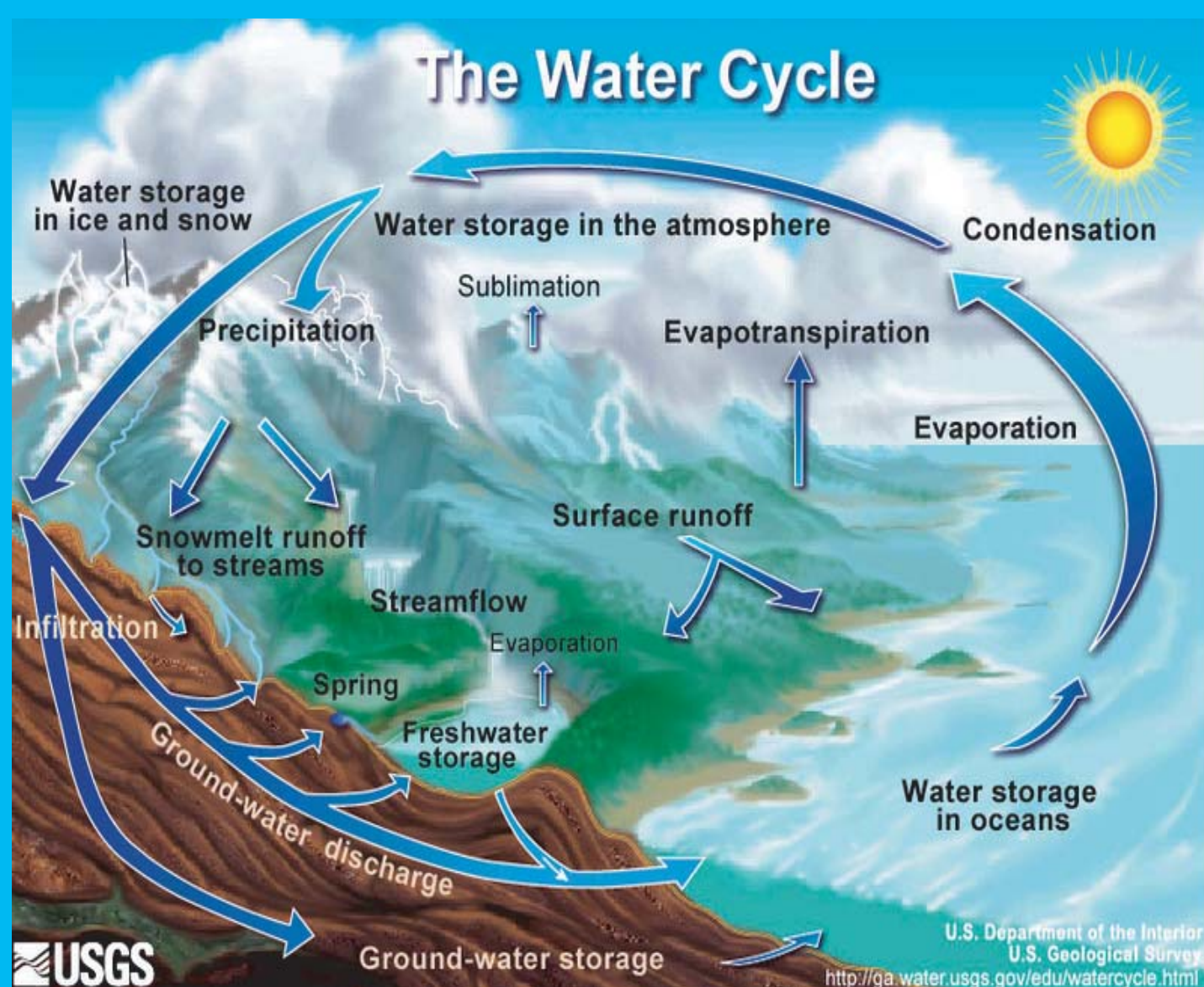


# Understanding Climate Change: Climate Modeling

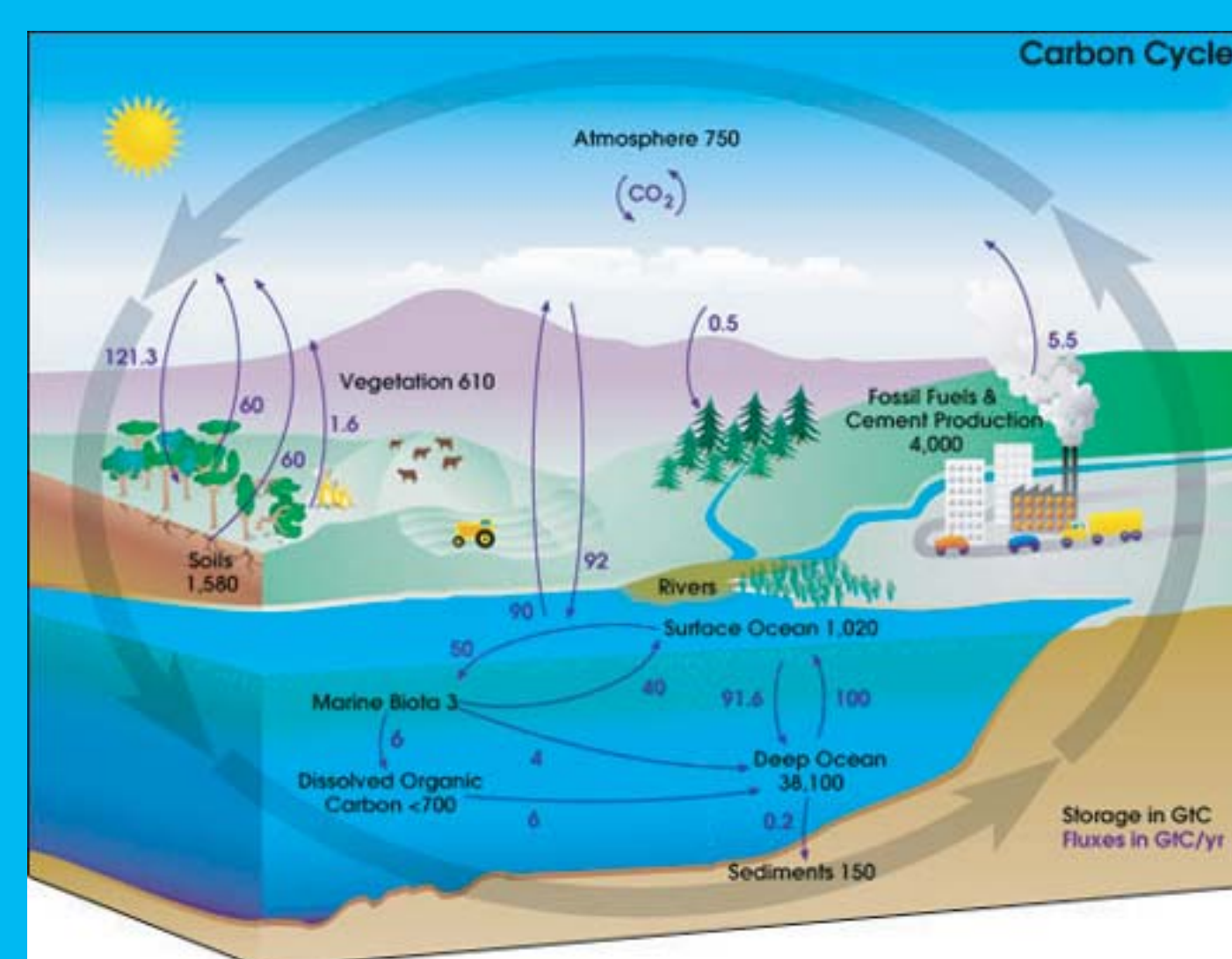
## What is a climate model?

- \*A climate model is a computer model that is capable of simulating many earth processes.
- \*The following graphics represent some of the processes simulated by General Circulation Models (GCMs).



