



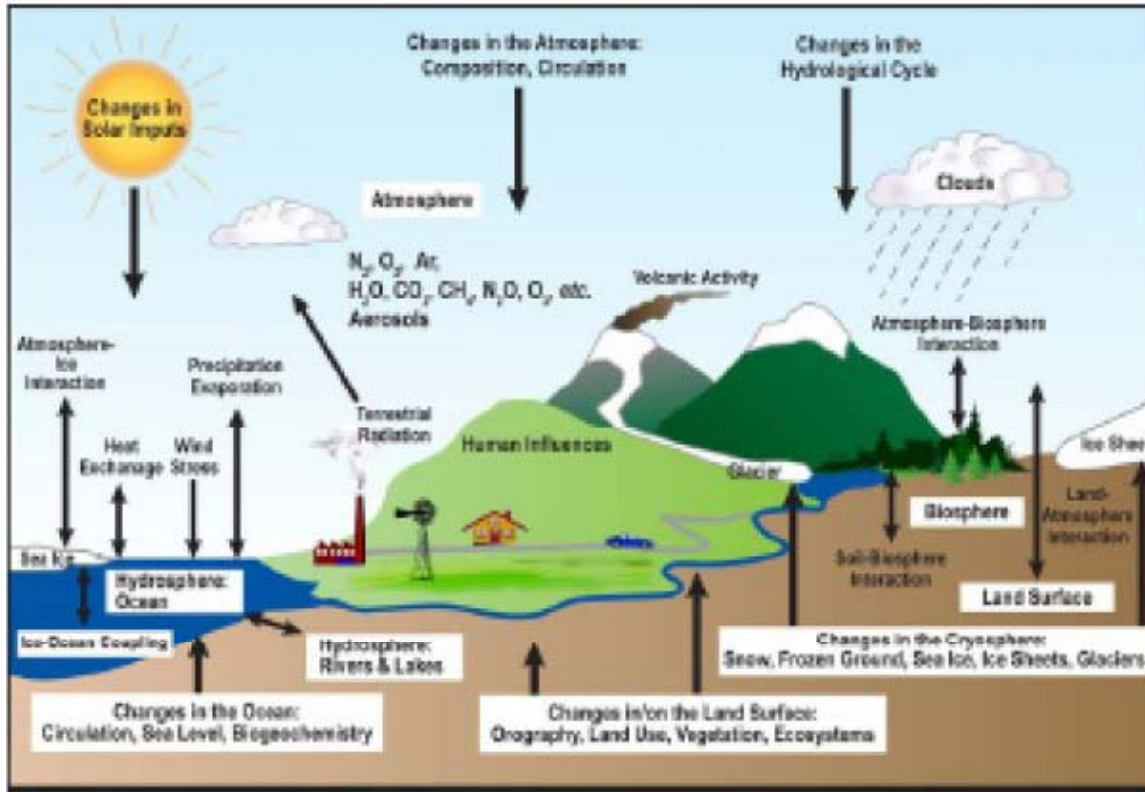
**In Northern Mists:
IPCC Arctic Climate and Sea Ice Projections**

