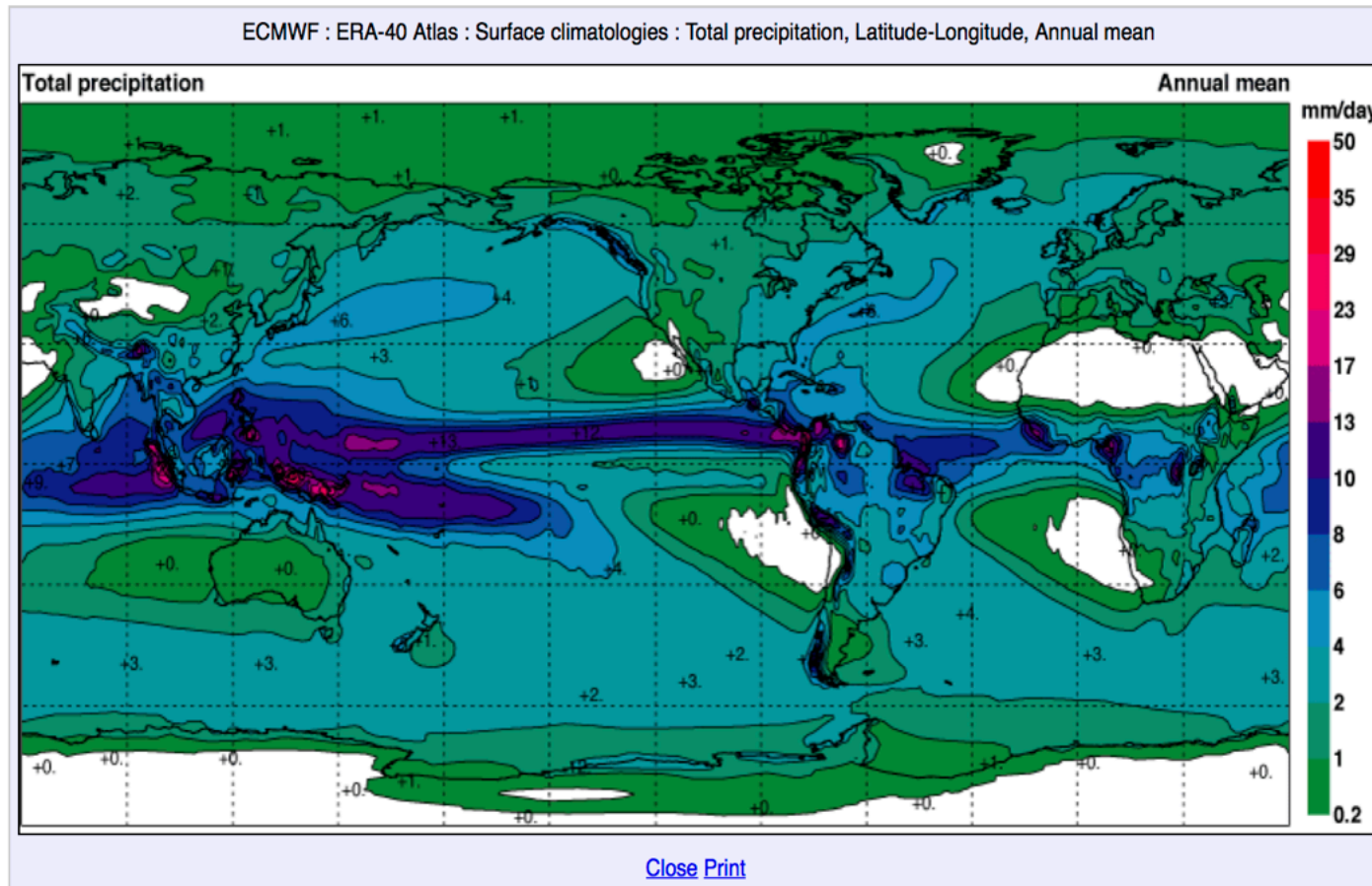


Climate Dynamics 610: Introduction to the Physical Climate System

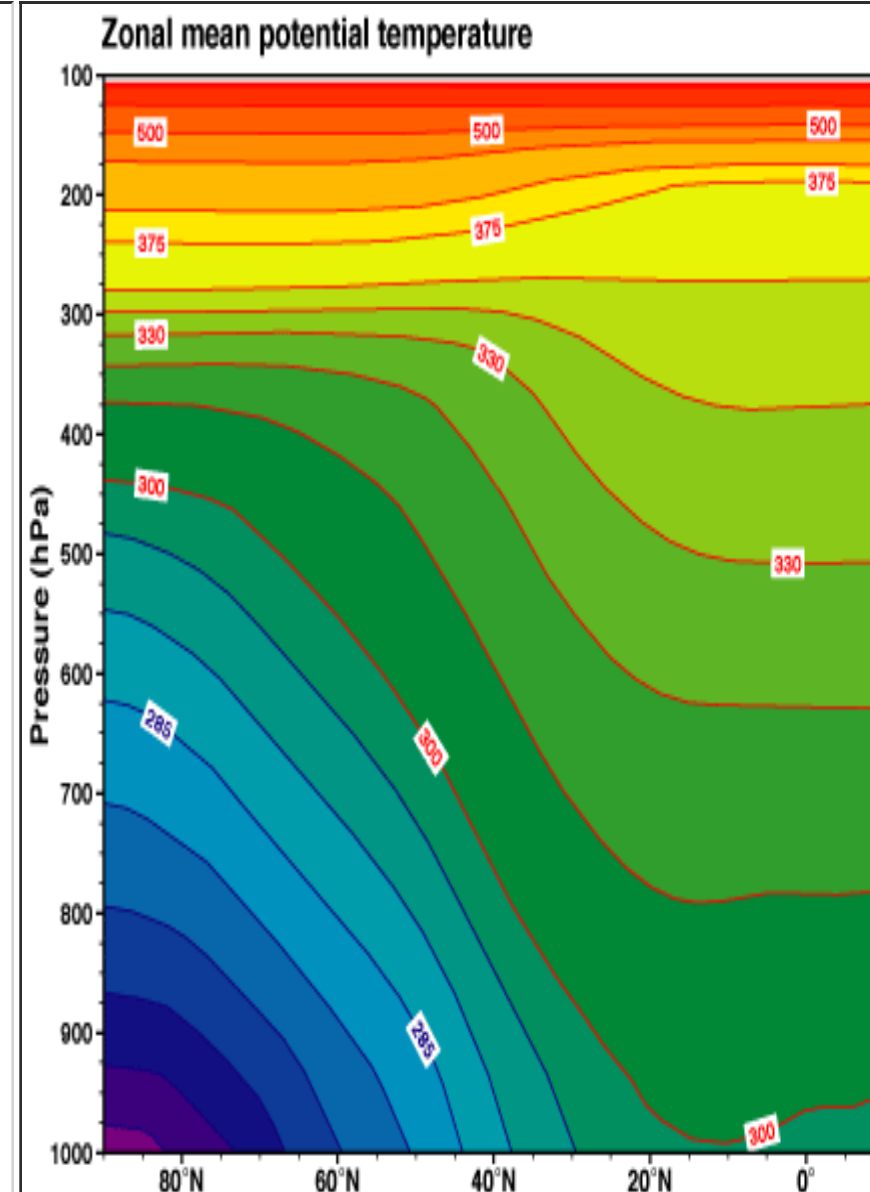
Course Syllabus Spring 2020

Course Instructor: **David M. Straus**

Contacts: D. Straus dstraus@gmu.edu



Map of Annual Mean Precipitation (ECMWF)



Zonal Mean of Potential Temperature

Class location: Research Hall Room 121 (Climate Dynamics Lab)