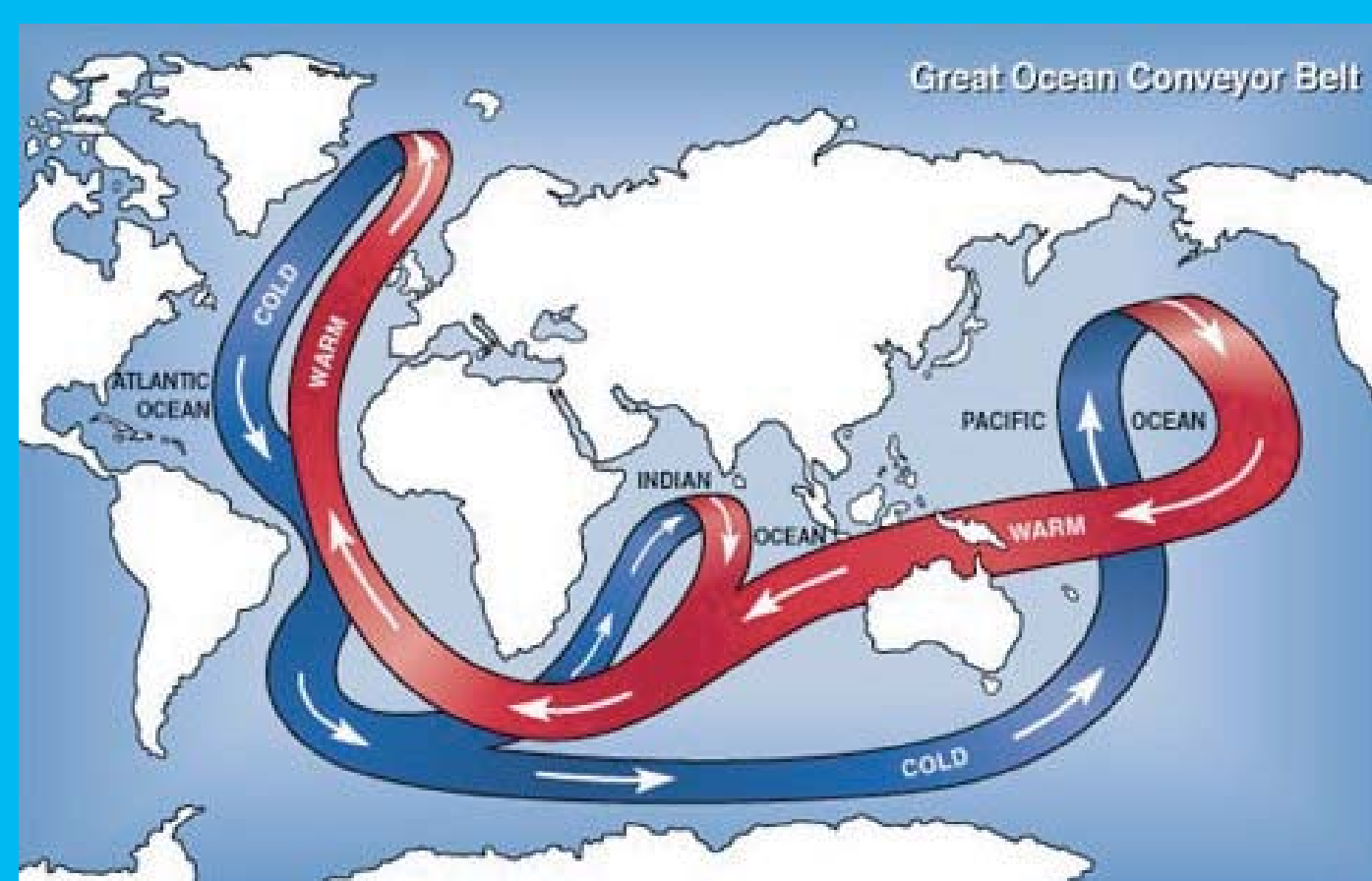
### The Hydrologic Cycle:

The transport and storage of water molecules between the atmosphere, land and ocean reservoirs



### The Carbon Cycle:

The transport and storage of carbon dioxide molecules between the atmosphere, land, and ocean



### Great Ocean Conveyor Belt (Thermohaline Circulation):

The slow cycling of surface ocean waters to the deep ocean due to density differences.

