

A photograph of a bright sun in a clear blue sky, with lens flare rays extending downwards. Below the sun is a vast expanse of dark blue ocean covered with numerous small, white, irregularly shaped pieces of sea ice.

Global Warming

Lecture 5.1

Global Climate Models

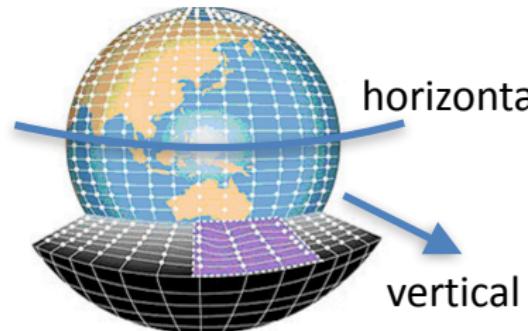
Global Climate Models (GCMs)

Used to forecast the climate.

GCMs break the ocean and the atmosphere up into **gridboxes**, in which each variable (temperature, pressure, etc.) takes a single value.

The models solve *partial differential equations* relating the values of variables on each gridbox to one another, and step these values forward in time.

The GCMs are run on supercomputers.



The oldest “supercomputer”

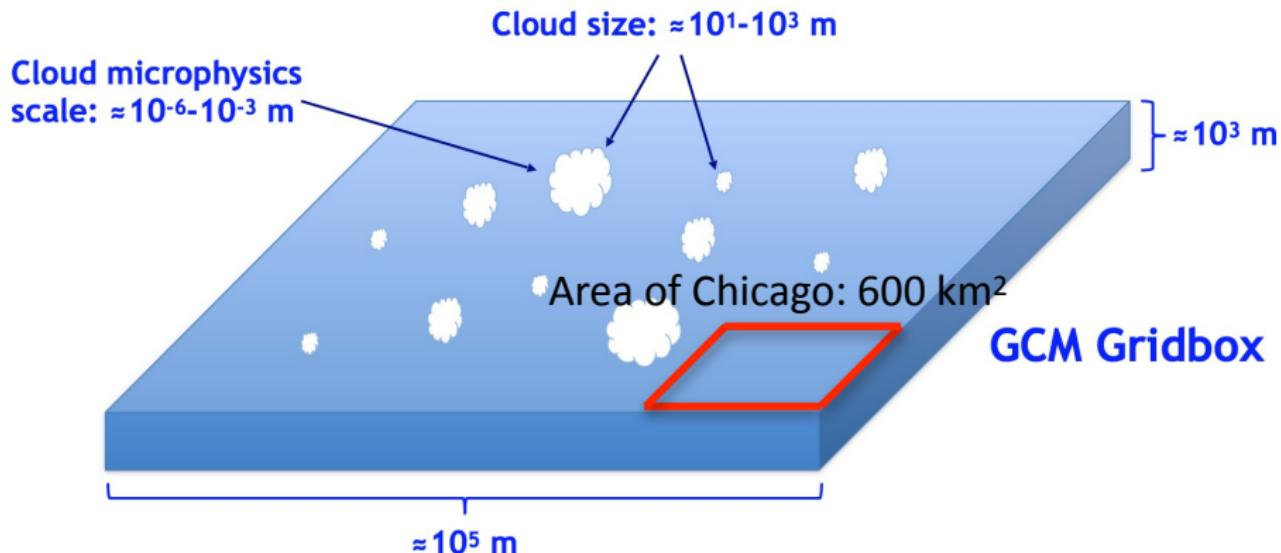


Figure 1. This illustration depicts Richardson's "forecast factory." Image courtesy of L. Bengtsson.

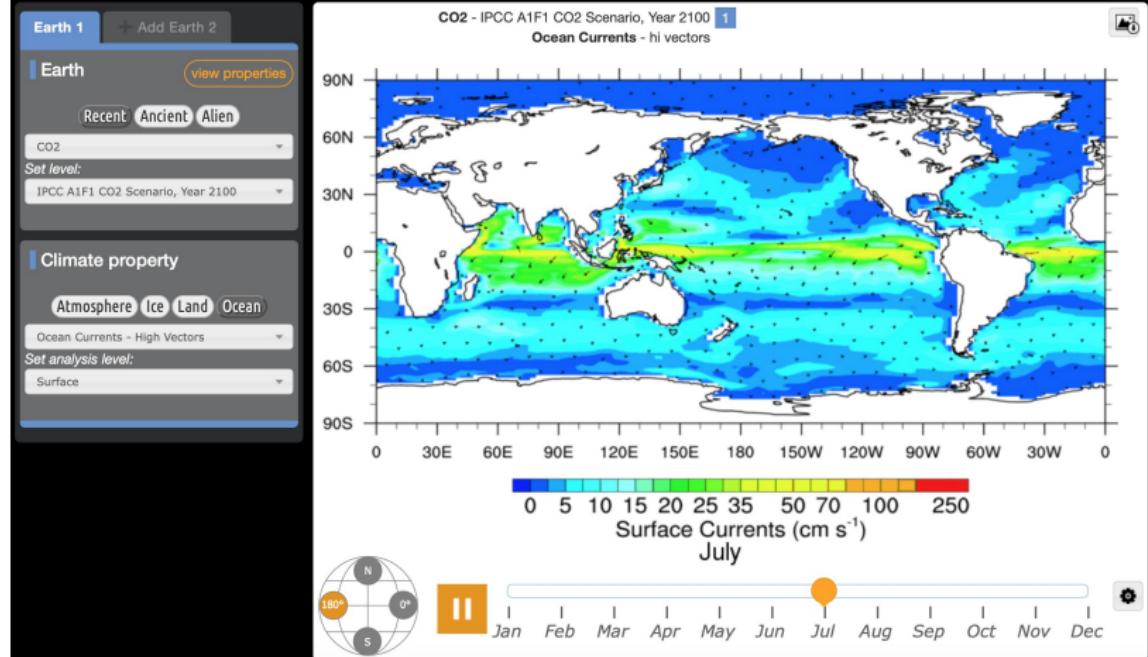
GCMs cannot resolve clouds!

These GCM grid boxes are much larger than the horizontal dimension of a typical cloud, and even larger than the size of cloud droplets which determine cloud microphysics.

> Clouds are usually parametrized



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