DEPARTMENT OF SCIENCE, TECHNOLOGY, ENGINEERING
AND PUBLIC POLICY (UCL STEaPP)

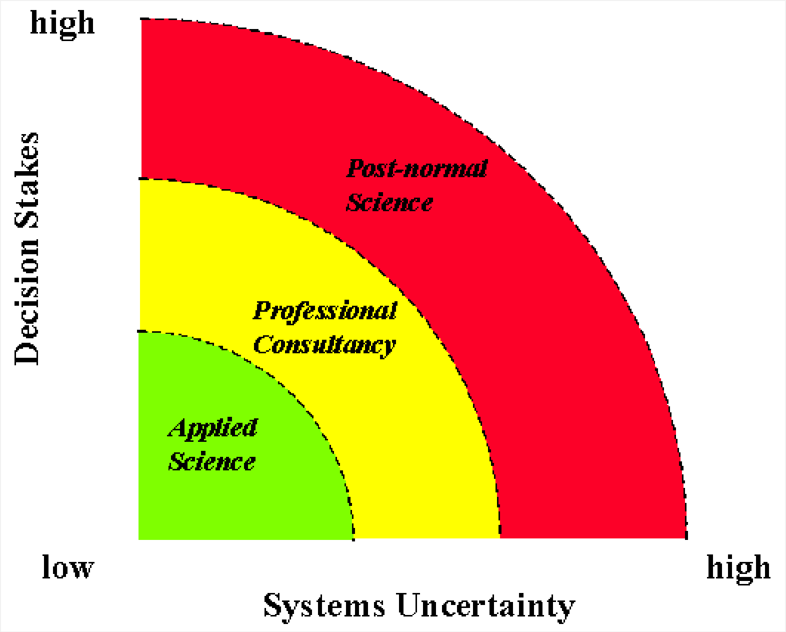
The ethos of science advice

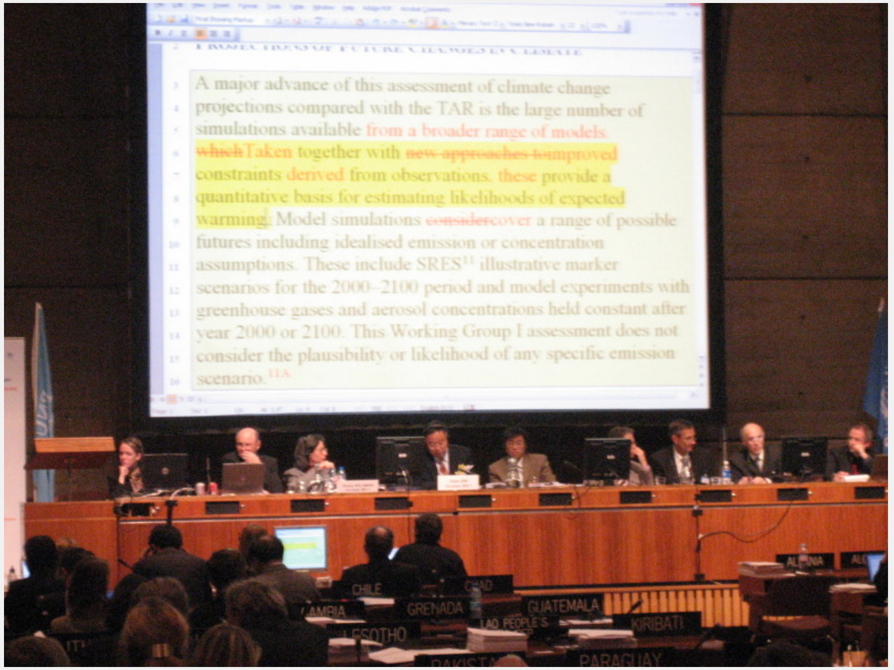
Arthur Petersen

Professor of Science, Technology and Public Policy

(collaborators: Jason Blackstock, Kira Matus, Michael Veale, Pita Spruijt)

STIG PoP Seminar, University of Tokyo, 6 November 2015





Outline

- Literature review advisory roles
- Oustanding questions
- Climate-change uncertainty
- Post-normal science
- IPCC
- Capacity-building needs
- PBL and uncertainty
- Ethos of science advice

UNCERTAINTY MATRIX			Level of uncertainty (from 'knowing for certain' (deterministic knowledge) to 'not even knowing what you do not know' (total ignorance))			Nature of uncertainty		Qualification of knowledge base (backing)			Value-ladenness of choices		
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Outputs		Indicators; statements											

Literature review Spruijt et al. (2014)

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Environmental Science & Policy

Roles of scientists as policy advisers on complex issues: A literature review

CrossMark

Pita Spruijt[a,b,*], Anne B. Knol[b], Eleftheria Vasileiadou[c], Jeroen Devilee[b], Erik Lebret[a,b], Arthur C. Petersen[c,d]

[a] Institute for Risk Assessment Sciences, Utrecht University, Utrecht, The Netherlands
[b] Centre for Sustainability, Environment and Health, National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands
[c] Institute for Environmental Studies, VU University Amsterdam, Amsterdam, The Netherlands
[d] PBL Netherlands Environmental Assessment Agency, Bilthoven, The Netherlands

“Most theories are well elaborated, but empirical proof for the described changes, roles and processes is limited” (p. 16)

Spruijt et al. (2014)