**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?

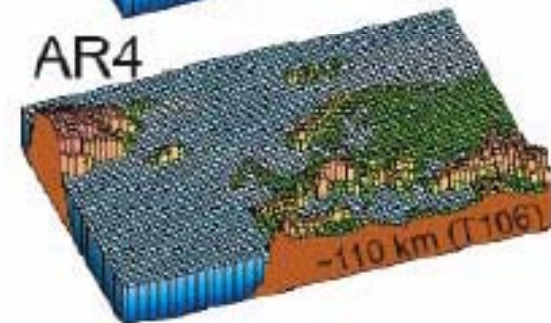
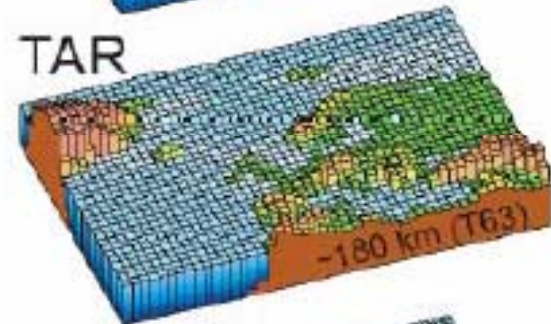
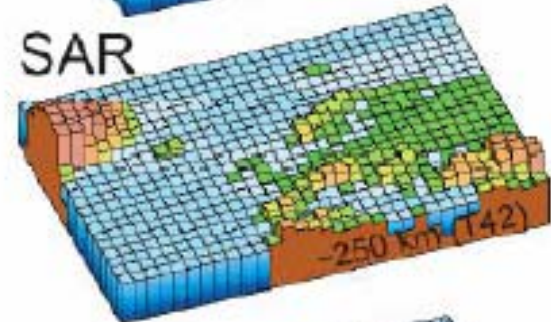
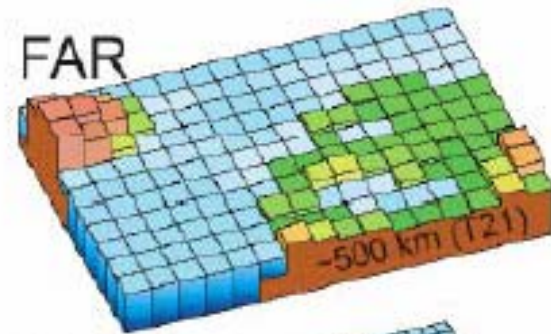


- Physics and Chemistry
- Parameterizations
- Numerical Methods
- Spatial Resolution

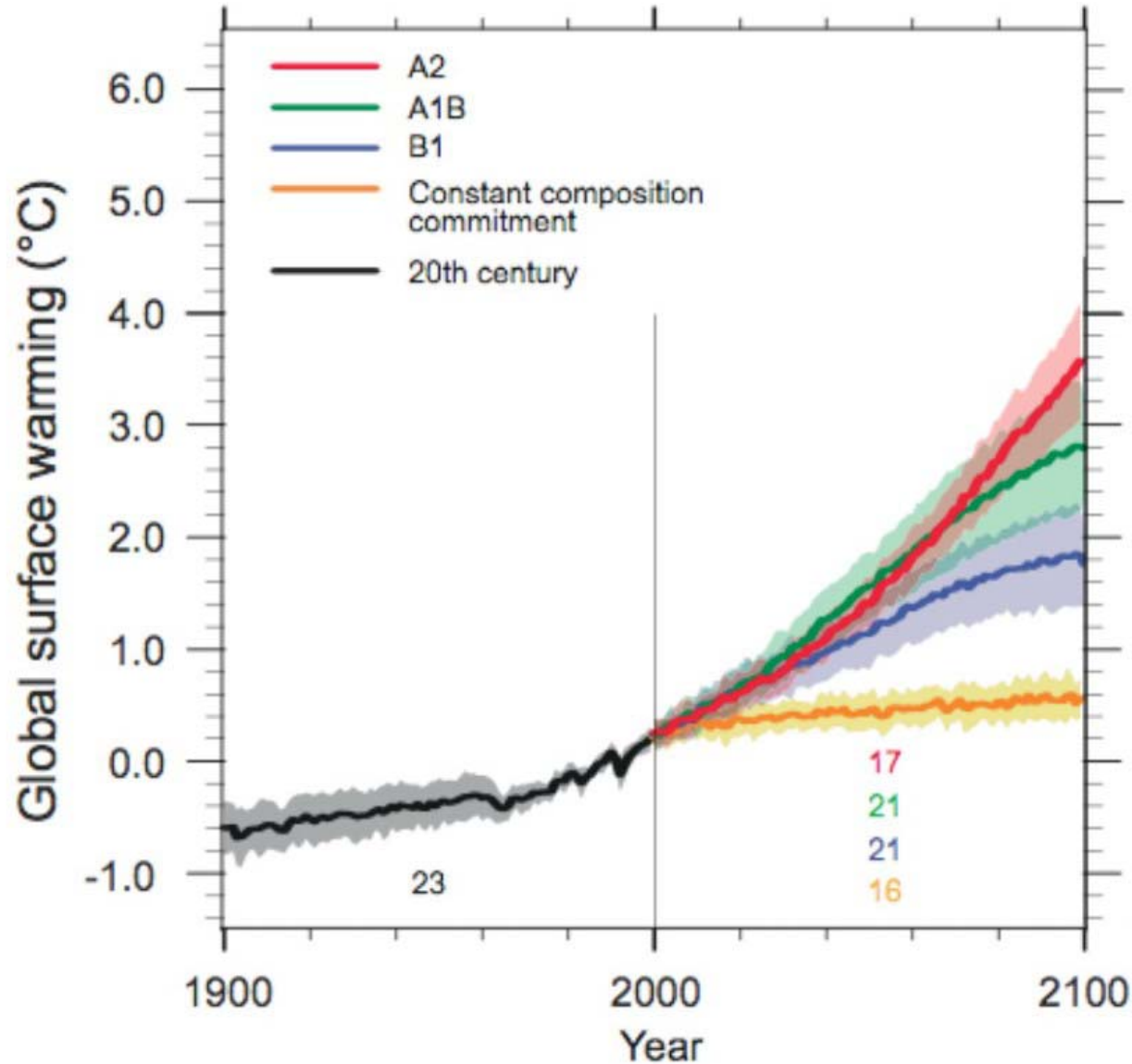
Current models' resolution is about 180 km (T63)

