

Synthesis and Assessment Report 3.1 Draft Outline

August 3, 2006

I. Overview of the state of climate modeling

- A. Describe the main characteristics of coupled atmosphere-ocean general circulation models (AOGCMs), regional climate models (RCMs) and climate models of intermediate complexity (EMICs). (The report will focus primarily on AOGCMs and secondarily on RCMs.)*
- B. Historical background, the relationship to numerical weather prediction models, and a discussion of the increasing resolution and expanding comprehensiveness of models.*

II. Description of major components of global climate system models

- A. Atmospheric GCMs*
- B. Ocean GCMs*
- C. Land surface models*
- D. Sea Ice models*
- E. –Couplings, feedbacks, and the model development process - distinguish between those parts that are validated independent of the climate simulations (reductive) and those that are "tuned" explicitly to improve the simulations (holistic).*

III. Climate simulations discussed in this report

- A. Control runs (constant forcing, except for diurnal and seasonal changes)*
- B. Idealized forcing experiments, especially climate sensitivity tests*
- C. 20th Century time-dependent forcing simulations*

IV. The added value of regional models, using N. America as the focus

- A. Design of downscaling simulations*
- B. Strengths and limitations of regional models*

V. Concise survey of our ability to simulate the continental to global scale structure of the climate and major climate features

- A. Mean climate*
- B. 20th century trends*
- C. More in-depth but relatively brief discussions of specific phenomena (possible topics include --)*

1. Processes

- a) -clouds**
- b) aerosol-radiative interactions**

2. Circulation

- a) extratropical storms**

- b) monsoons
 - c) tropical storms
 - d) Polar climates
 - e) vertical structure of atmosphere
 - f) the Atlantic overturning circulation
3. Modes of variability
- a) Madden-Julian oscillation
 - b) ENSO
 - c) multi-decadal variability
4. Extreme events
- a) precipitation
 - (1) droughts, particularly over N. America and Africa),
 - (2) excessive rainfall leading to floods
 - b) heat and cold waves
5. North America emphasis
- a) North American Monsoon
 - b) Great Plains low level jet

VI. Discussion of uncertainties in climate modeling and the future direction of model development and application

- A. Cloud-resolved models*
- B. Biogeochemistry*
- C. Ecosystem dynamics and dynamic vegetation*
- D. Surface /subsurface hydrology*