The Community Climate System Model:
A Framework for Collaborative Research

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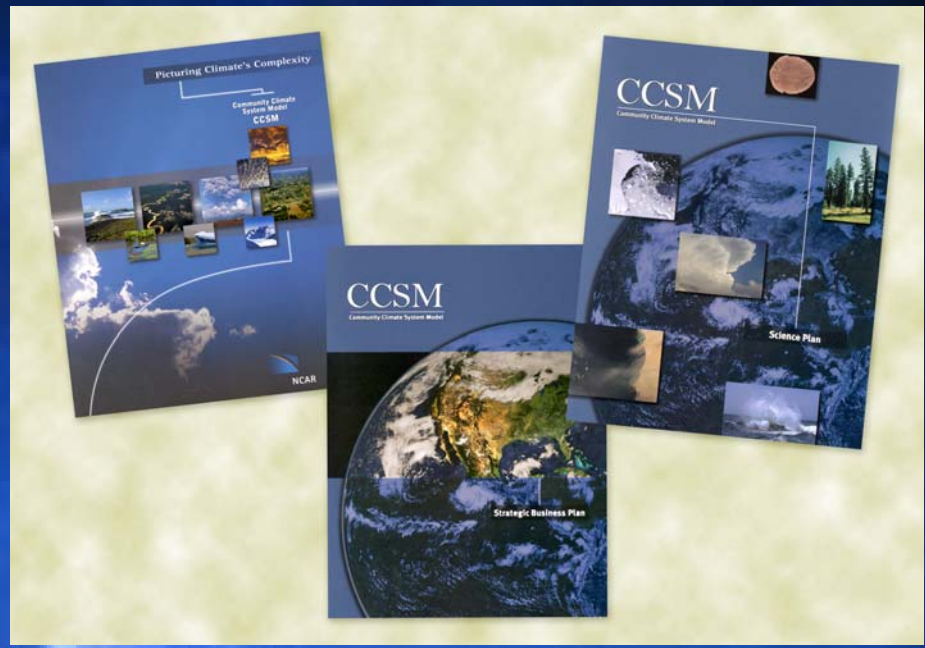
The CCSM Program

Scientific Objectives:

- Develop a comprehensive climate model to study the Earth's Climate.
- Investigate seasonal and interannual variability in the climate.
- Explore the history of Earth's climate.
- Estimate the future of the environment for policy formulation.

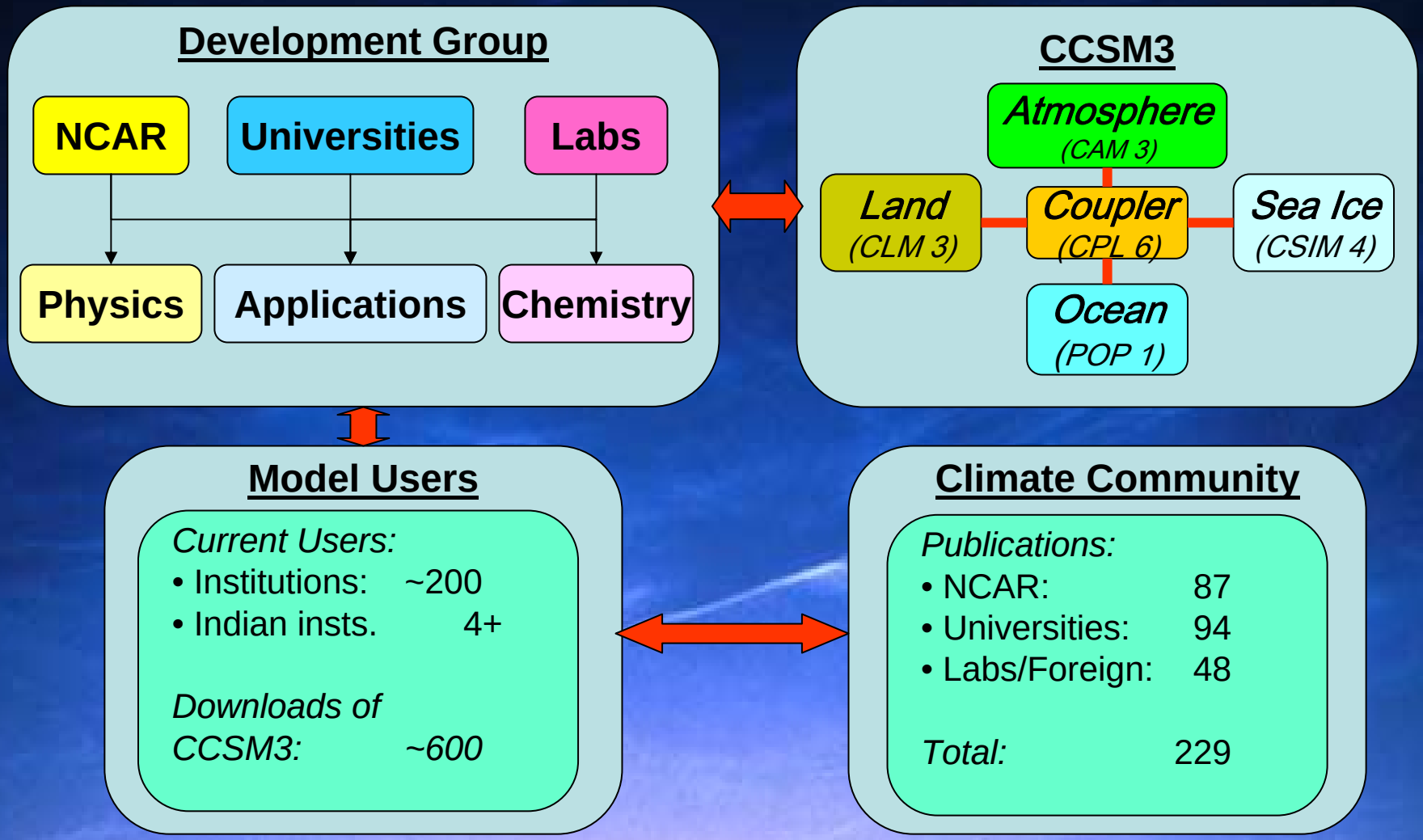
Recent Accomplishments:

- Release of a new version (CCSM3) to the climate community.
- Studies linking SST fluctuations, droughts, and extratropical variability.
- Simulations of last 1000 years, Holocene, and Last Glacial Maximum.
- Creation of largest ensemble of simulations for the IPCC AR4.



http://www.ccsm.ucar.edu

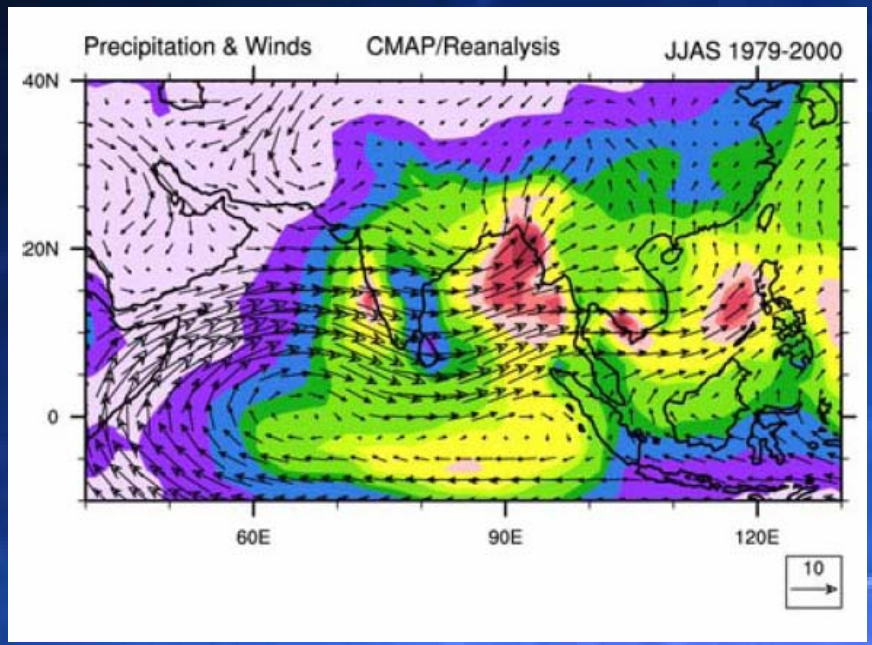
The CCSM Community

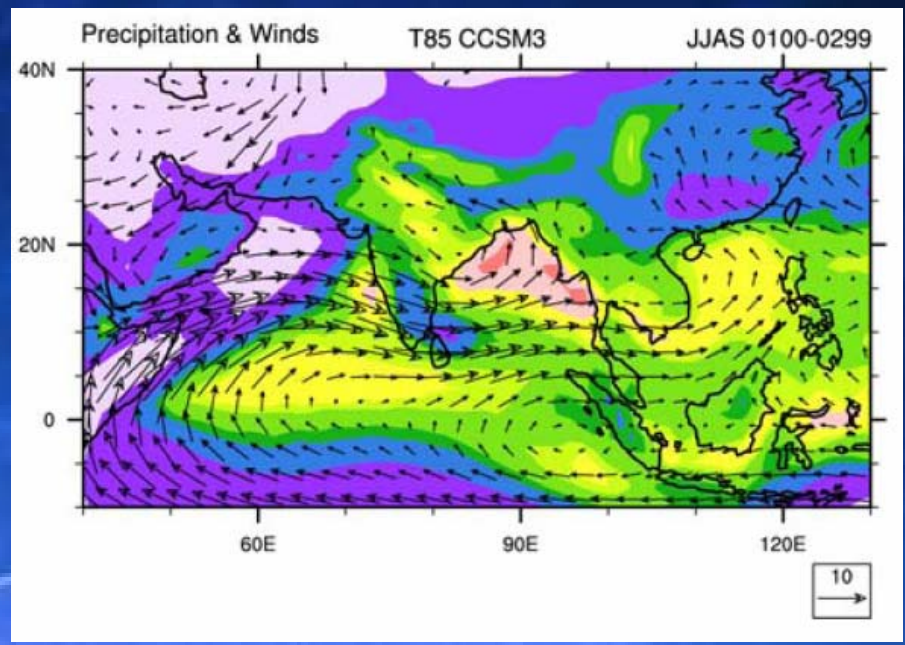


CCSM Resources

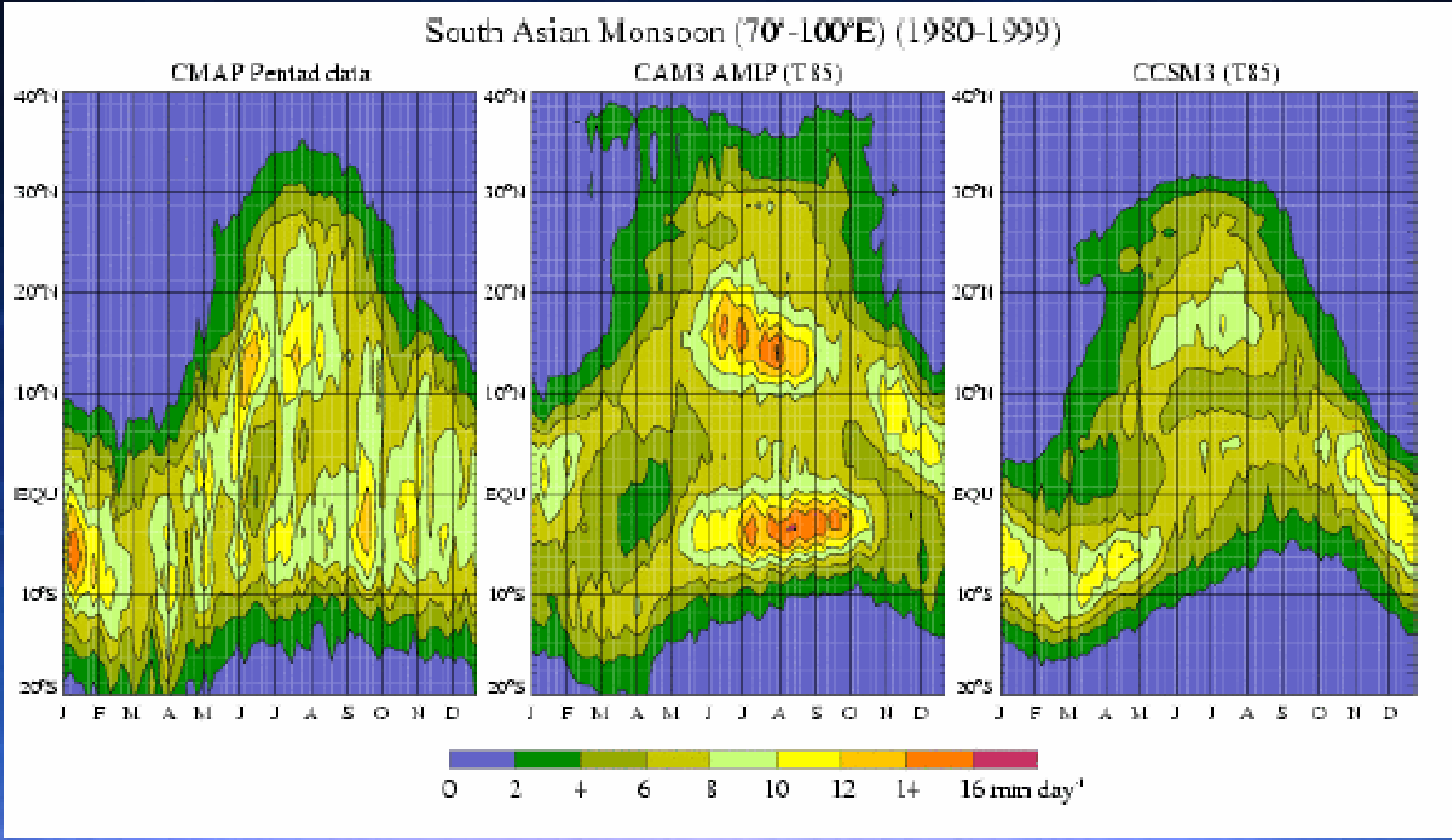
- The model:
  - All the code and documentation is freely available to the global climate community.
- Simulation data sets:
  - All our IPCC and control simulations are freely available.
  - These include 11,000 years of IPCC runs and 4,500 years of control integrations.
  - We provide special data sets for regional modeling.
- The community:
  - Our active collaborators include scientists from 22 U.S. universities and more institutions abroad.
  - This community has expanded to include chemists, biogeochemists, ecologists, hydrologists, & paleoclimatologists.

