15.023J / 12.848J / ESD.128J Global Climate Change: Economics, Science, and Policy
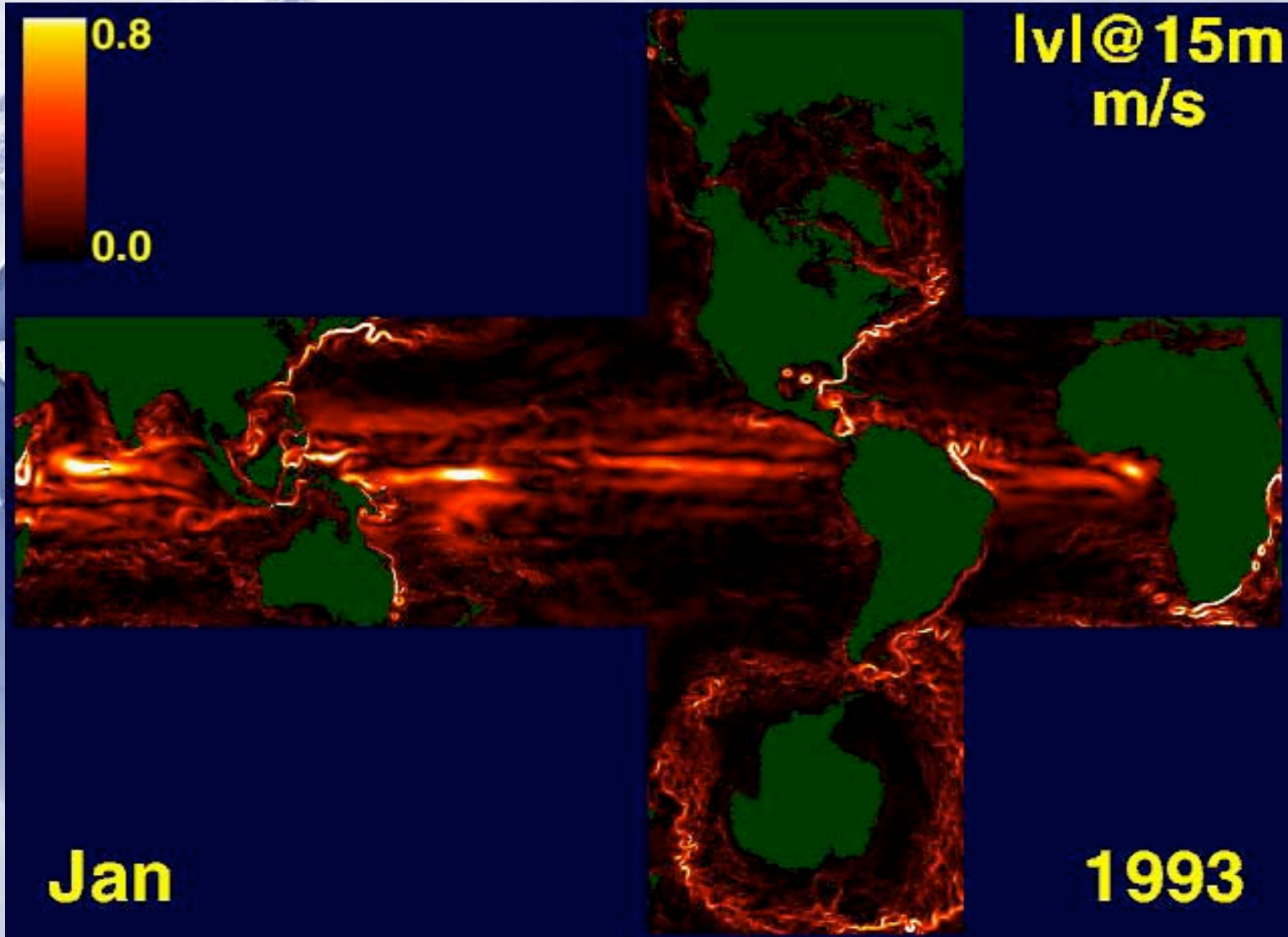Spring 2008

WHAT IS THE NATURE OF THE SYSTEM THAT DETERMINES CLIMATE?