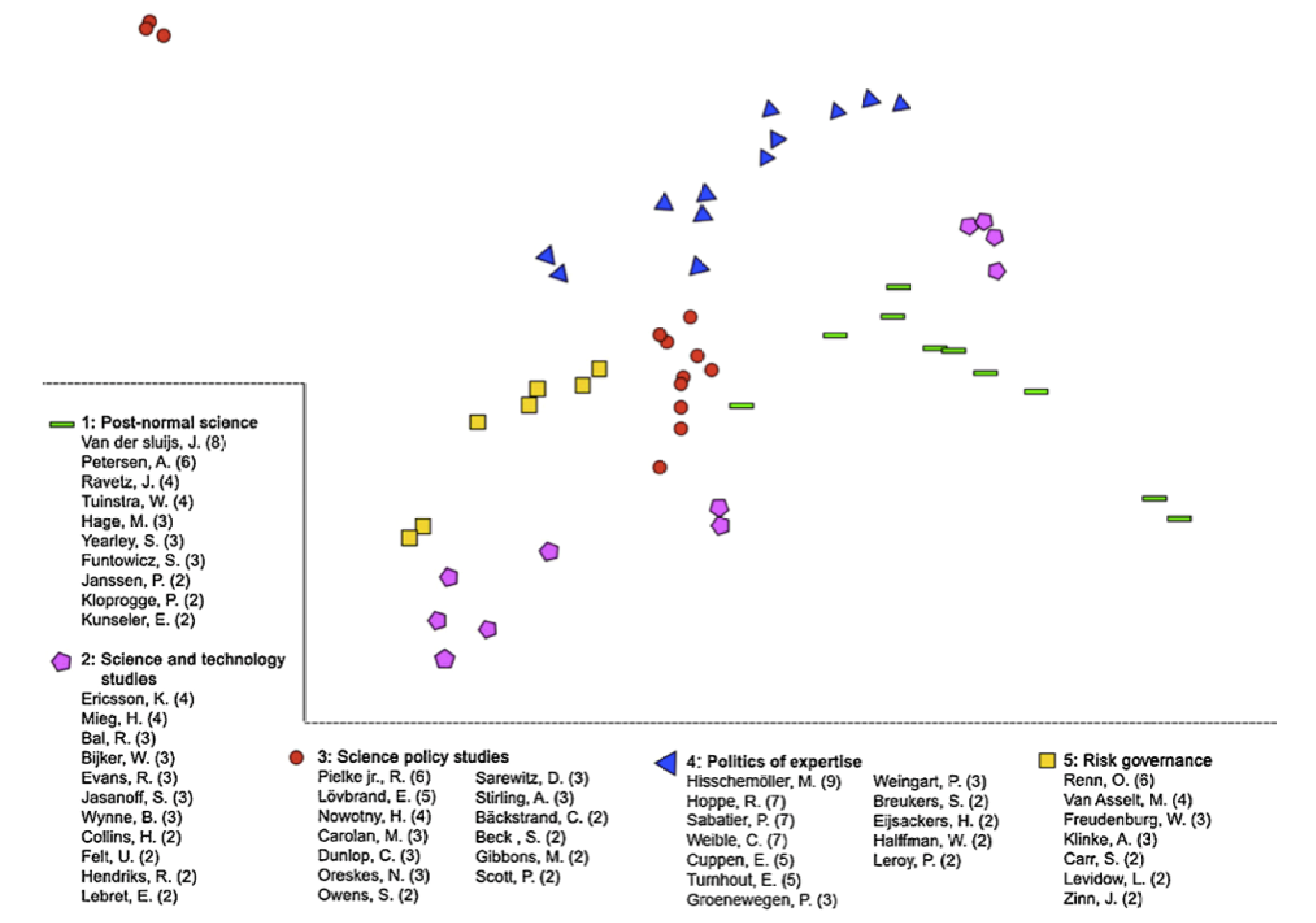


Fig. 2 – Co-citation analysis of cited references.

Spruijt et al. (2014)

Table 2 – Suggestions to improve ways in which experts (should) advise on complex issues.

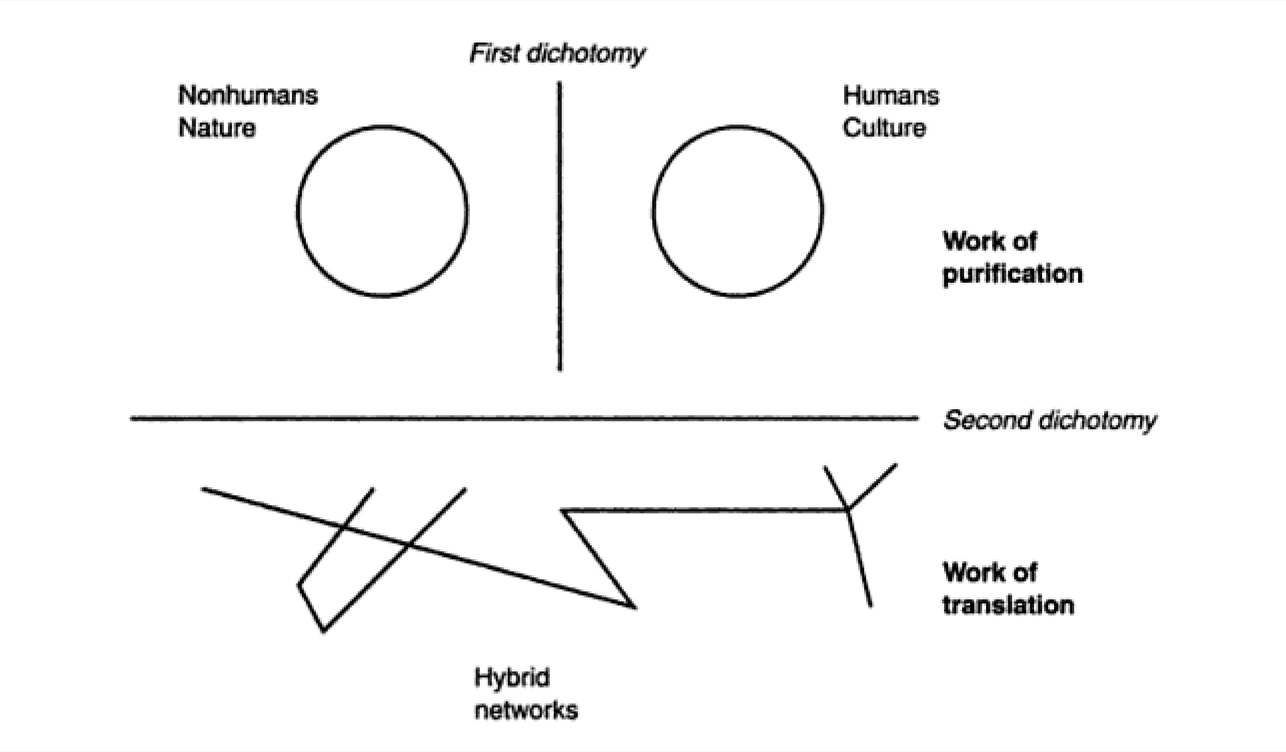
Suggestions to improve ways in which experts (should) advise on complex issues	Cluster number				
	1	2	3	4	5
Transparency in methods, assumptions, etc.	x	x	x		
Professional attitude of humility		x	x		
Public participation, democratizing science (i.e., stakeholder dialogs)	x	x	x	x	x
Precautionary principle					x
Explicating different points of view within the expert community	x	x	x		

Jasanoff (2013)

“In a world that seems too often to be hurtling toward planetary self-destruction, we need the capacity – and will – to question our purposes deeply: to ask over and over how knowledge underpins institutions and policies that are sometimes serviceable but other times perverse; and to explore how even esoteric social institutions such as scientific advice-giving can stay in touch with ongoing reflection on where we have come from and where we are going” (pp. 66–67)

Jasanoff, S. (2013), ‘The science of science advice’, in CSaP, *Future Directions for Science Advice in Whitehall*, pp. 62-67

Latour: "We have never been modern"



Outstanding questions

Two practical questions from scientific advisory practitioners about science advice:

1. What evidence is there to help me do my job better?
2. How should I set up effective science advisory mechanisms in my context?

Research programme: starting points

- International Network for Government Science Advice
- OECD Global Science Forum Report on Scientific Advice for Policymaking

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UCL

Charting science advice at local, national and international levels

UCL STEaPP launch an empirical framework-building project helping practitioners work towards more successful and appropriate science–policy interactions.

April 24, 2015.

