

GEOG 531
Topics in Physical Geography – Mountain Meteorology
Fall 2007
9:30-10:45 T, TH

Instructor: Prof. Donna Tucker
Office: 404 Lindley, Phone 864-4738
Office Hours: 1:30-2:45 MW, 2:30-3:30 T, R
Email: dtucker@ku.edu

Prerequisites: ATMO 105, MATH 104

Textbook: Mountain Meteorology Fundamentals and Applications, C. David Whiteman, Oxford University Press, 2000 (W)

Other References:

Smith, Ronald, B., 1979: The influence of mountains on the atmosphere, *Rev. Geophys.*, **21**, 87-230.

Blumen, W., Ed., 1990: Atmospheric Processes over Complex Terrain, *Meteorological Monograph*, **45**, American Meteorological Society

Barry, R., 1992: Mountain Weather and Climate, Routledge

Carlson, T., 1991: Mid-latitude Weather Systems, American Meteorological Society.

Web Materials: This course will make some use of materials from the web site www.meted.ucar.edu. You will need to register on the web site to access the modules but there is no charge for doing so. Most of the modules are available on CD. I can make you a copy of the CDs I have if you provide the 2 CDs. Note that the modules listed with a (q) has an associated quiz (sometimes called final exam). You are to do this quiz (open book), list your instructor as your supervisor, and have results sent to the email address given above. You may do each quiz more than once to try for a higher grade.

Course Outline

I. Introduction

- A. Why are mountains important?
- B. Mountain ranges of the world
- C. Mountain ranges of North America
- D. Review of atmospheric stability

Reading

W, 11-21

II Mountain climate features

- A. Surface energy budget
- B. Radiation
- C. Temperature
- D. Clouds
- E. Fog

/mesoprim/skewt (q)

W, 2-9

W, 42-46

W, 312-315, Handout

W, 36-38, 46-48

W, 81-94

W, 94-97

Lab #1 Temperature and Initialization of Numerical Models

III. Mountain Winds

- A. Mechanical effects
 - 1. Basic flow interaction – Froude Number W, 141-146
/mesoprim/flowtopo
 - 2. Flow over mountains W, 146-149
 - 3. Flow around mountains W, 158-165
 - 4. Gap winds /mesoprim/gapwinds (q)
 - 5. Cold air damming W, 165-168
/mesoprim/cad (q)
- B. Thermal effects – diurnal winds
 - Mountain as elevated heat source
 - 1. Slope and along valley winds W, 171-194
/mesoprim/mtnval
 - 2. Plateau circulation systems W, 194-199. 108-111
Handout
/norlat/pbl_complexterrain/
part1
/norlat/pbl_complexterrain/
part2

Lab #2 Observations of mountain winds

Exam 1, Oct. 9.

IV. Mountain waves

- A. Gravity waves W, 147
- B. Mountain waves
- C. Downslope wind storms W, 149-158
/mesoprim/mtnwave (q)

V. Orographic precipitation

- A. Review of cloud physics
- B. General precipitation effects W, 105-107
- C. Lee Cyclogenesis Handout
- D. Effects on precipitation development /norlat/orographic
- E. Upslope snowstorms Handout
- F. Convective precipitation W, 112-126

Lab #3 Initiation of Thunderstorms in Rocky Mountains

VI. Applications

- A. Weather Forecasting /challenge_fcstwest (q)
- B. Air pollution W, 221-236
- C. Avalanches

Exam 2 Nov. 29

No Final Exam but class will meet during Final Exam time for student presentations

Course Requirements and Grading

Grades will be computed as follows:	Lab and Homework	25%
	Exam #1	25%
	Exam #2	25%
	Paper and presentation	25%

Most examples in class will be drawn from North America. So that students can become familiar with parts of the rest of the world, each student will do a paper (literature review) describing the meteorological features associated with a mountain range of the student's choice outside of North America. No later than Sept. 20, students will turn in an assignment giving their choice of mountain range and seven references they plan to use in their paper. No two students may do the same mountain range. The student turning in his/her abstract the earliest has priority. The written paper will be due Thursday Dec. 13, 2007 at 8:30 a.m. During the last week of class and the final exam time, students will give 20 minute presentations describing the meteorological effects of their chosen mountain range.