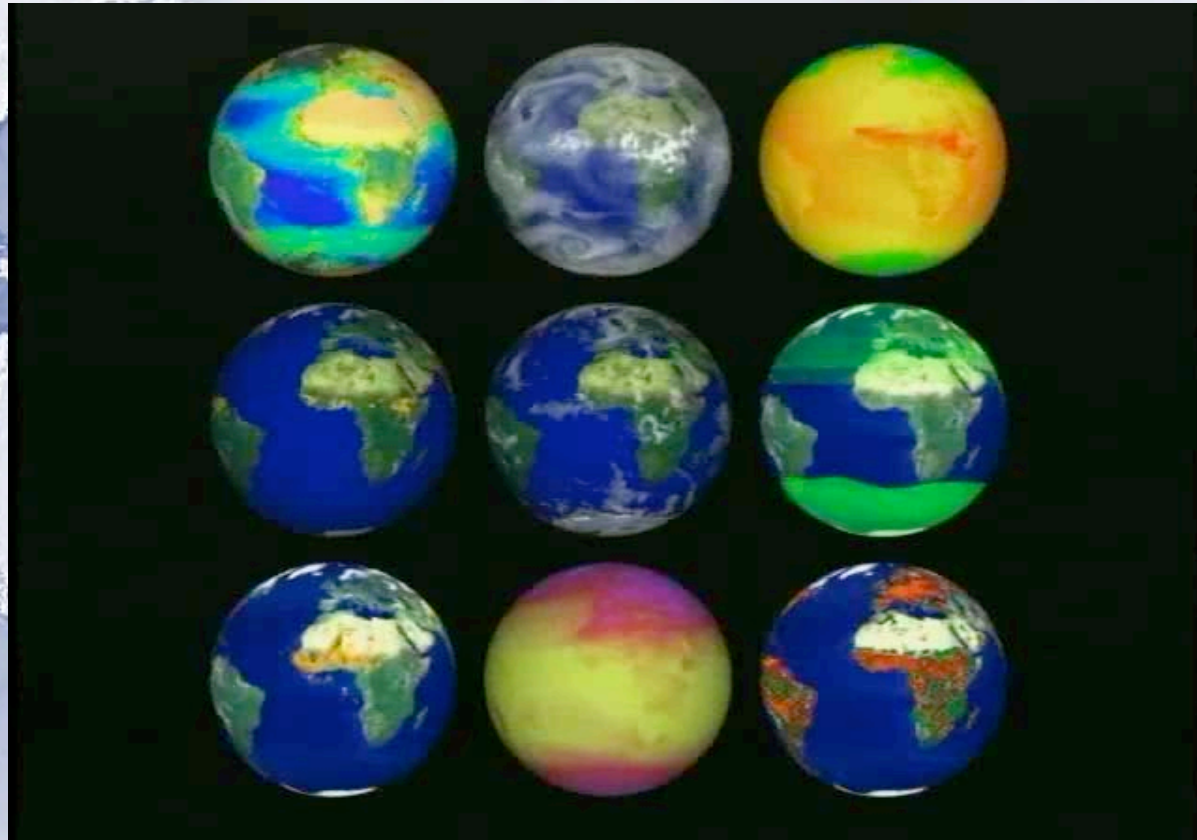
IMAGES From NASA's TERRA satellite

Investigation of this complex system requires an integrated approach

AN EXAMPLE: OCEAN CIRCULATION MODEL
(CGCS CLIMATE MODELLING INITIATIVE)

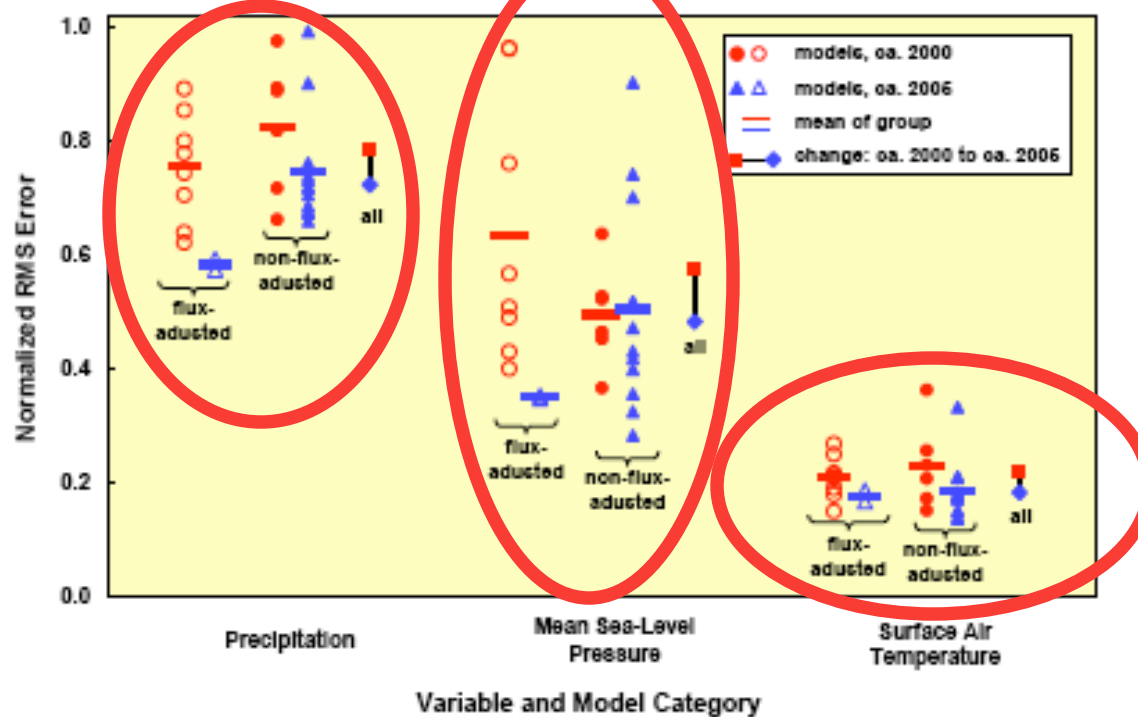**USES NOVEL CUBED SPHERE GRID** **CURRENTS AT 15 METERS DEPTH**

Figure 8.11. Normalized root-mean-square error in simulation of climatological patterns of monthly precipitation, mean sea-level pressure, and surface air temperature. Recent AOGCMs (ca. 2005) are compared to their predecessors (ca. 2000, and earlier). Models are categorized based on whether or not any flux adjustments were applied. The models are gauged against the following observation-based datasets: CMAP (Xie and Arkin, 1997) for precipitation (years 1980–1999), ERA40 (Uppala et al., 2005) for sea-level pressure (years 1980–1999), and CRU (Jones et al., 1999) for surface temperature (years 1961–1990). Before computing the errors, both the observed and simulated fields were mapped to a uniform 4 x 5 degree latitude-longitude grid. For the earlier generation of models, results are based on the archived output from control runs (specifically, the first 30 years, in the case of temperature, and the first 20 years for the other fields), and for the recent generation models, results are based on the 20th Century simulations with climatological periods selected to correspond with observations. (In both groups of models, results are insensitive to the period selected.)