Research programme: knowledge gaps

Parliamentary advice

Engineering advice

Roles of 'boundary organisations'

Roles of NGOs and think tanks

Technical advice

Influence of topical domains

Influence of levels of development

Advocacy roles

Operational vs. agenda-setting roles

'Top' advisors vs. more specific/ lower levels of engagement

International/national/local advice

Internal structures

Capacities

Mobilising and incentivising science and engineering communities

Accountability, quality, communication, participation

Research programme: aspects

- Type of issue
- Advisory structures
- Management and orchestration
- Characteristics of the recipients of advice
- Skills and characteristics of advisors
- Activities of advisors and recipients
- Type of knowledge
- Methods of communicating and disseminating
- Culture and context

Functional framework for analysing science advice to decision-makers

Activity perspective

- Knowledge-making activities and decision-making activities
- Connecting activities
- Perspectives on activities by actors and media

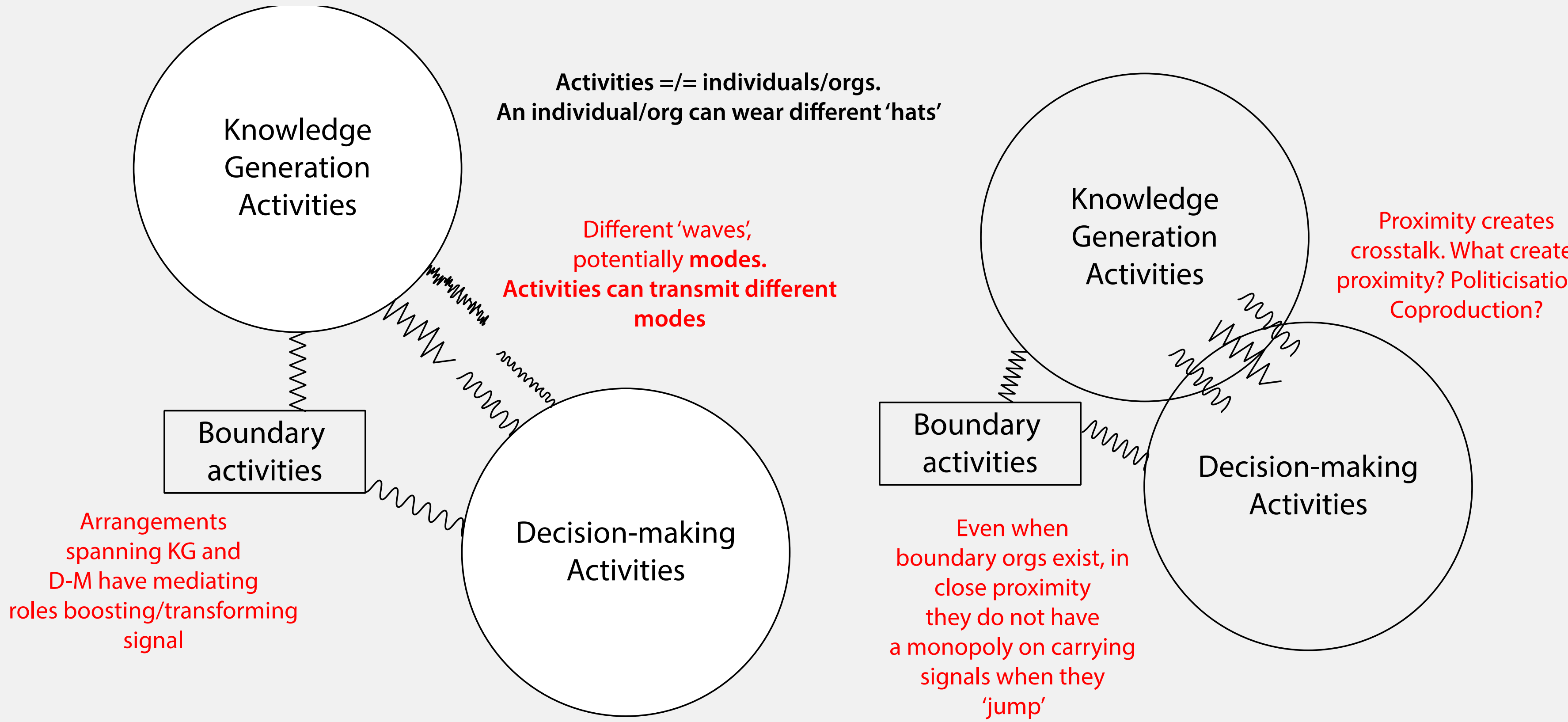
Actor perspective

- Main actors and their characteristics, resources, capabilities, interests, values and goals
- Perspectives on actors by other actors and media
- Political constellations

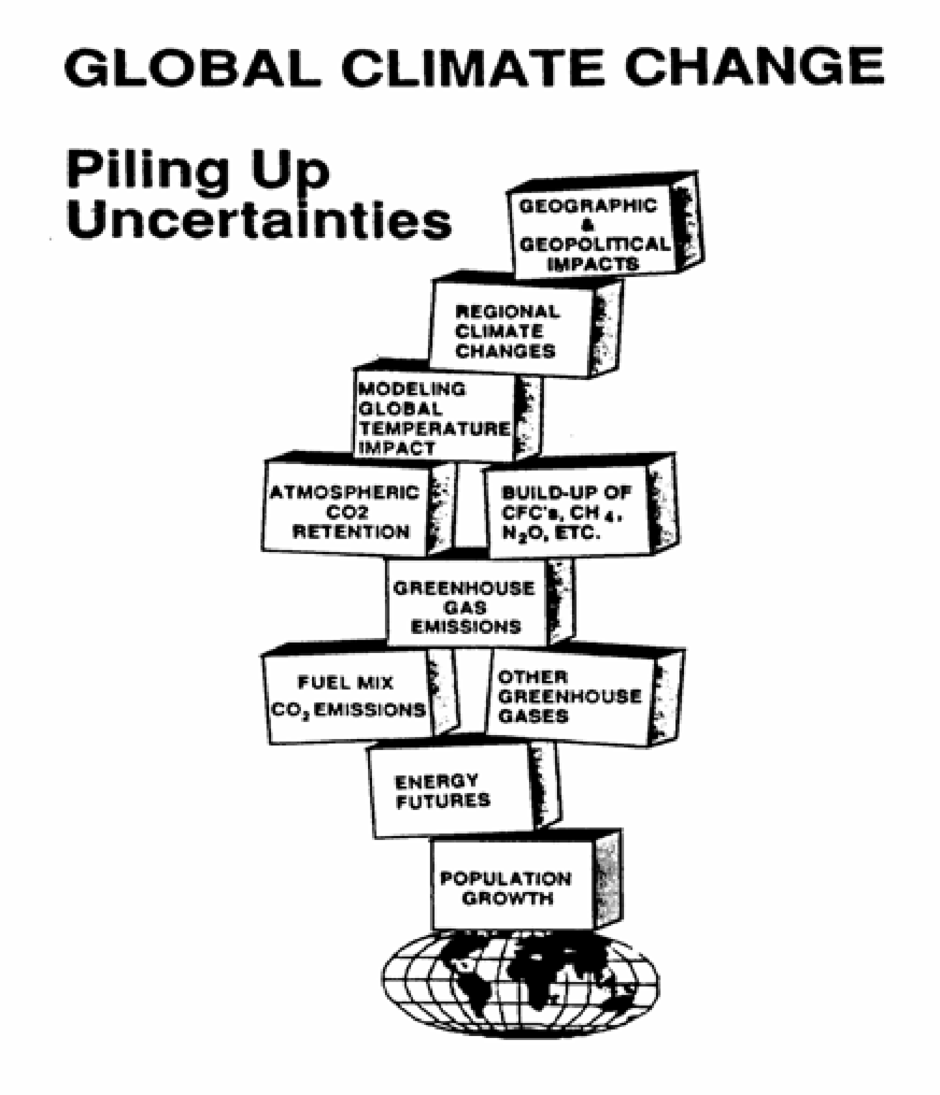
Institutional perspective

- Informal and formal institutions
- Effects of institutions on actors, activities and structures
- Conflicts and complementarities

