GEOF326 Dynamics of the Atmosphere

Fall 2014

Overview

In GEOF326, you will learn about atmospheric circulations on the synoptic to large scale, i.e., 100 to 5000 km. In particular you will learn about the concepts of vorticity and circulation and its applications to atmospheric flow phenomena. The central theory developed during the class is quasi-geostrophy. Quasi-geostrophic theory is used to describe synoptic scale circulations and the development of baroclinic instability in particular. Linear perturbation theory is introduced to investigate analytic solutions to various problems with wave like and unstable solutions.

Lecturer

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Learning Outcomes

On completing this course you should be able to:

- Define and characterize atmospheric circulations
- Formulate the problem in a physical and mathematical framework
- Develop ideas for analytical and (to some extend) numerical solutions to the problem
- Use and write a computer code (Matlab) to solve problems and view the results

Content

Throughout the course we will cover the following chapters in Holton's book:

- Chapter 1 Introduction
- Chapter 2 Basic Conservation Laws
- Chapter 3 Elementary Applications of the Basic Equations
- Chapter 4 Circulation and Vorticity
- Chapter 5 Atmospheric Oscillations
- Chapter 6 Quasi-Geostrophic Analysis
- Chapter 7 Baroclinic Develpment

Assessment

There will be exercises, ranging from problem solving to developing toy models. A continuous and engaged participation in the class as well as in the exercise hours is requested for admission to the oral exam. It is expected that the exercises are prepared for the exercise hours and that students present at least three of their own solutions at the black board during the semester.
There will be a written mid-term exam, which will count 20% of the total grade. The final oral exam at the end of the semester aims to test the level of understanding and comprehension of the covered material. The remaining 80% of the course grade will be based on this oral exam.

Textbooks

Holton, J.R., and Hakim, G. J., 2004: An Introduction to Dynamic Meteorolgy, Elsevier Academic Press, ISBN 0-12-354015-1 (ca. NOK 309) This is one of the standard textbooks on dynamic meteorology.

Vallis, G. K., 2006: Atmospheric and Oceanic Fluid Dynamics, Cambridge University Press, ISBN 978-0-521-84969-2 (ca. NOK 488) This book covers both, Atmosphere and Ocean, in a slightly more advanced mathematical manor.

Cushman-Roisin, B. and Beckers, J.-M., 2011: Introduction to Geophysical Fluid Dynamics: Physical and Numerical Aspects, Academic Press, ISBN 9780120887590 (ca. NOK 619) This book covers both, Atmosphere and Ocean, in a slightly more advanced mathematical manor.

Pedlosky, J., 1987: Geophysical Fluid Dynamics, Springer, ISBN 978-0-387-96387-7 (ca. NOK 760) This book covers Geophysical Fluid Dynamics in general and is applicable to both Atmosphere and Ocean. The mathematical treatment is very accurate and extensive.