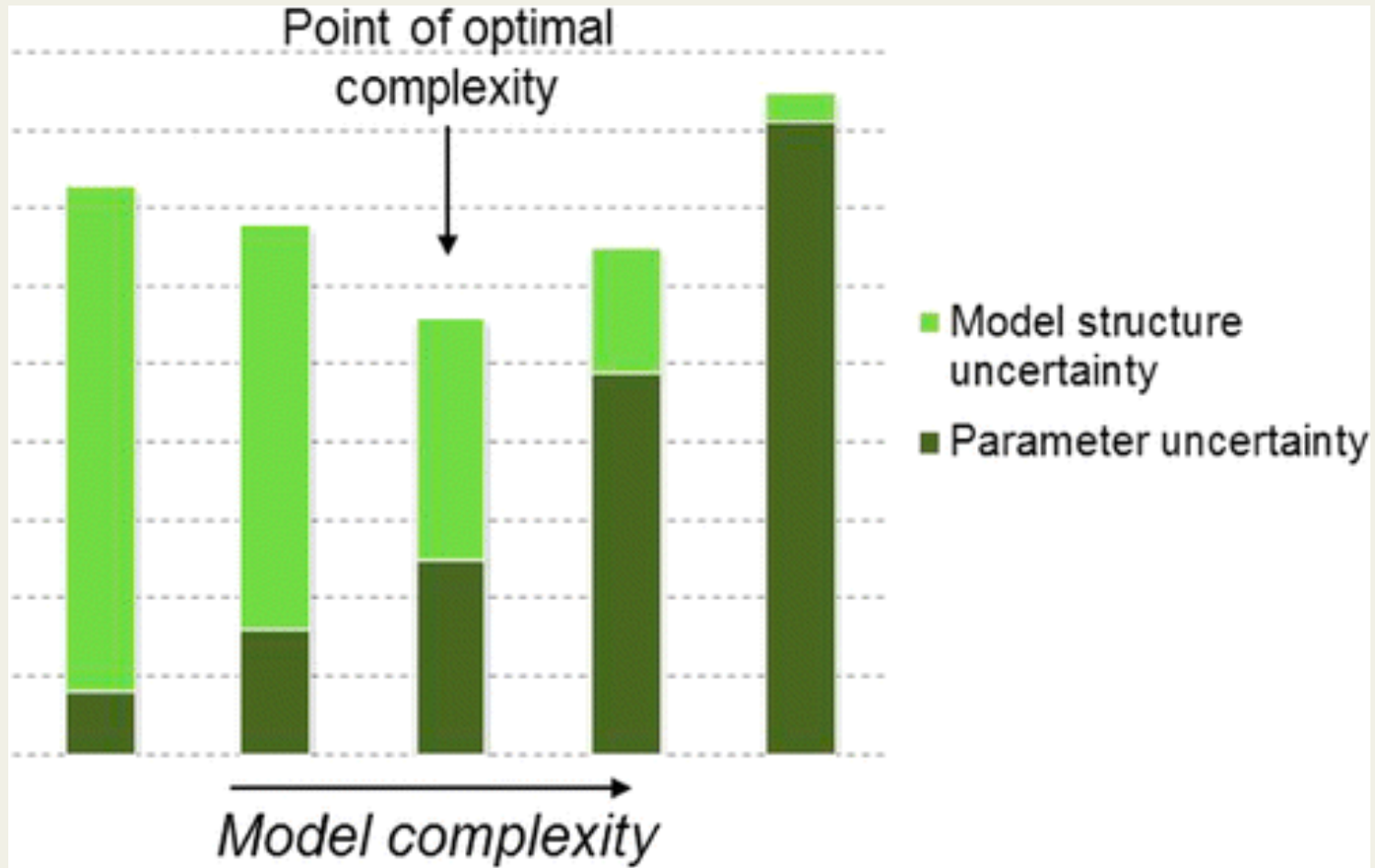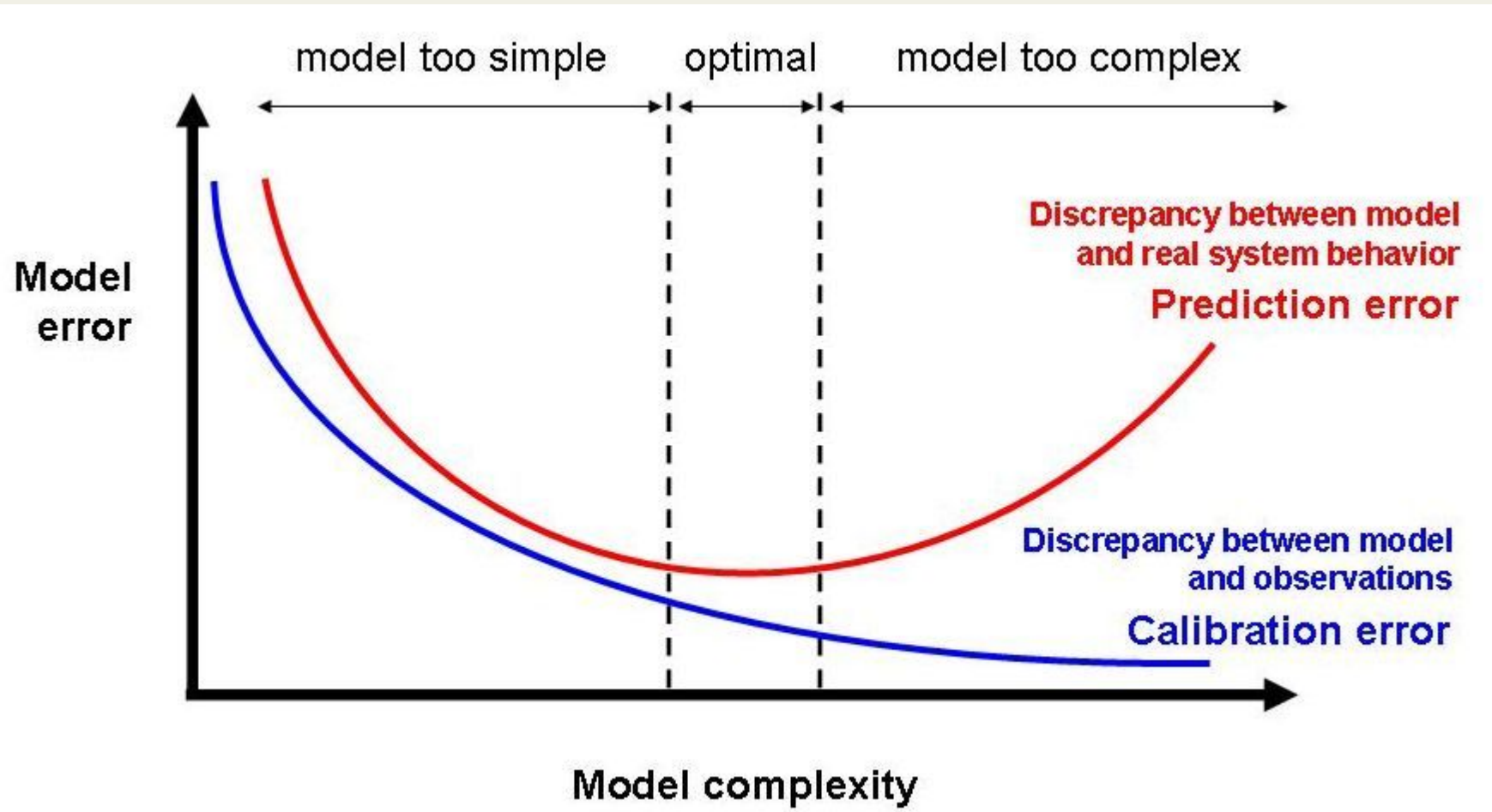
Communicating Climate Science

Figure SPM.5 | The implications of different 2030 GHG emissions levels (left panel) for the rate of CO_2 emissions reductions from 2030 to 2050 (middle panel) and low-carbon energy upscaling from 2030 to 2050 and 2100 (right panel) in mitigation scenarios reaching about 450 to about 500 (430–530) ppm CO_2eq concentrations by 