Predicting Climate Change

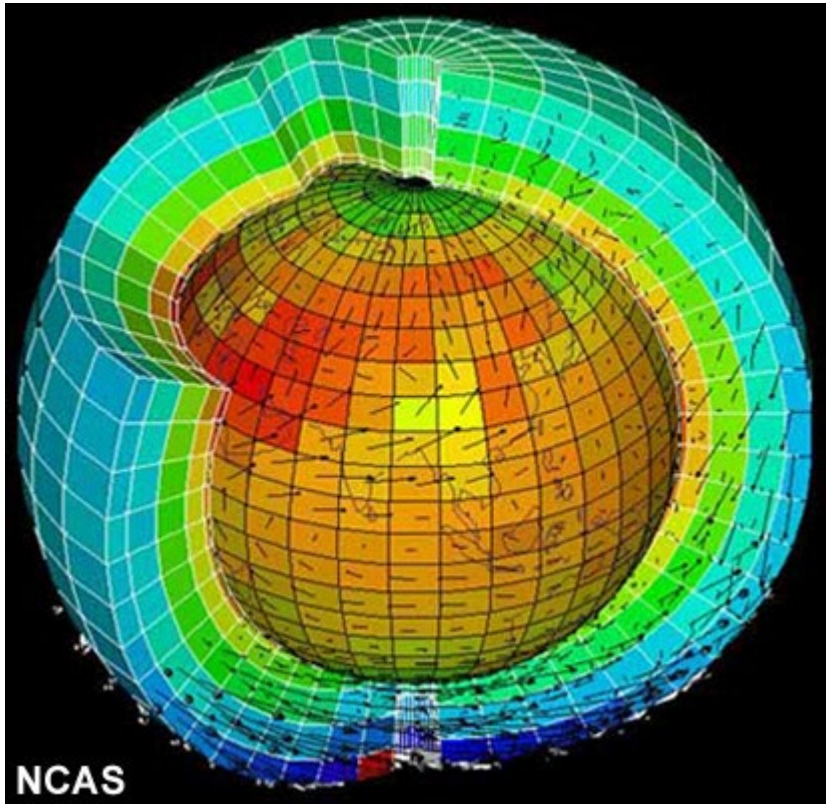
How is climate change predicted?

Scientists use experiments to explore how things work and to test predictions. However, the climate is far too large and too complicated to be reproduced in a laboratory.

Instead, **computer models** are used to represent the climate and explore the possible effects of human actions.

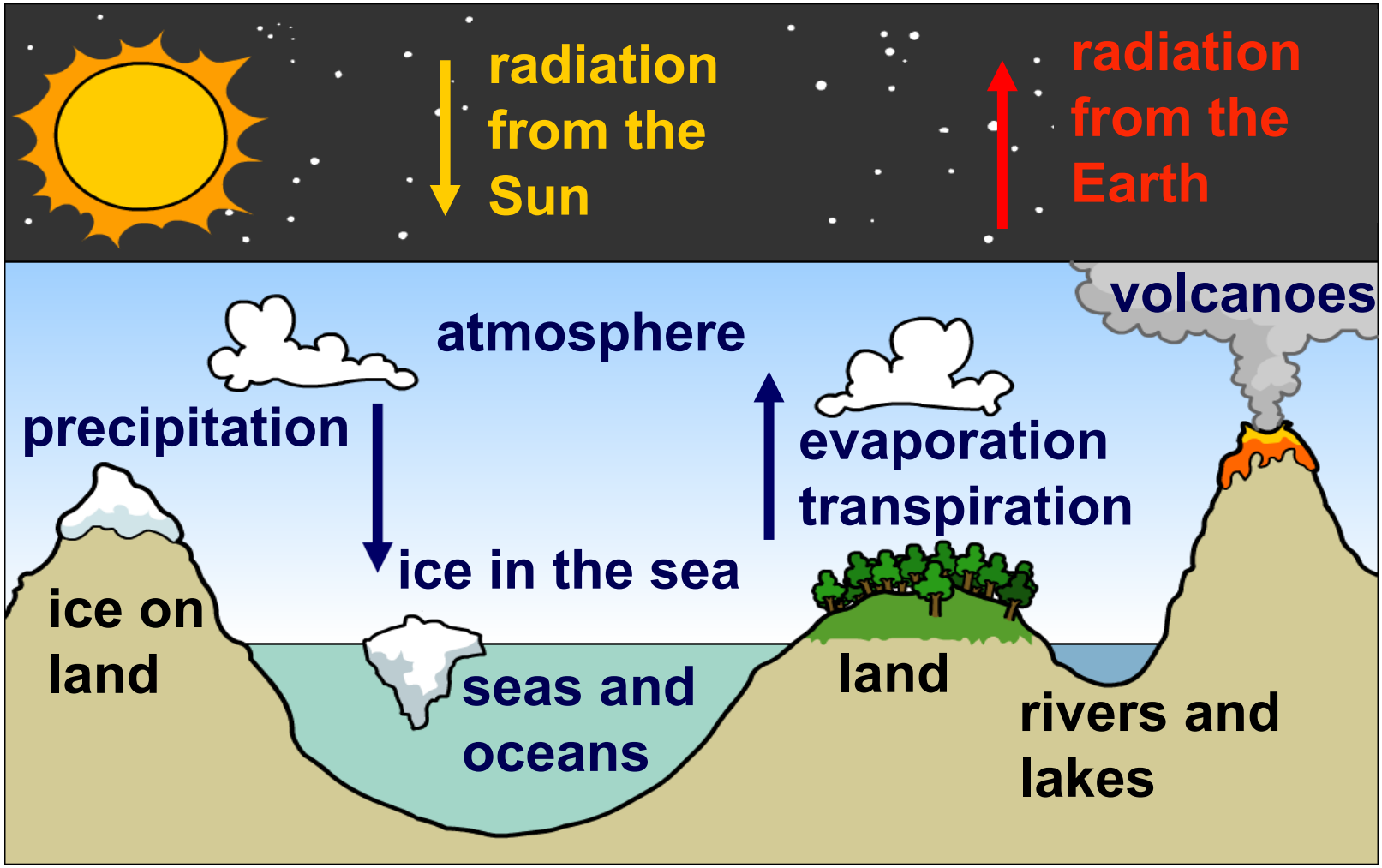
Mathematical formulae are used to represent the separate parts of the climate system and how they interact.