Better Ice Parameterization

Better Ocean (no restoring terms)



21st Century Anthropogenic Scenarios



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) uncertainty. Cloud feedbacks are a primary source of these differences.

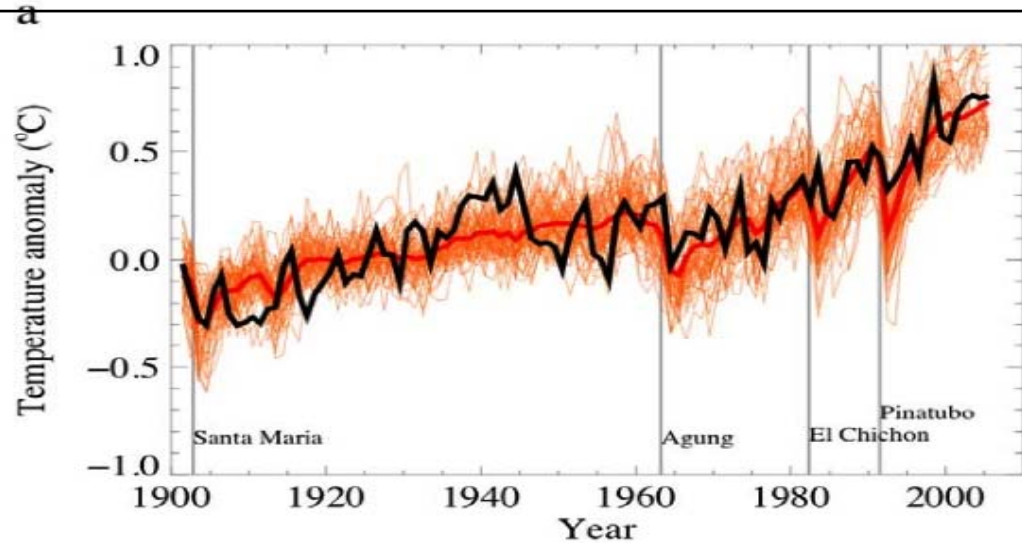
Drop “Outlier” models based on hindcast/data comparisons to reduce uncertainty

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