2100. The scenarios are grouped according to different emissions levels by 2030 (coloured in different shades of green). The left panel shows the pathways of GHG emissions (GtCO$_2$eq/yr) leading to these 2030 levels. The black bar shows the estimated uncertainty range of GHG emissions implied by the Cancún Pledges. The middle panel denotes the average annual CO_2 emissions reduction rates for the period 2030–2050. It compares the median and interquartile range across scenarios from recent intermodel comparisons with explicit 2030 interim

An experiment with climate negotiatiors

- Elicitation of Priors of long term °C
- Providing information on a specific long term scenario (3 Treatments)

Predicted 2100 Temperature Increase over Pre-industrial Level

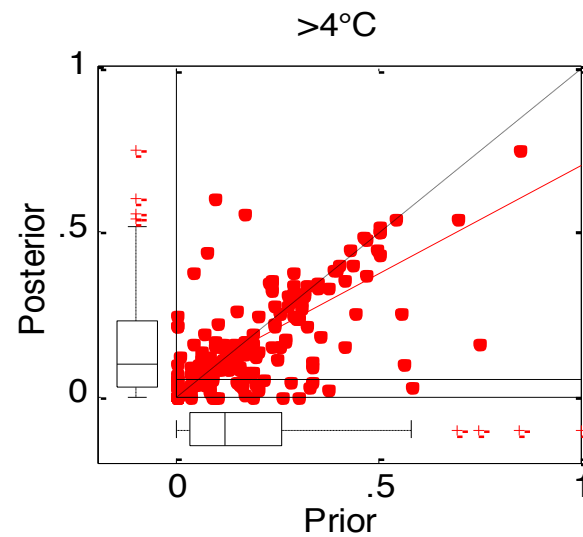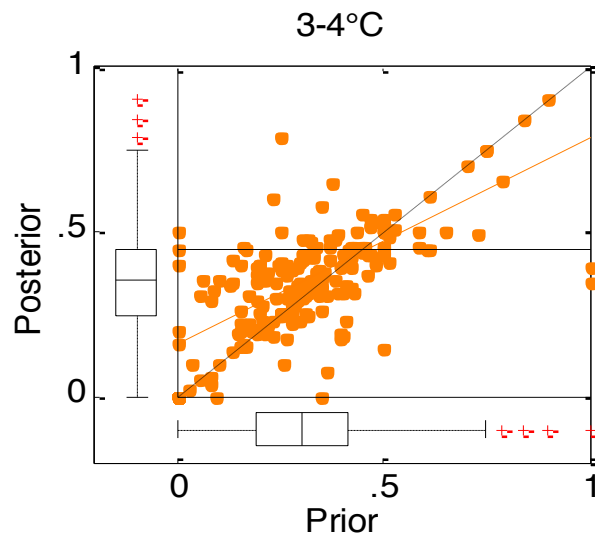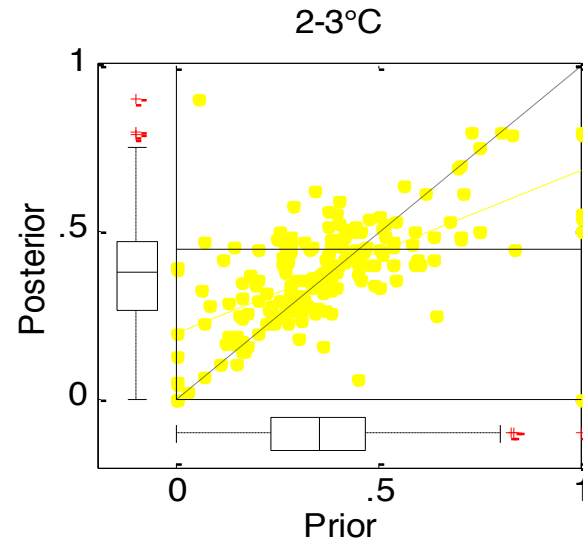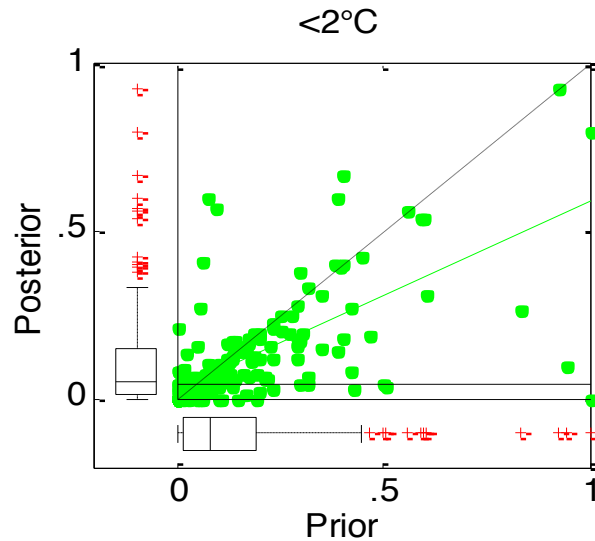| Format 1	Format 2	Format 3