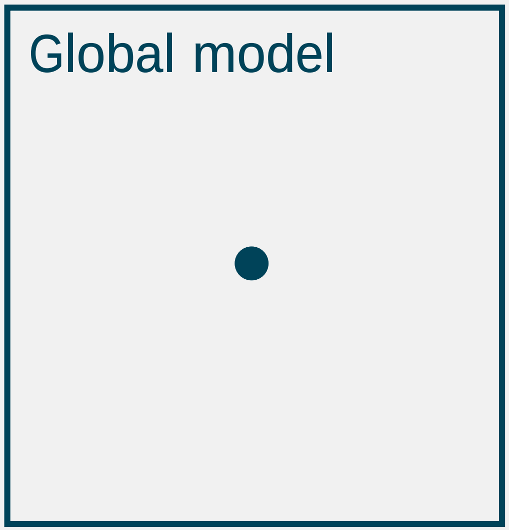
Activities: potential graphical depiction



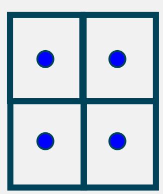
Courtesy Michael Veale (UCL)

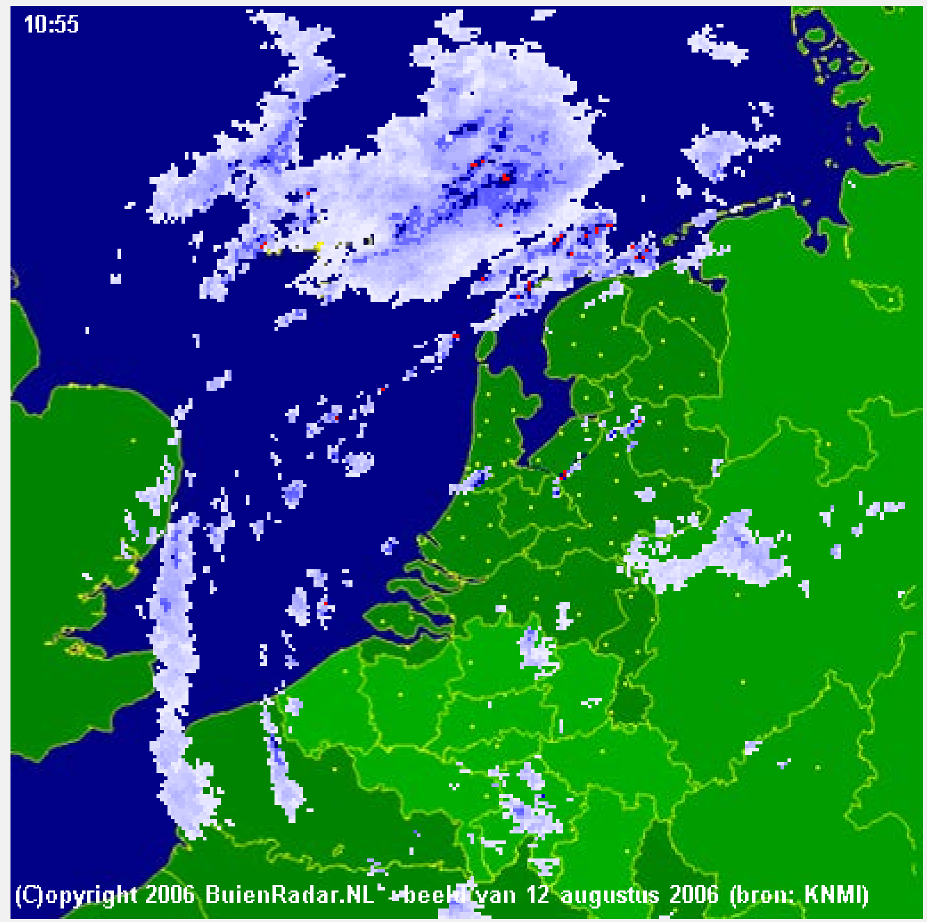

GLOBAL CLIMATE CHANGE
Piling Up Uncertainties
GEOGRAPHIC & GEOPOLITICAL IMPACTS
REGIONAL CLIMATE CHANGES
MODELING GLOBAL TEMPERATURE IMPACT
ATMOSPHERIC CO2 RETENTION
BUILD-UP OF CFC's, CH 4, N2O, ETC.
GREENHOUSE GAS EMISSIONS
FUEL MIX CO2 EMISSIONS
OTHER GREENHOUSE GASES
ENERGY FUTURES
POPULATION GROWTH