Ref: IPCC 4th Assessment, Chapter 8, 2007

OCEAN and LAND BIOSPHERES PLAY A SIGNIFICANT ROLE IN CLIMATE

ECOSYSTEM IMPACTS ON CLIMATE (reflectivity, water & carbon cycles, natural non-CO2 gas emissions)
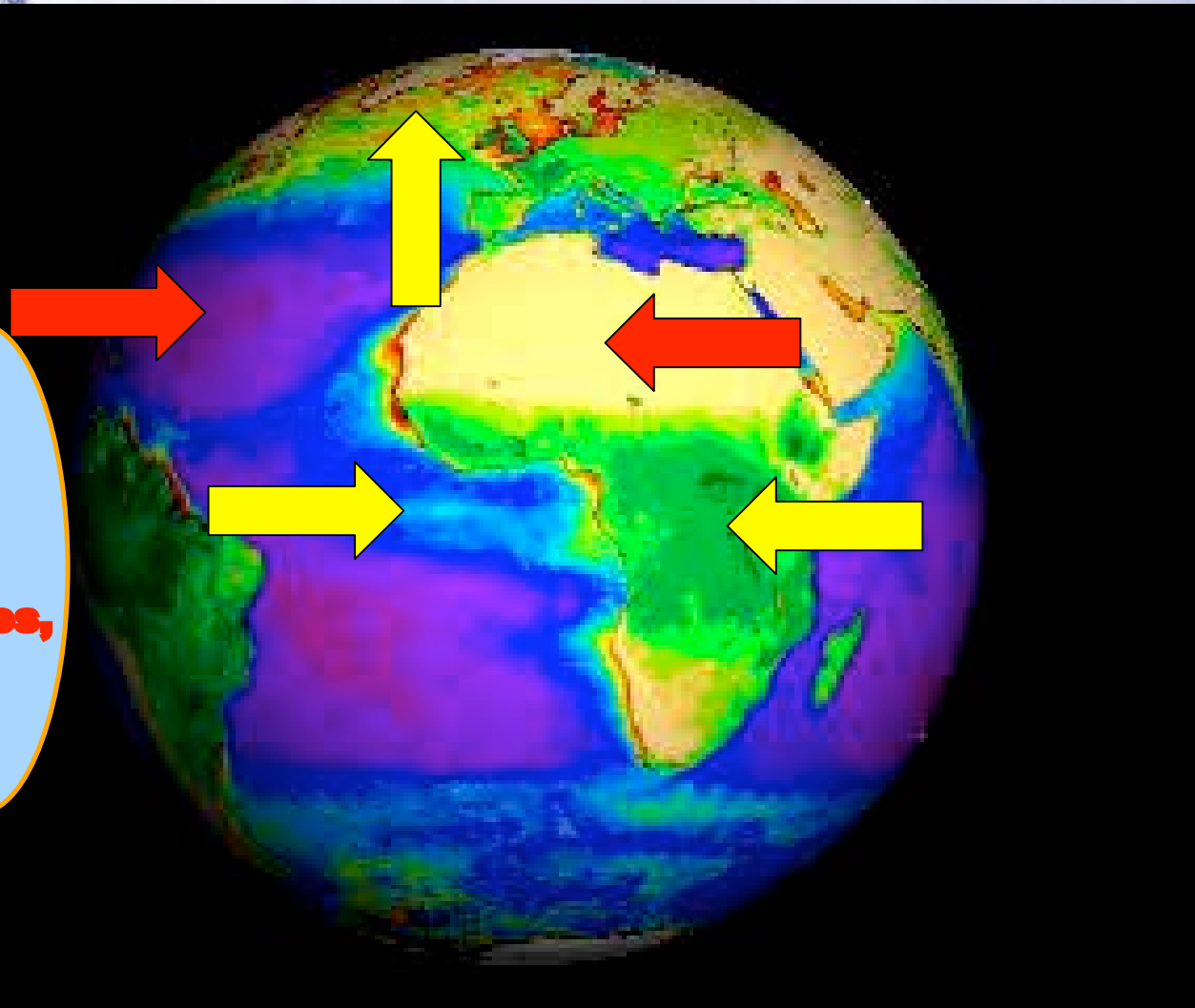