In models, the Earth is divided into grid squares. Using smaller squares increases the detail.



How is the climate modeled?

There are many factors that can affect the climate. All these interactions need to be included in climate models.



What is a supercomputer?

Computers were developed in the 1960s and have been getting more and more powerful ever since.

The Earth Simulator center in Japan has one of the largest computers used for climate modeling.

It can work at a speed of **35,000,000,000 calculations per second**!

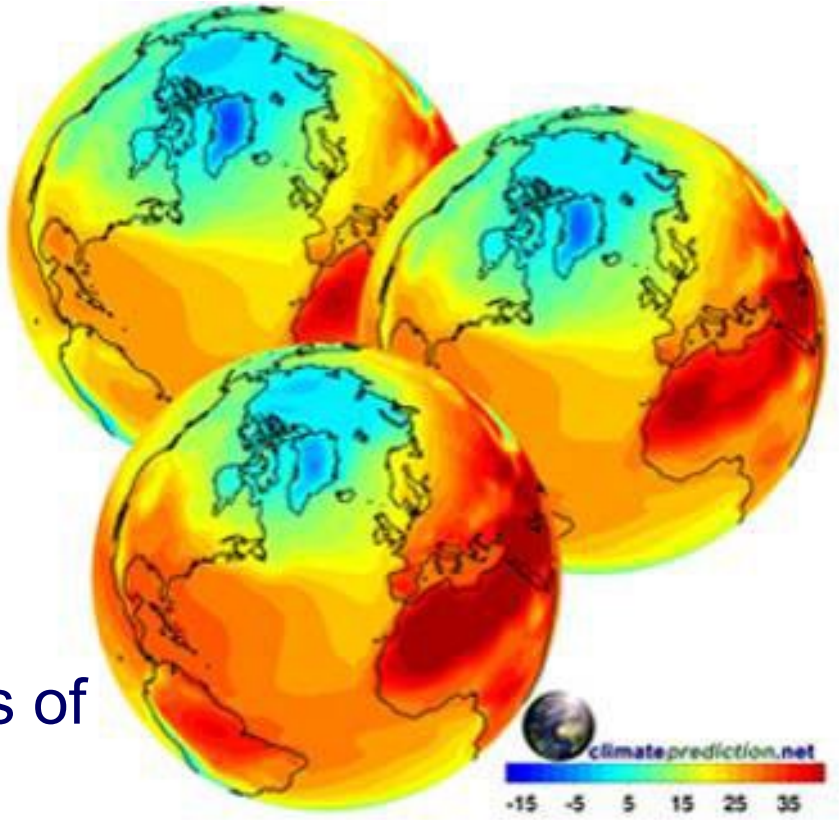
Powerful computers like this make it possible to model the complexity of the climate system.


Earth Simulator Centre / NCAS

How can I help predict climate change?

Climateprediction.net is a climate modeling program that can be run from home and school computers.

- Instead of using one supercomputer, lots of smaller computers are used to run climate models. This is called ‘distributed computing’.
- The project has been running since 2004 and uses over 90,000 computers worldwide.
- These globes show the results of simulations to predict how the temperature may change in response to greenhouse gases.



How accurate are climate models?

Within a small section of the scientific community there is still some scepticism about the accuracy of the predictions produced using climate models.

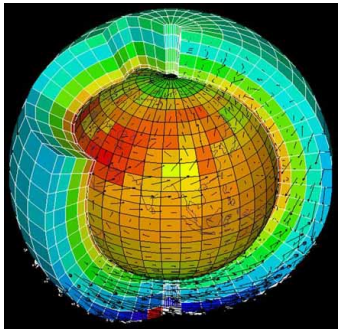
Arguments against using climate models include:

- Climate models do not measure local variability well.
- It is difficult to model aspects of the climate like clouds. Cloud cover greatly influences surface temperature. Not including clouds in models could reduce their accuracy.
- To predict the contribution of humans to climate change, the models have to make assumptions about population and economic growth. This could cause prediction errors.

How are climate researchers trying to solve these problems?

How are climate models tested?

Climate change researchers take several steps to make model predictions more reliable.



- Data from previous climates is entered into the model. This tests the ability of the model to reproduce known climates.
- Scientists usually report a range of projections or scenarios. These can show, for example, how the climate might change if human carbon dioxide production stays the same, if it decreases, or if it increases.
- The International Panel on Climate Change (IPCC) is a UN organization that is responsible for assessing climate change data. They use information from different computer models to write reports for governments about the science of climate change.