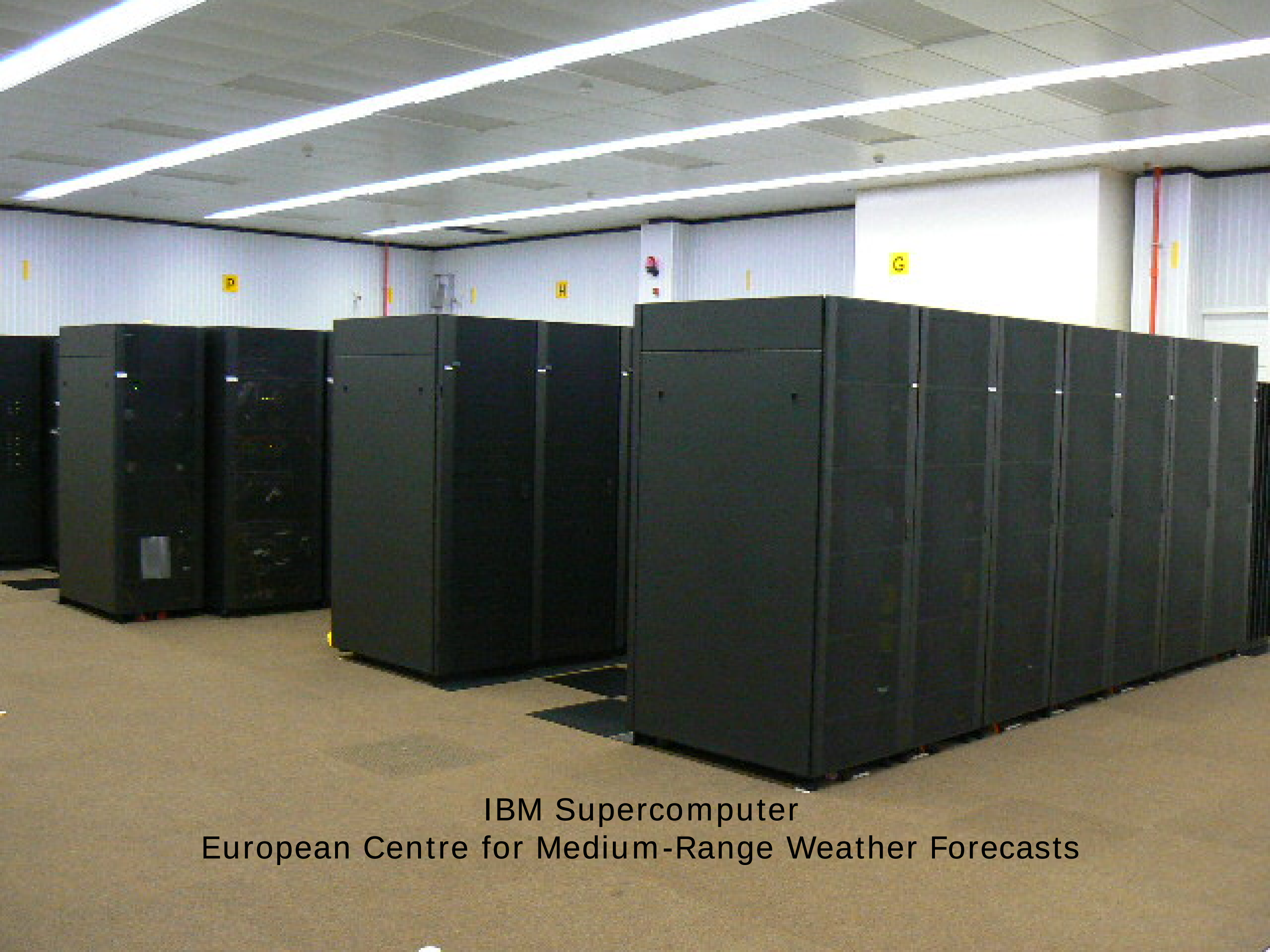
Global and regional models



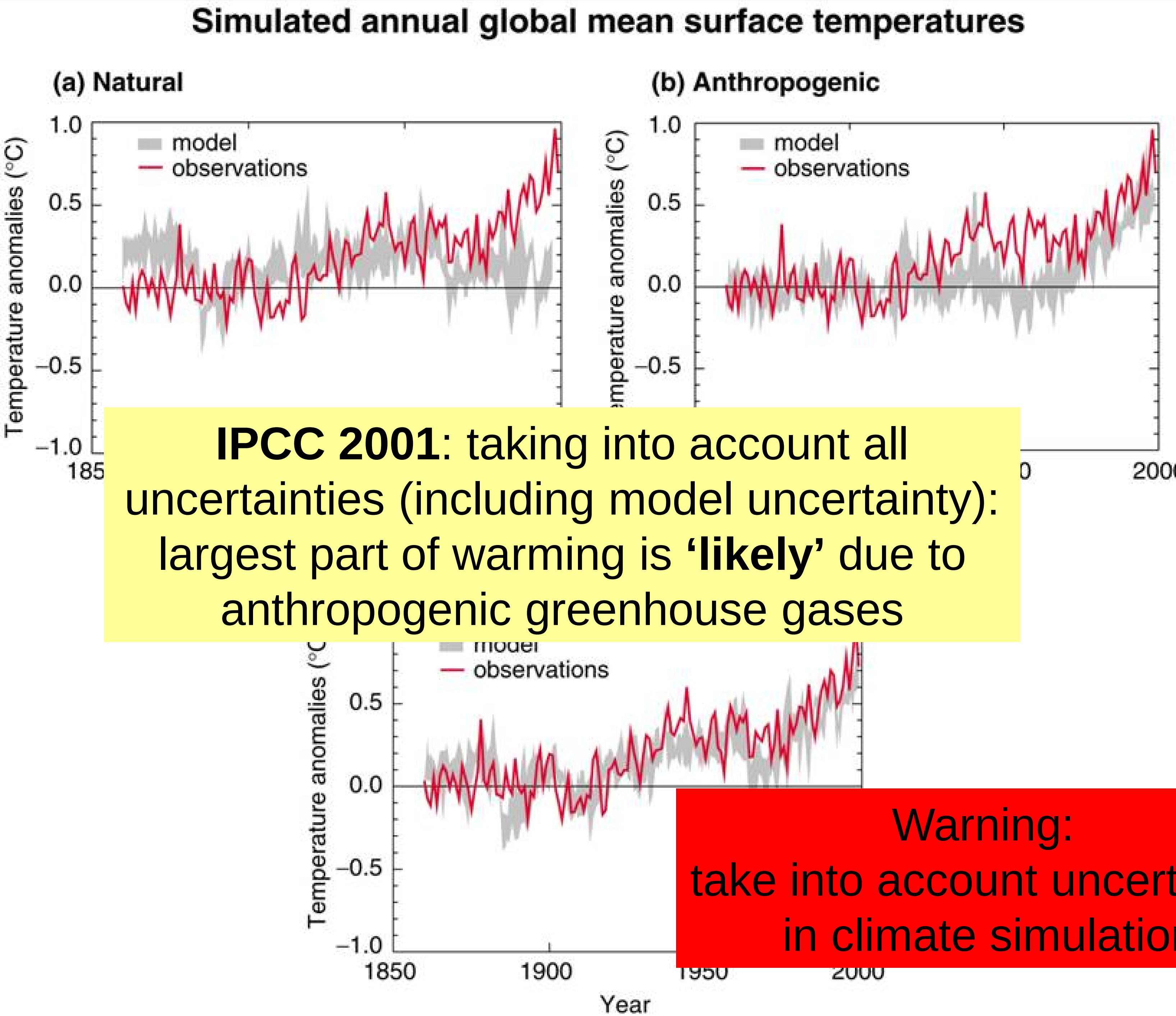
Regional model







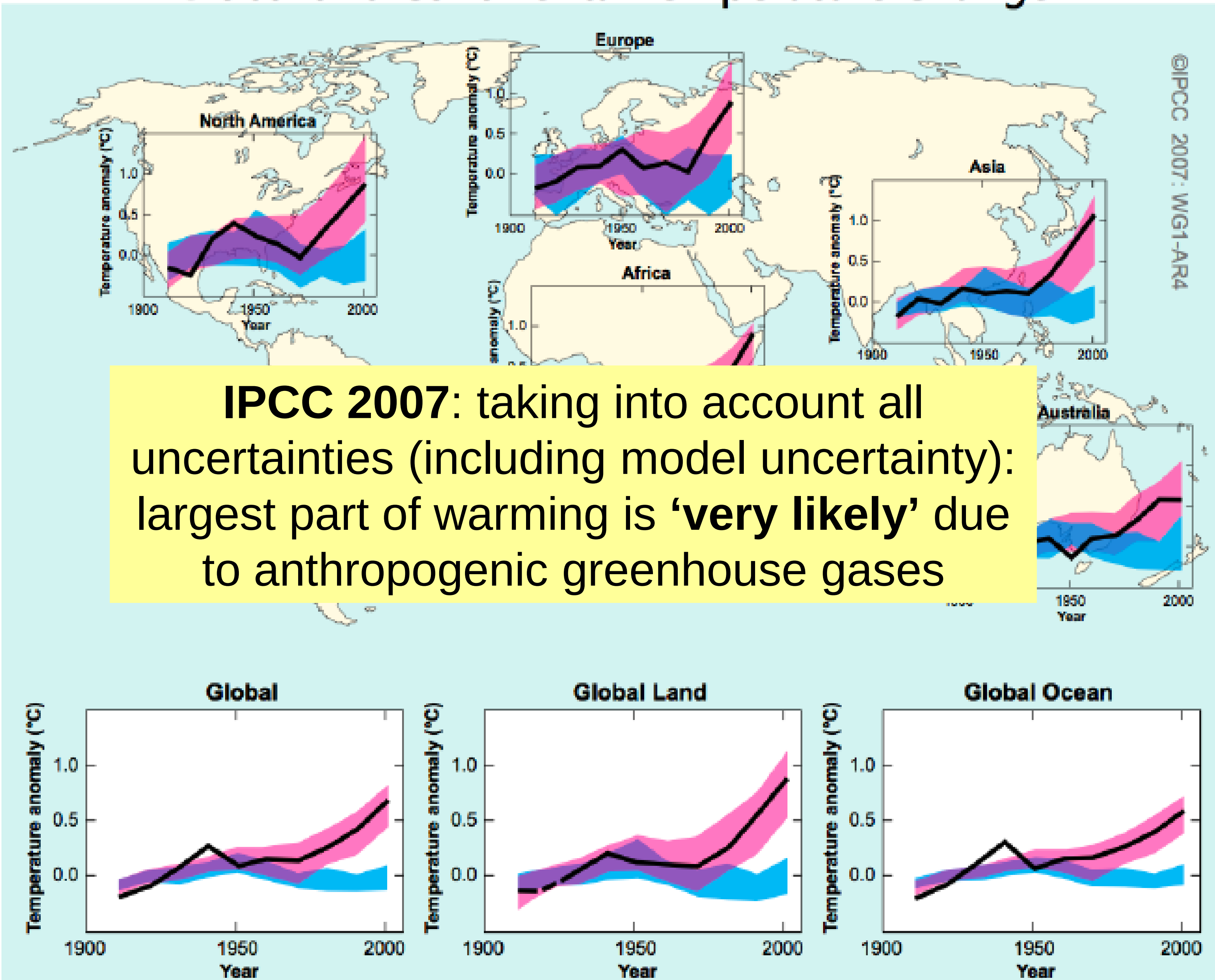
IBM Supercomputer
European Centre for Medium-Range Weather Forecasts