Simulation of Indian Monsoon





Seasonal Cycle of Monsoon Precipitation

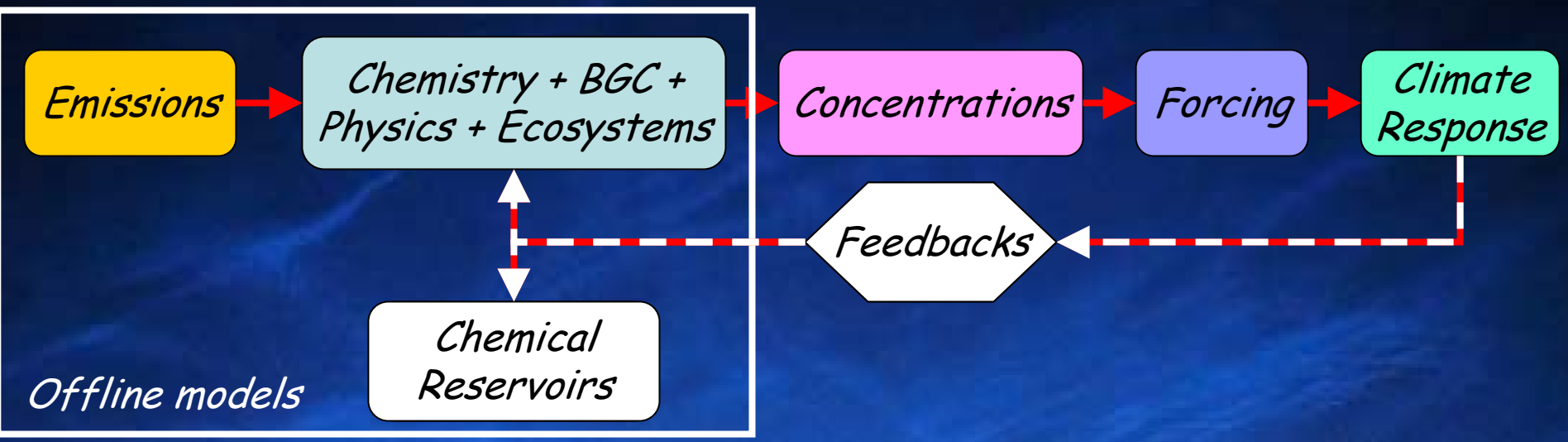


Scientific objectives for the near future

- Major objective:
  Develop, characterize, and understand
  the most realistic and comprehensive model of the observed climate system possible.

