

12.812: The general circulation of the atmosphere and climate change

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Meet Tuesday and Thursday 2-3:30 in 54-824 (only meets once a week in Part 2)

Class webpage: www.mit.edu/~pog/812.html

Description

Describes the general circulation of Earth’s atmosphere and its maintenance. Second half of the course explores the response of the general circulation to climate change.

Topics

Part 1: Data sources and space-time decomposition, mean state and circulation (including the hydrological cycle), energetics, angular momentum and the transformed Eulerian mean, momentum flux cospectrum and Rossby wave chromatography, low-frequency variability.

Part 2: Use what we learned in Part 1 to discuss the general circulation of the atmosphere in different climates. We will read 1-2 papers a week. Possible topics include the effect of climate change on storm track intensity, jet position, superrotation and the MJO, the Walker cell, stationary waves, the pole-to-equator temperature difference and poleward energy flux, hydrological cycle, and the effect of sea-ice loss on the midlatitudes.

Subject Evaluation

Part 1: Three problem sets.

Part 2: Participation in class discussion. A student leads the discussion each week and writes a summary. Students answer short online questions on the reading prior to the class.

References

Textbook: Physics of Climate, Peixoto and Oort

Textbook: An Introduction to Dynamic Meteorology, Holton and Hakim

Review paper: The general circulation of the atmosphere, T. Schneider, Annu. Rev. Earth Planet. Sc., 2006

Review paper: Response of the large-scale structure of the atmosphere to global warming, Vallis et al, QJRMS, 2015