IPCC 2001: taking into account all uncertainties (including model uncertainty): largest part of warming is **‘likely’** due to anthropogenic greenhouse gases

Warning:
take into account uncertainty in climate simulation

Global and Continental Temperature Change



IPCC 2007: taking into account all uncertainties (including model uncertainty): largest part of warming is **'very likely'** due to anthropogenic greenhouse gases

de Kwaadsteniet versus van Egmond

- de Kwaadsteniet:
  “Computer simulations are seductive due to their perceived speed, clarity and consistency. However, simulation models are not rigorously compared with data.”
- van Egmond:
  “Policy makers are confronted with incomplete knowledge; it is the task of scientific advisers to report on the current state of knowledge, including uncertainties. Simulation models are indispensable.”

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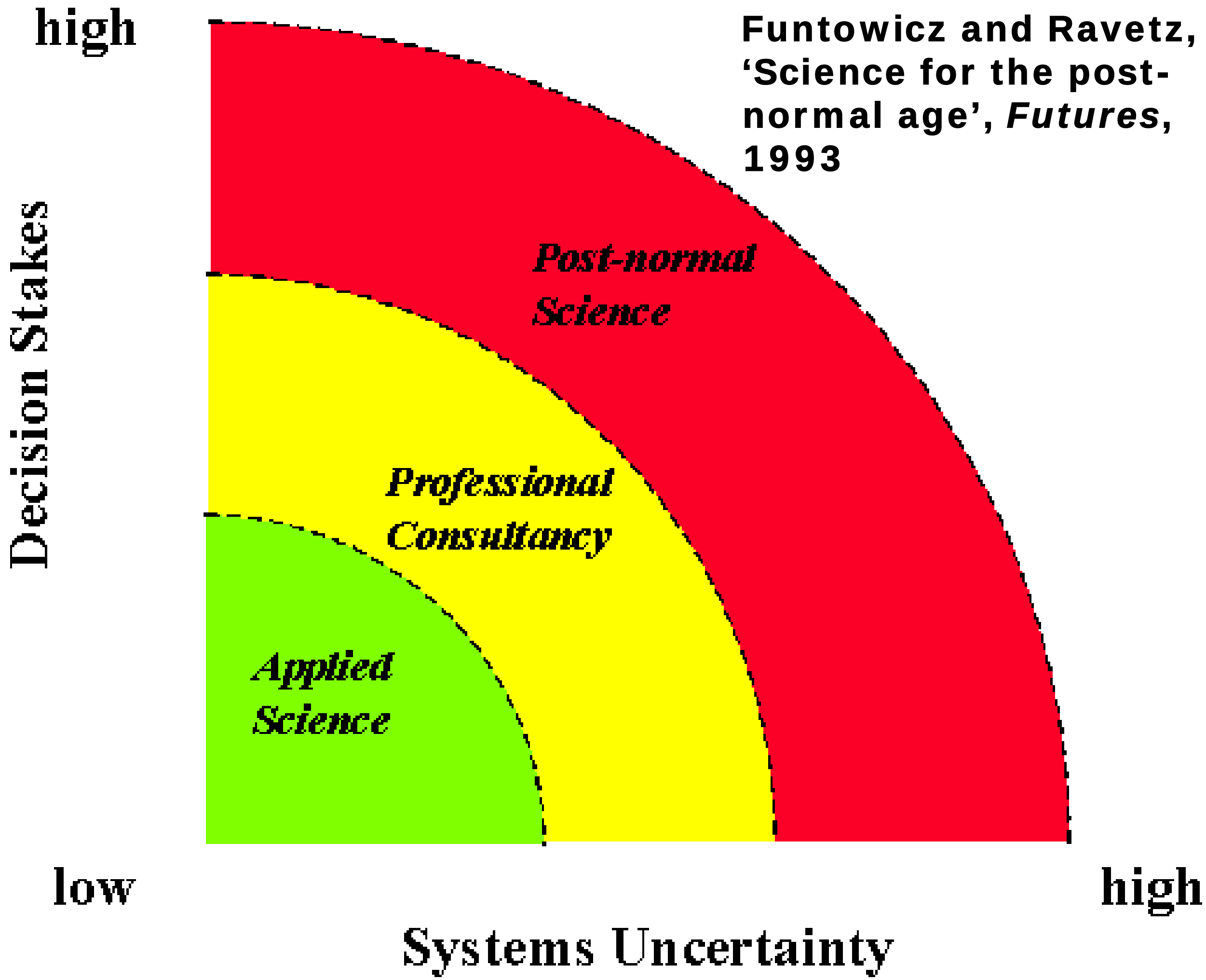


Funtowicz and Ravetz, 'Science for the post-normal age', *Futures*, 1993

The challenge of post-normal science

- Expert advisers should be reflexive
- Methods for dealing with uncertainty should merely be considered as tools, not as the solutions
- Fear for paralysis in policy making should not be allowed to block communication about uncertainty
- Communication with a wider audience about uncertainties is crucial

Shifting notions of reliability

- Statistical reliability (expressed in terms of probability)
  - How do you statistically assess evidence?
- Methodological reliability (expressed qualitatively in terms of weak/strong points)
  - How do you determine the methodological quality of the different elements in scientific and engineering practice?
- Public reliability (expressed in terms of public trust)
  - What determines public trust in scientists and engineers?

Example from the Intergovernmental Panel on Climate Change WG I (2007)

"Most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations[12]." (SPM)

[12] Consideration of remaining uncertainty is based on current methodologies.

Example from the IPCC WG I 2007 (continued)

"Very likely" means a chance >90%. But what kind of probability are we dealing with here?

"assessed likelihood**, using expert judgement,** of an outcome or a result"

Final SPM

Example from the IPCC WG I 2013

"Probabilistic estimates of quantified measures of uncertainty in a finding are based on statistical analysis of observations or model results, **or both, and** expert judgment."