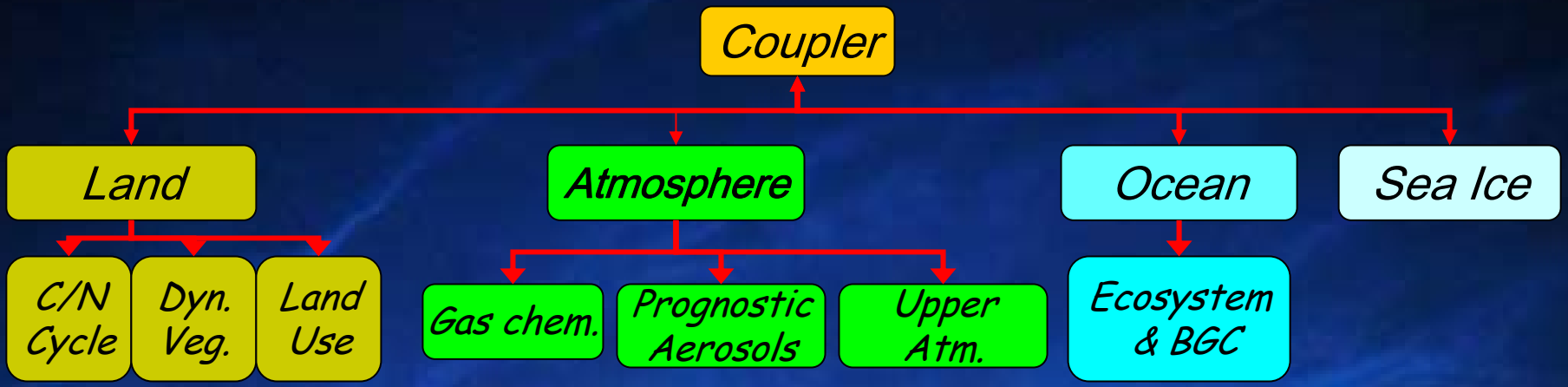
- Subsidiary objectives:
  - Analyze and reduce the principal biases in our physical climate simulations using state-of-the-art theory and observations.
  - Simulate the observed climate record with as much fidelity as possible.
  - Simulate the interaction of chemistry, biogeochemistry, and climate with a focus on climate forcing and feedbacks.

Simulating the chemical state of the climate system



- In the past, we have generally used offline models to predict concentrations and read these into CCSM.
- This approach is simple to implement, but
  - It cuts the feedback loops.
  - It eliminates the chemical reservoirs.
- The next CCSM will include these interactions.

A configuration of CCSM4



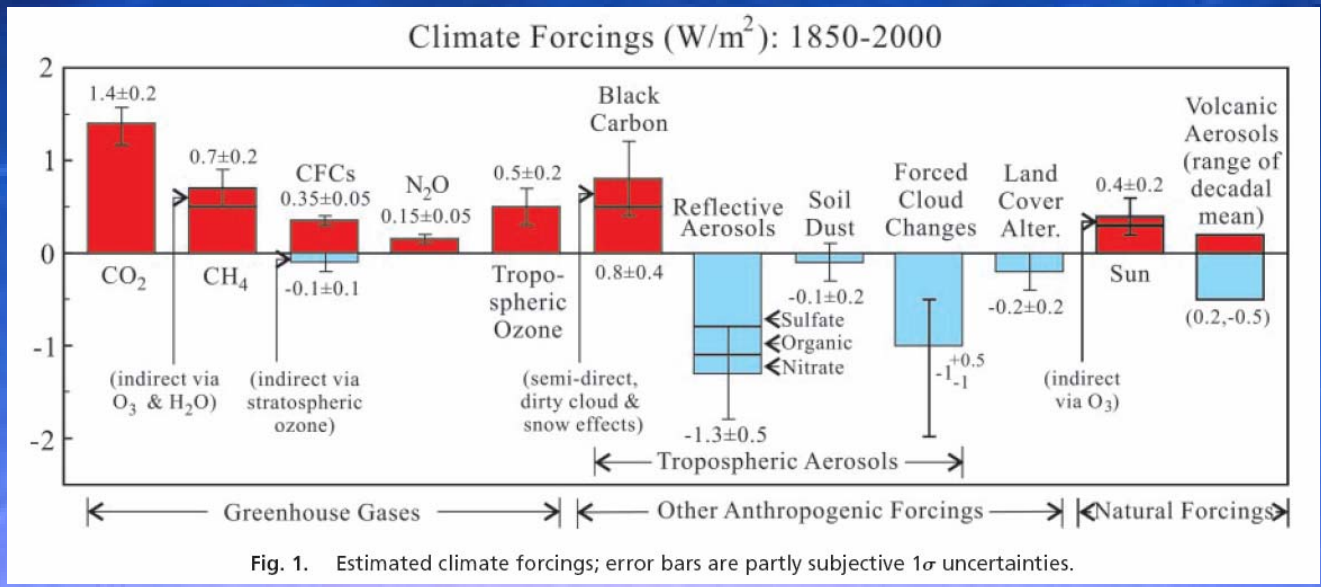


Fig. 1. Estimated climate forcings; error bars are partly subjective 1σ uncertainties.