The box covers 90% of the estimated temperatures (box edges represent the 5th and 95th percentiles) with the central line marking the mean.	The box covers 90% of the estimated temperatures (box edges represent the 5th and 95th percentiles) with the central line marking the mean. Each dot represents the temperature projection of a climate models that falls outside the box edges	The box covers 90% of the estima temperatures (box edges represent the and 95th percentiles) with the central marking the mean. Each dot represents temperature projection of a climate mod

Design/2

- Elicitation of Posteriors given Information
- 230 negotiatiors at COP21 in Paris. Replicated with MBA students
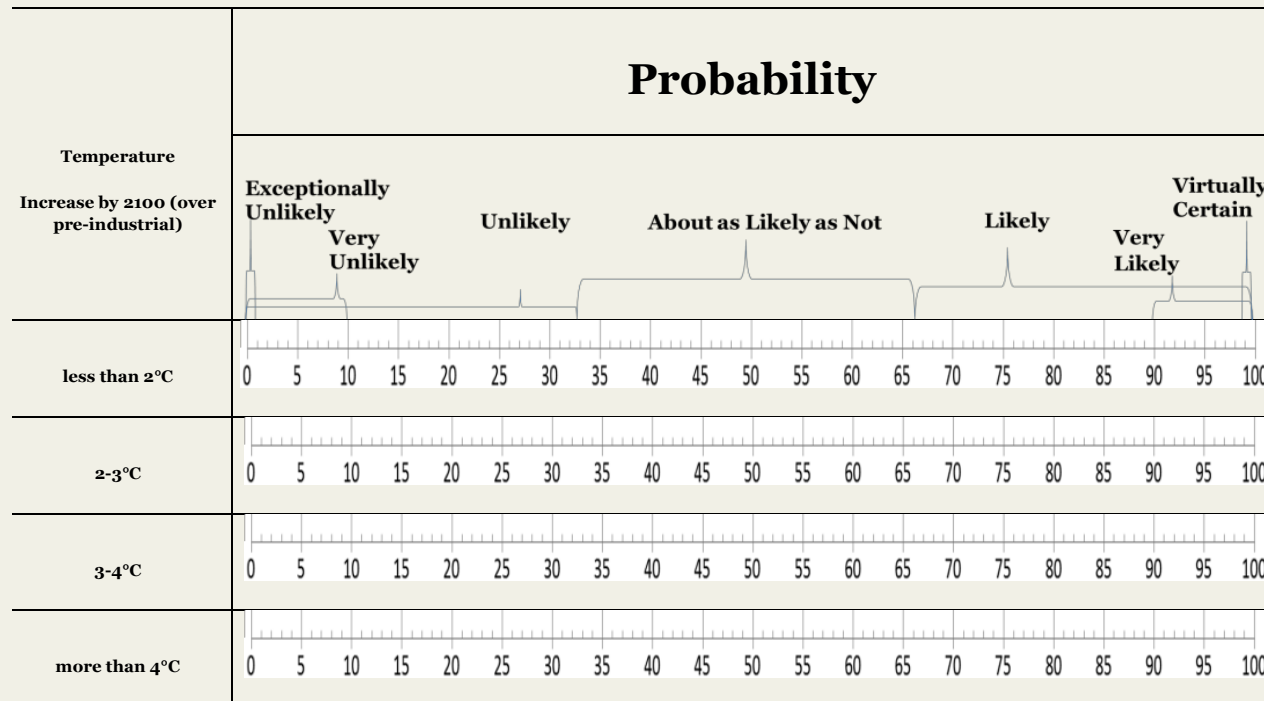
Priors
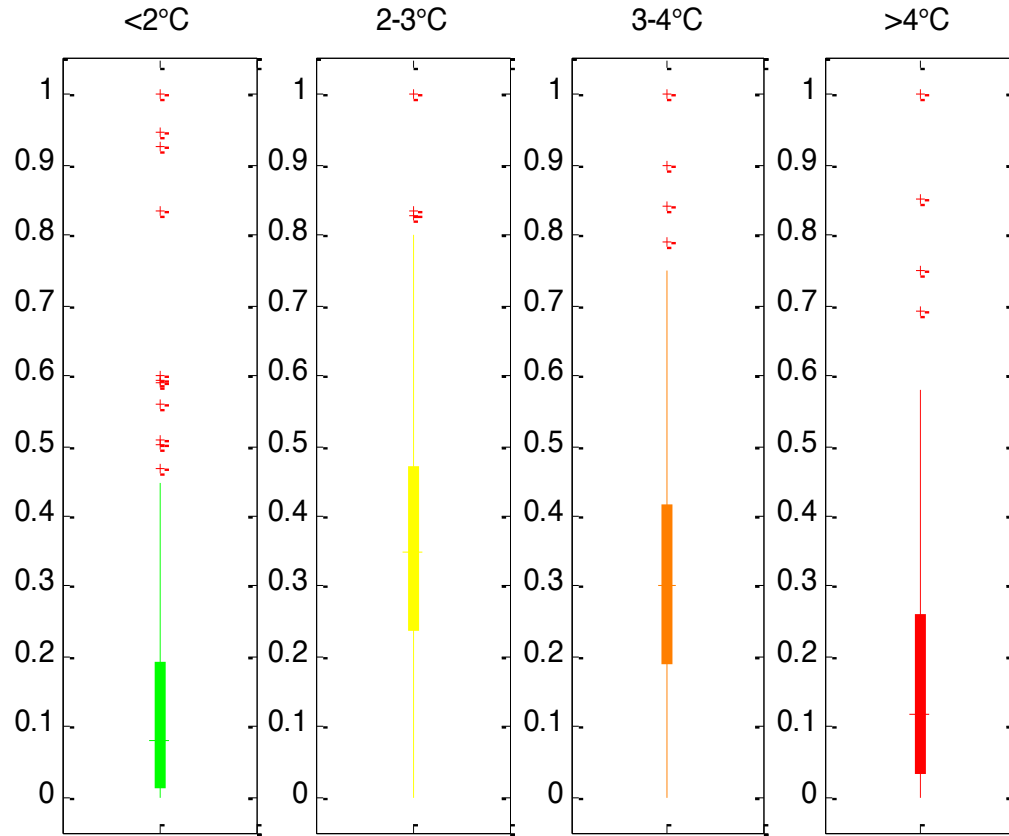
Anchoring on Beliefs

Impact of display format