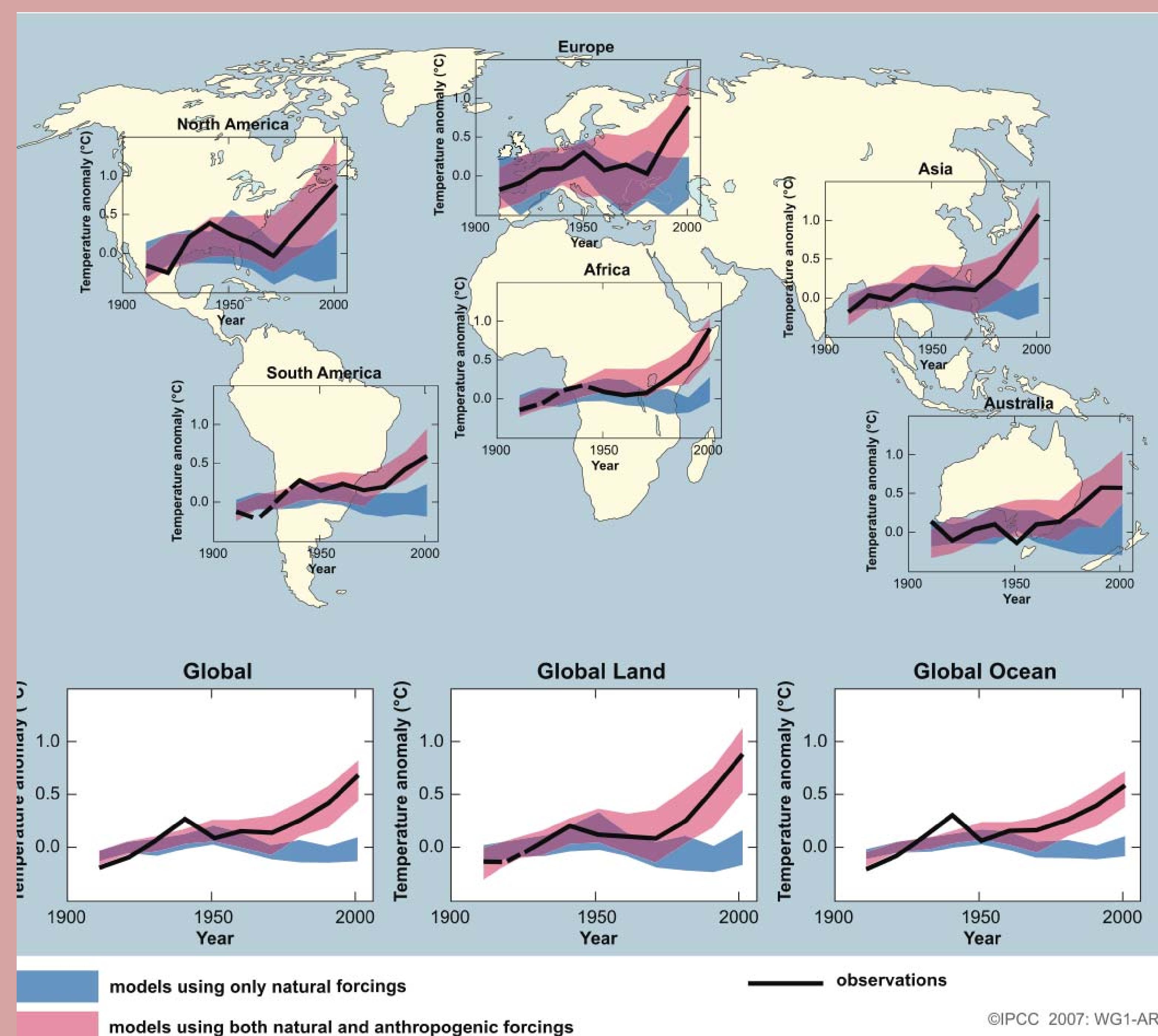
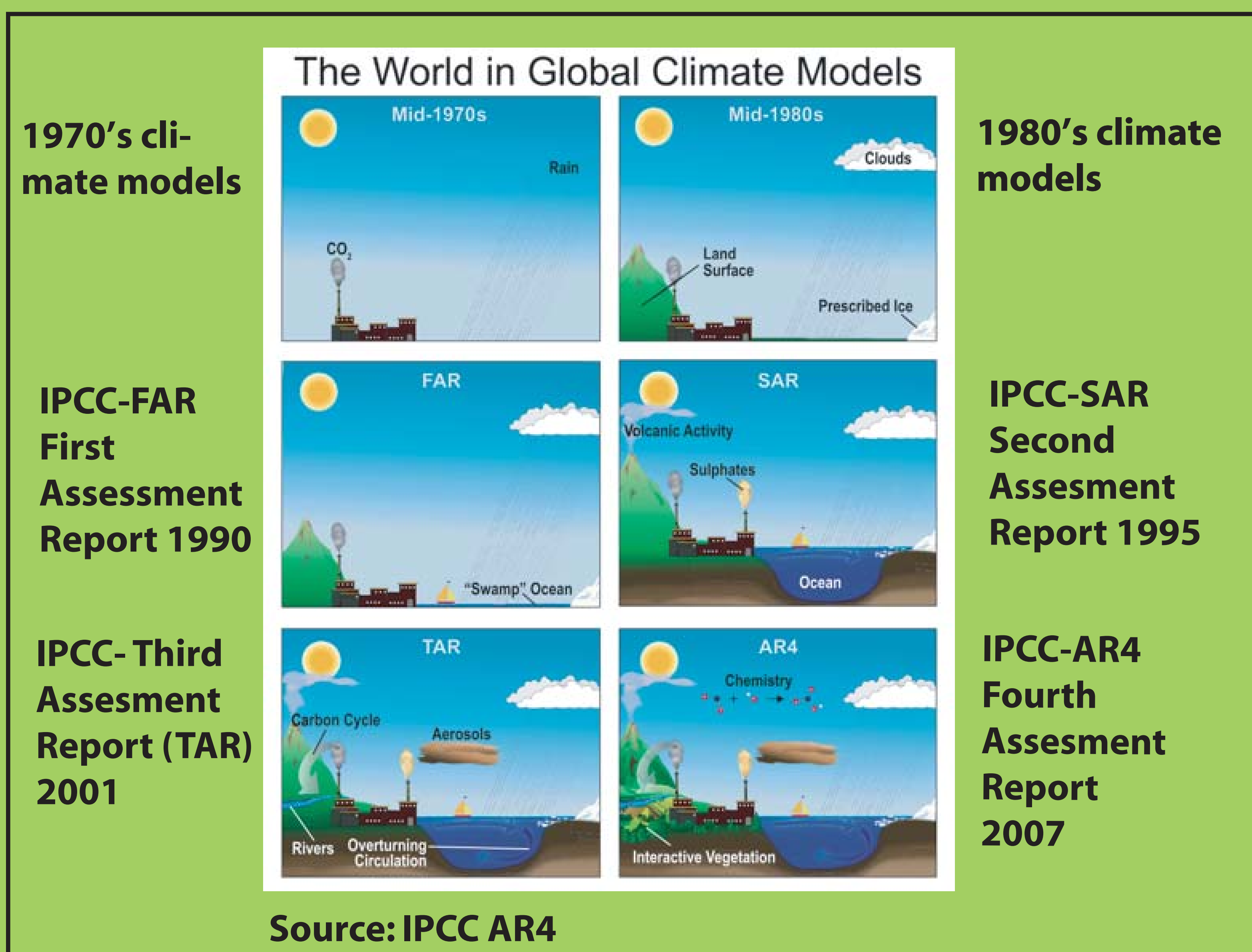
## Main Points

- \*Climate models are capable of simulating many complicated earth processes
- \*Climate models advance in complexity and speed as technology improves
- \*Model simulations of increasing temperature match observations. This fact verifies the predictive ability of climate models

*Models attribute observed temperature increase to human activity*

## A Short History of Climate Model Advances

The earliest GCMs designed in the 1970's could only model a limited number of earth's physical processes. The illustration below shows what processes have been added to GCMs in the past 30 years



The following diagram shows regional and global temperatures as simulated by GCMs. The blue line indicates how much the earth will warm in the absence of factors attributable to human activity. The pink line shows warming with natural forcing and human activity. Note the pink line model simulations that match observations of warming temperatures. **The fact that model simulations match observations of warming increase confidence in the predictive ability of climate models.**