

## 12.312: Understand and run your own climate model

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Meet MWF Jan 5-28 except MLK day; 10am-12:00pm in 54-1615  
Class webpage: <http://stellar.mit.edu/S/course/12/ia11/12.312/>

### Description

Overviews the fundamentals of simulating the Earth’s climate. Basic background on the processes maintaining the climate is provided. Students run simple climate models (radiative-convective equilibrium and energy balance models) in Matlab and analyze output from the comprehensive climate models used in global-warming assessments. The components of a modern general circulation model will be discussed.

Prereq: GIR:PHY1, GIR:CAL1  
Level: U 6 units Graded P/D/F

### Syllabus

1. Introduction to climate and matlab tutorial
2. Radiation and convection: 0D and column radiation models
3. Poleward energy transport and ice-albedo: 1D (in latitude) energy balance model
4. Basic dynamics: spinup of fluid-dynamical instability
5. Modern climate models and climate change experiments: analysis of climate model output

### Subject Evaluation

1. One problem set per class
2. A short (five-slide) presentation at the end of the course on one research paper that is accessible to non-specialists. A list of papers will be given out in the first class meeting.

### References

Some readings will be handed out in class

#### *Textbooks:*

Global Physical Climatology, Hartmann  
Global warming: understanding the forecast, Archer (Popular science)  
A climate modelling primer, McGuffie  
The Physics of Atmospheres, Houghton

#### *Websites:*

Fourth IPCC report, sections 8 and 10: <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>  
Numerical Recipes in *C or other languages*, Press (<http://www.nr.com/oldverswitcher.html>)