Class time: Tuesday - Thursday 3:00 PM to 4:15 PM

- **First class: Tuesday Jan 21**
- **Mid-Term: TBD**
- **Spring break: Tuesday Mar 10, Thursday Mar 12**
- **Last class: Tuesday May 5**
- **Final Exam: Thursday May 7 1:30 AM - 4:15 PM**

Primary Required Reading (Course Notes):

http://mason.gmu.edu/~dstraus/CLIM_610_syllabus.htm

Primary Reference Books:

- **Hartmann, D. L.: Global Physical Climatology, Second Edition. Elsevier, 2016.**
 - ISBN-13 978-0-12-328531-7
- **Andrews, D. G., 2000. An Introduction to Atmospheric Physics., Cambridge University Press, 2000**

- ISBN-13: 978-521-62958-4
- ISBN-10: 0-521-62958-4

Supplementary Reading:

- Salby, Murry L. *Fundamentals of Atmospheric Physics*. Academic Press, 1996.
 - ISBN-10: 0-12-615160-1
- Masaki, Satoh. *Atmospheric Circulation Dynamics and General Circulation Models* Springer, 2004
 - ISBN-10: 3-540-42638-8

Course Goals and Student Learning Outcomes

- Acquire knowledge of the basic physics principals that govern weather and climate.
- Understand the overall energy balance of the earth-atmosphere-ocean system.
- Be able to articulate the reasons for global atmosphere and ocean transport of energy.
- Become familiar with the atmospheric structures that transport energy and moisture.
- Acquire basic skills for examining current data sets of weather and climate variables.
- Develop the ability to read basic journal papers on the subject, and report the main findings.

Student Work Components

1. Mid-Term Exam = 20% percent of grade
2. Final Exam = 20% percent of grade
3. Four Homework Sets = 30% percent of grade
4. Journal Paper Presentations = 20% of grade [Suggested Journal Articles](#)
5. Class Participation = 10% of grade

Homework Policy

Course Topics

(Note: Content of lectures subject to updating!)

1. [Overview Lecture](#)
2. [Global Energy Balance](#)
3. [Atmospheric Thermal Structure](#)
4. [Satellite Radiation Maps](#)
5. [Planck Function and Blackbody Radiation](#)
6. [Radiation and Climate Part 1](#)
7. [Introduction to Temperature and Ideal Gas](#)
8. [Radiation and Climate Part 2](#)
9. [Short Wave Radiation Distribution](#)
10. [Radiative-Convective Equilibrium](#)
11. [Thermodynamics Part 1](#)
[Enlarged Figures for Thermodynamics Part 1](#)
[Entropy and the First Law](#)
12. [Thermodynamics Part 2](#)
[Thermodynamics Problem Set 2](#)
13. [Thermodynamics Notes Part 1](#)
14. [Thermodynamics Notes Part 2](#)
15. [Thermodynamics Figures 2](#)
16. [Ocean Circulation and Climate \(Dr. Barry Klinger\)](#)
17. [Atmosphere General Circulation: Introduction-1](#)
18. [Hadley and Ferrel Cells](#)
19. [Energy Transport](#)

20. [Atmosphere General Circulation: Introduction-2](#)
21. [Rotational vs. Divergent Flow](#)
22. [Isentropic Hadley Cell](#)
23. [Transient Fluctuations](#)
24. [A direct look at Baroclinic Transients](#)
25. [The Hydrological Cycle](#)
26. [The Indian Monsoon](#)
27. [Predictable Component Analysis](#)
28. [Extra-Tropical Energy Flux](#)
29. [Oceans and Climate](#)
30. [Paleoclimate: Observations, Theory and Modeling;](#)
31. [Brief Review](#)

Academic Integrity

George Mason is an Honor Code university. The principal of academic integrity is taken very seriously and violations are treated gravely.

When you as the student are responsible for a task, you will perform that task.

When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form.

The homeworks and exams in this course are designed to be undertaken independently.

You may discuss your ideas with others and conference with peers on drafts of the work.

But you are responsible for making certain that the work you hand in is your own.

Please see the [Academic Integrity website](#)