Sensitivity Analysis using the
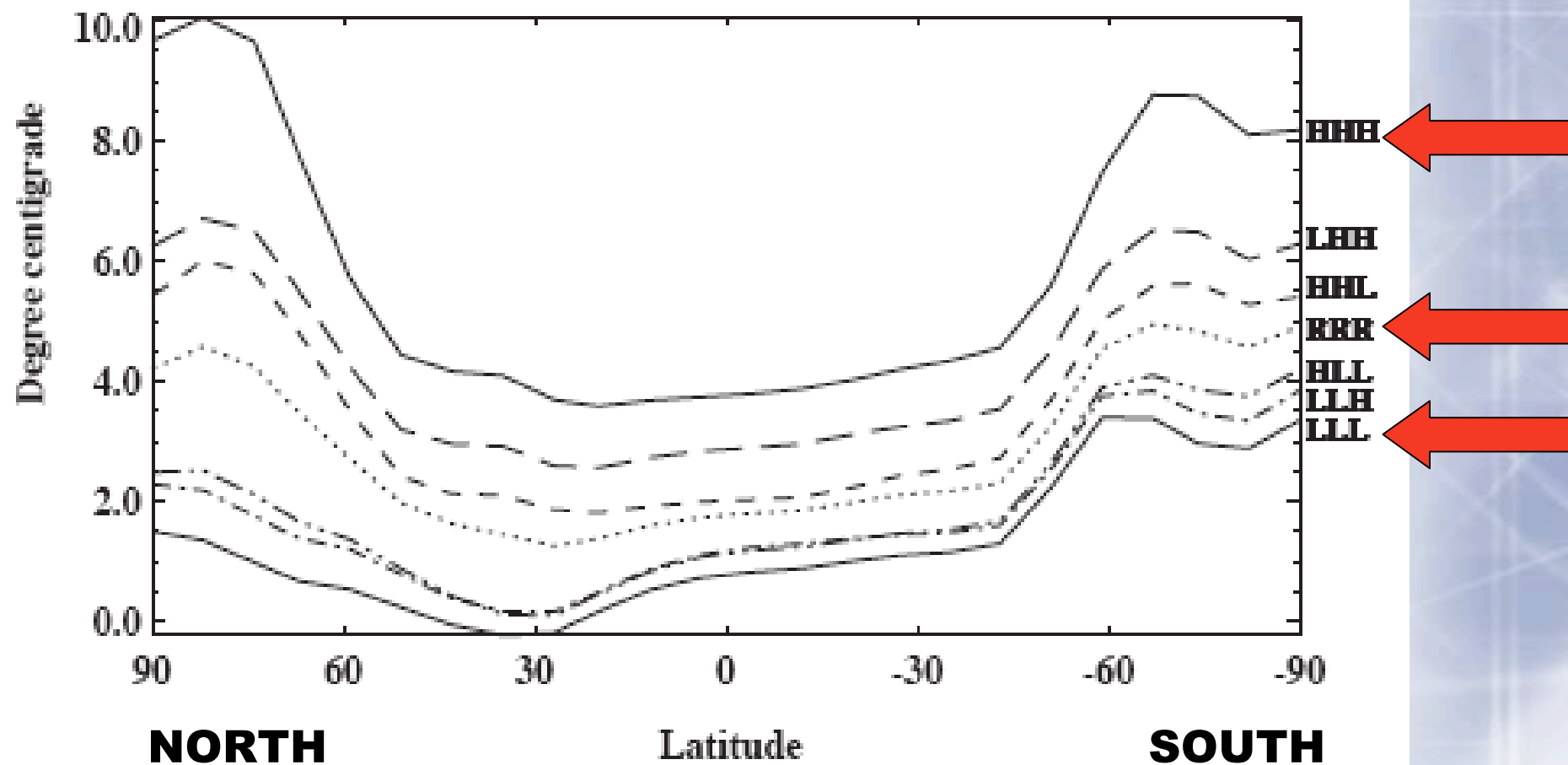# MIT INTEGRATED GLOBAL SYSTEM MODEL VERSION 1
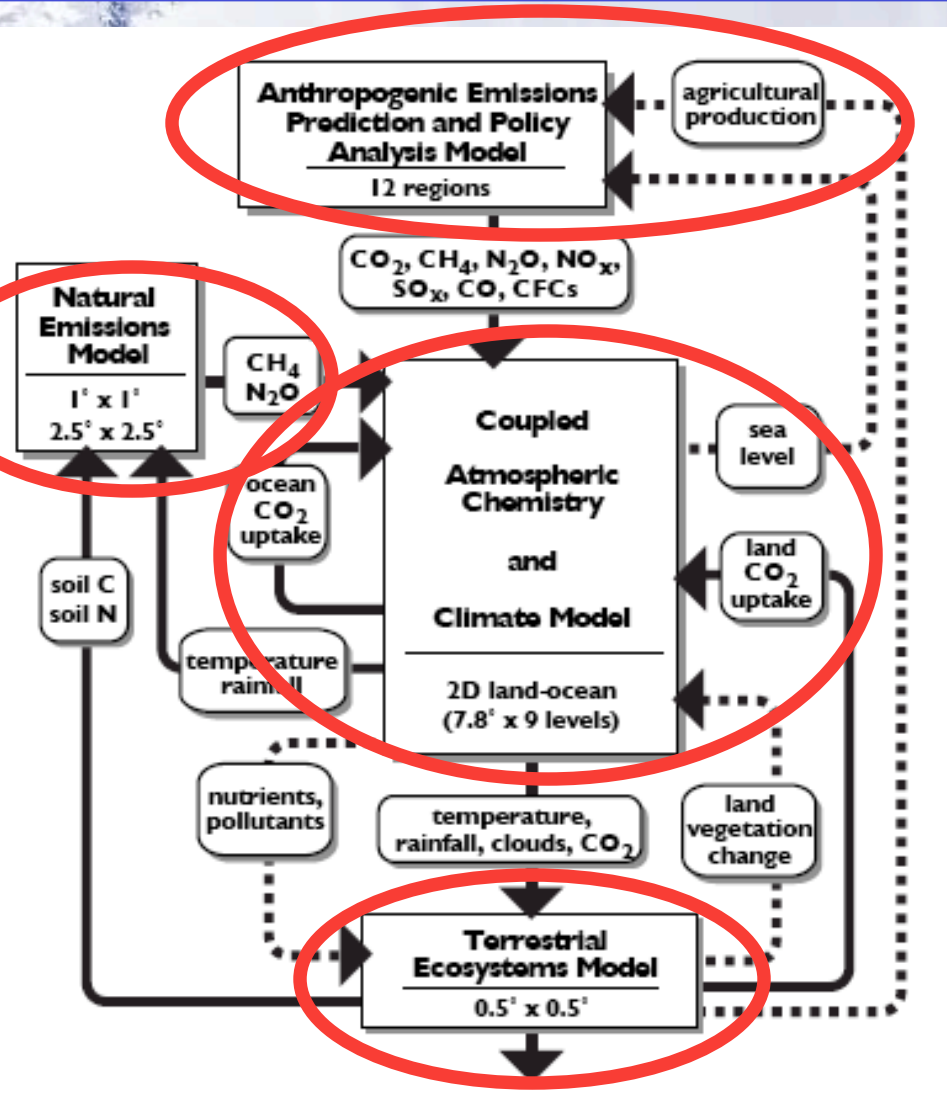
Ref: Prinn et al, Climatic Change, 41, 469-546, 1999

Schematic Illustrating the seven runs performed for the Sensitivity Analysis of the IGSM 1. Open ellipses denote points in sequence where output is available, with the letters in the ellipse denoting the identifying symbol for the output.