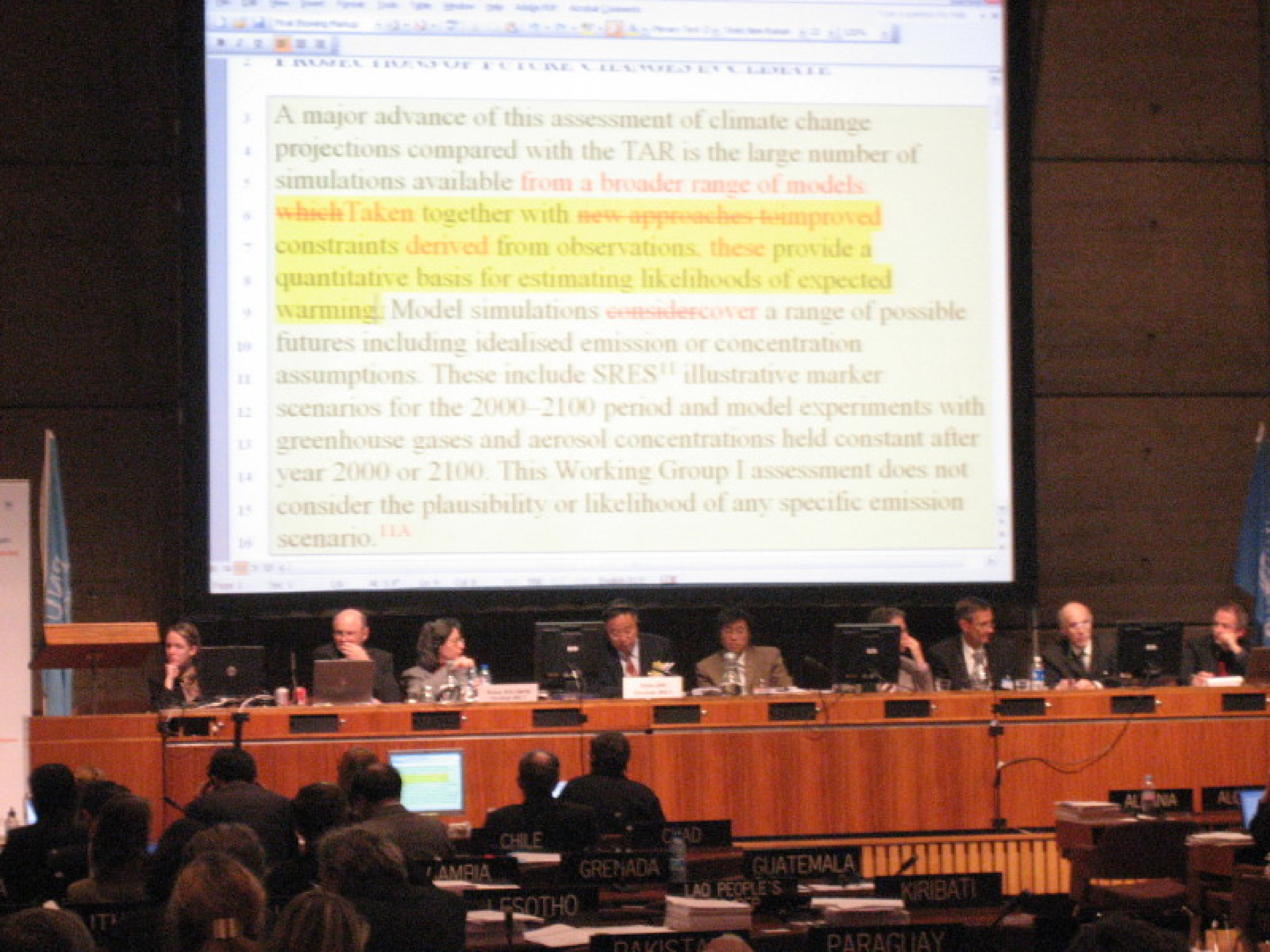
Final SPM


UNITED REPUBLIC OF
TANZANIA
SWITZERLAND
TOGO
WELLE-ZELANDE
NETHERLANDS


PANAMA
NETHERLANDS


NRDC
SEI
WBCSD
SWAZILAND
SURINAME
PAKISTAN
PARAGUAY
NIGER
UNITED REPUBLIC OF TANZANIA


UNEP
PNUE
COMOROS
CONGO
COOK ISLANDS
COSTA RICA
CROATIA
EL SALVADOR
EGYPT
ECUADOR
DOMINICA


A major advance of this assessment of climate change projections compared with the TAR is the large number of simulations available from a broader range of models. whichTaken together with new approaches toimproved constraints derived from observations, these provide a quantitative basis for estimating likelihoods of expected warming. Model simulations considercover a range of possible futures including idealised emission or concentration assumptions. These include SRES11 illustrative marker scenarios for the 2000–2100 period and model experiments with greenhouse gases and aerosol concentrations held constant after year 2000 or 2100. This Working Group I assessment does not consider the plausibility or likelihood of any specific emission scenario.11A
CHILE
CHAD
GRENADA
GUATEMALA
LAO PEOPLE'S
KIRIBATI
LESOTHO
PARAGUAY

- The equilibrium climate sensitivity quantifies the response of the climate system to constant radiative forcing on multi-century time scales. It is defined as the change in global mean surface temperature at equilibrium that is caused by a doubling of the atmospheric CO_2 concentration. Equilibrium climate sensitivity is *likely* in the range 1.5°C to 4.5°C (*high confidence*), *extremely unlikely* less than 1°C (*high confidence*), and *very unlikely* greater than 6°C (*medium confidence*)[X]. The lower temperature limit of the assessed *likely* range is thus less than the 2°C in the AR4, but the upper limit is the same. This assessment reflects improved understanding, the extended temperature record in the atmosphere and ocean, and new estimates of radiative forcing. { TS Figure TFE6.1, Box 12.2}


suggests reductions of polar
land ice extent and 4 to 6 m of sea level rise. {6.4, 10.7}
TSU WG I
ESTONIE


