In Northern Mists:
IPCC Arctic Climate and Sea Ice Projections
James Overland and Muyin Wang
NOAA/Pacific Marine Environmental Laboratory
Seattle, WA
Intergovernmental Panel on Climate Change
Fourth Assessment Report (IPCC AR4)

• 4th Report Models are better than in Third Report

• 22 Model results made widely available

• The Issue: Convince ourselves that some models give a somewhat credible representation of the large-scale response of the Arctic to anthropogenic addition of radiative active gases, relative to natural variability
  
  *Physics, Methodology, Consistency, Best Explanation, Predictions
What is a climate model?

- Physics and Chemistry
- Parameterizations
- Numerical Methods
- Spatial Resolution
Current models’ resolution is about 180 km (T63)

Better Ice Parameterization

Better Ocean (no restoring terms)
21st Century Anthropogenic Scenarios

![Graph showing global surface warming (°C) from 1900 to 2100 with different scenarios labeled A2, A1B, B1, and constant composition commitment, compared to the 20th century.](image)
How many climate models (and runs) are needed?

Ensembles: running the same model many times with different starting conditions- represents range of natural (chaotic) variability of climate

Model to model differences- Rough estimate of parameterization (physics) uncertainly. Cloud feedbacks are a primary source of these differences.

Drop “Outlier” models based on hindcast/data comparisons to reduce uncertainty
International Panel on Climate Change 4th Assessment Report
90 % chance that humans have contributed to global warming
Based on climate computer models and data

With CO2

Without CO2