Ref: Prinn et al, Climatic Change, 41, 469-546, 1999
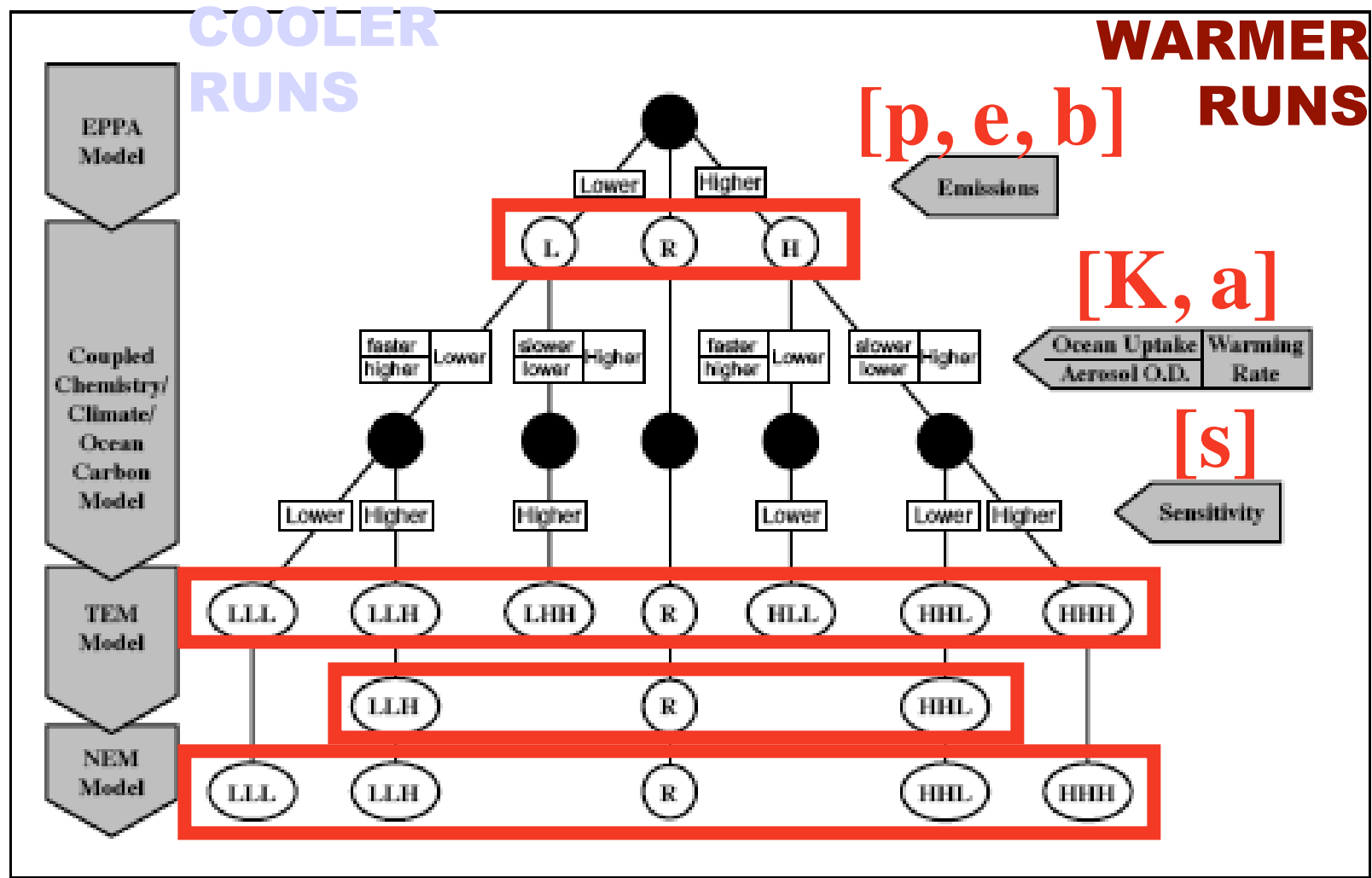
Sensitivity of Temperature Change from 1990 to 2100 to assumed: Emissions (p, e, b); Ocean Heat & Carbon Uptake and Aerosol Forcing (K, a); & Climate Sensitivity (s)

Ref: Prinn et al, Climatic Change, 41, 469-546, 1999