CO-CHAIR WG I
CO-CHAIR WG I

IPCC by the Numbers*

859 authors and editors from **39** nations

2214 pages

41 climate models

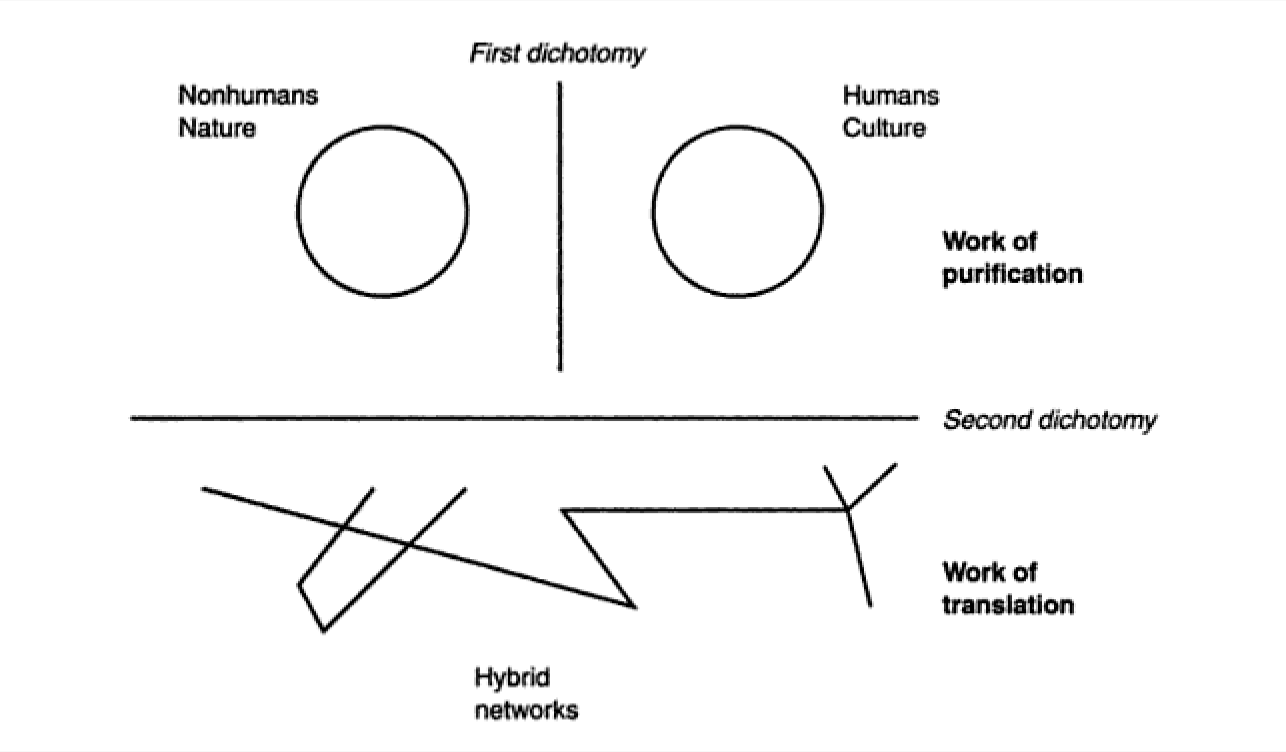
2 million gigabytes of modeling data

9200 papers cited

54,677 comments

*Working Group I report on climate science

Latour: "We have never been modern"



The IPCC: science or politics?

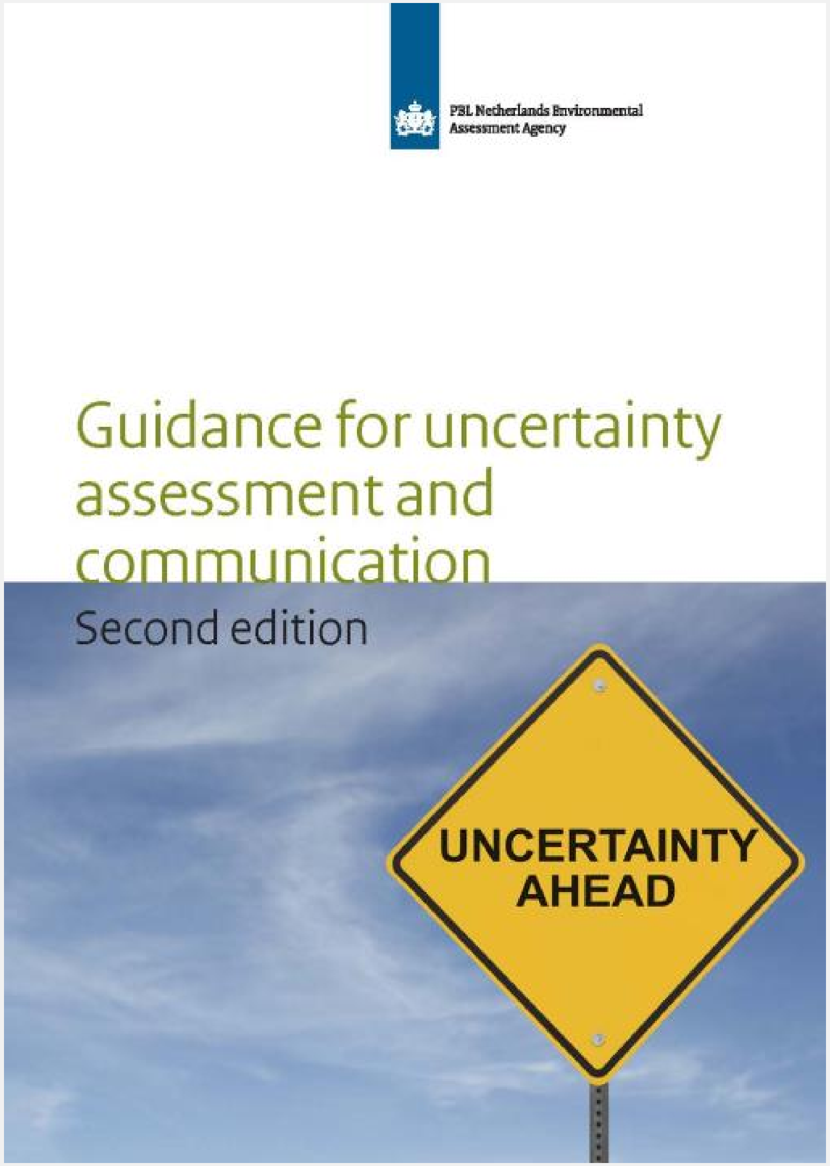
- Assessments are social constructs that contain both scientific and political elements
- Successful? Depends on ability to connect to climate science and policy
- Generally voiced criticism: IPCC not open enough to skeptics

The IPCC: science or politics? (II)

- Practice: procedures ensure inclusivity; skeptics do have influence; reflexivity on dissensus is moderate (neither low nor high)
- Not: "scientific consensus". But: "policy-relevant assessment acknowledging uncertainty"
- Still, the communication of uncertainty can be further improved
- The IPCC acts as a Latourian "Parliament of Things" – but the actors won't admit this!

PBL's Guidance for Uncertainty Assessment and Communication

- Offers assistance to analysts
- Not a protocol
- Based on post-normal science



Six uncertainty elements in assessments

Foci	Key issues
Problem framing	Other problem views; interwovenness with other problems; system boundaries; role of results in policy process; relation to previous assessments
Involvement of stakeholders	Identifying stakeholders; their views and roles; controversies; mode of involvement
Selection of indicators	Adequate backing for selection; alternative indicators; support for selection in science, society, and politics
Appraisal of knowledge base	Quality required; bottlenecks in available knowledge and methods; impact of bottlenecks on quality of results
Mapping and assessing relevant uncertainties	Identification and prioritisation of key uncertainties; choice of methods to assess these; assessing robustness of conclusions
Reporting uncertainty information	Context of reporting; robustness and clarity of main messages; policy implications of uncertainty; balanced and consistent representation in progressive disclosure of uncertainty information; traceability and adequate backing

Typology of uncertainty

- Location
- Level of uncertainty

    statistical uncertainty, scenario uncertainty, recognised ignorance
- Nature of uncertainty

    knowledge-related uncertainty, variability-related uncertainty
- Qualification of knowledge base (backing)
- Value-ladenness of choices

Locations of uncertainty

- Context
- Expert judgement
- Model
- Data
- Outputs

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Capacity-building needs science advice

- Dealing with complexity, uncertainty and systems thinking
- Communicating in different languages (understanding of scientific and policy-making processes)
- Management of expectations (limits of science)
- Negotiating and influencing < > maintaining integrity
- ‘Civics’ for scientists
- Public education on science–policy interface
- Professional career paths

The ethos of science advice (1/2)

Explicit reflection on uncertainty and values

"Take "normal science" seriously, but also organise reflection on its uncertainties and value-ladenness.

Addressing methodological and public reliability

Alongside the *statistical reliability* of results (expressed in terms of probability), devote due attention to their *methodological reliability* (expressed in terms of strengths and weaknesses) and their *public reliability* (expressed as the degree of public confidence in the scientists who produce them).

The ethos of science advice (2/2)

Extended peer review

Involve a larger group of specialists and non-specialists who hold different values in monitoring the quality of scientific assessments.

Acknowledging social complexity

Be wary of accepting the conclusions of actors and practitioners at face value: try to delve deeper through the layers of complexity by means of narrative methods.