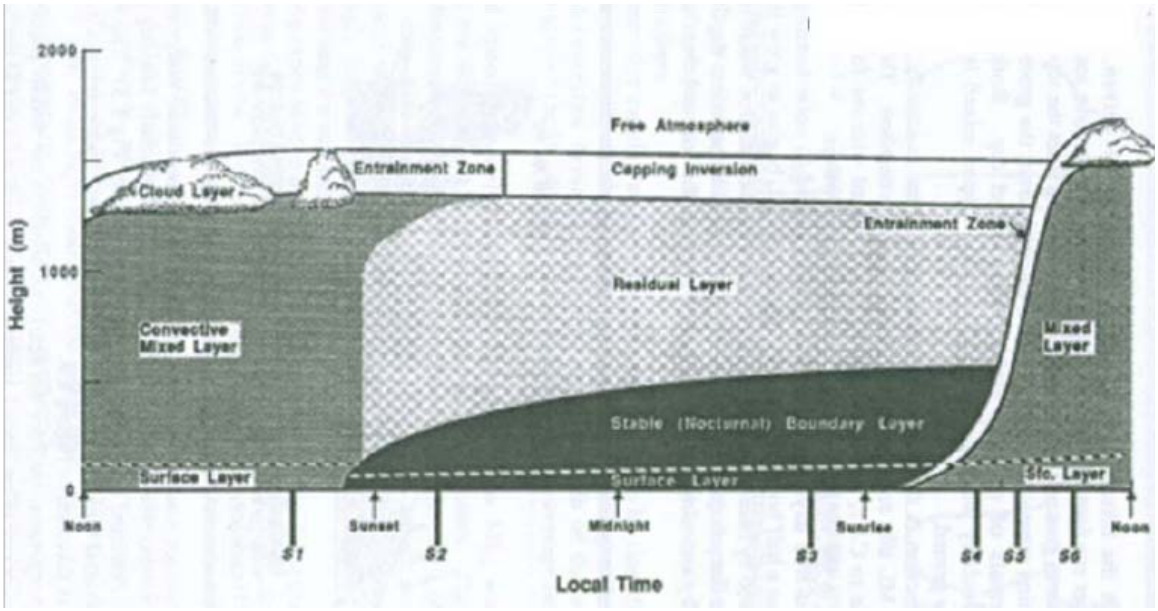
METEOROLOGY 130 (METR 130)
BOUNDARY LAYER METEOROLOGY
Spring 2011



Instructor: Dr. Frank R. Freedman
Course Meeting Time & Place: TTh 1630-1745, DH 614
Office Hours: TTh 1500-1615, DH 618
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Course Description: METR 130 is an upper division elective course for Meteorology majors. It is an introductory course on the earth's atmospheric boundary layer (ABL), roughly the lowest kilometer of the atmosphere adjacent to the surface. Topics covered include: mean vertical structure of ABL, turbulence and vertical turbulent fluxes in the ABL, surface energy balance, mathematical parameterization of ABL used in weather and climate models, mesoscale circulations driven by ABL processes, and applications to such topics as air pollution dispersion and wind speed assessment for wind energy.

Prerequisite: METR 121B or professor consent.

Learning objectives: The learning objectives for this course are:

1) Know definitions, both verbally and mathematically where appropriate, of the following key terms involved in boundary layer meteorology:

   - Atmospheric Boundary Layer (ABL)
   - Convective Boundary Layer (CBL)
   - Stable Boundary Layer (SBL)
   - Residual Layer
   - Free Atmosphere
   - Capping Inversion at ABL top
   - ABL height & Mixing Depth
   - Turbulence, Turbulent Mixing, Turbulent Fluxes
   - Diffusion & Dispersion
   - Eddy Viscosity and Eddy Diffusivity
   - Friction Velocity
   - Surface energy balance
   - Surface heat flux, surface latent heat flux
   - Log- Law Wind Profile
   - Monin-Obukhov Similarity Theory
   - Ekman Layer & Ekman Spiral
   - Entrainment at ABL top

2) Know how properties of the ABL are measured, and how turbulent fluxes are calculated from measured data.

3) Know ABL governing equations for horizontally homogenous (1-D) ABL.

4) Know what is meant by the turbulence "closure" problem, and some commonly used turbulence closure schemes (parameterizations) to solve the 1-D ABL equations.

5) Know the terms in the surface energy balance equation, and how they typically evolve in value over the diurnal cycle.

6) Know how ABL processes force 3-D mesoscale flows and affect other 3-D meteorological processes.

Textbook and Course Reading

- *Introduction to Micrometeorology*, S. Pal Arya, Second Edition (required, please bring to class for lectures)
- *The Atmospheric Boundary Layer*, J. R. Garratt (recommended)
- Various other readings, as assigned.

Lectures: Lectured will be given as powerpoint slides, with some "chalkboard" presentation from time to time. Powerpoint lecture slides will be posted on the course website before lecture and updated after lecture as changed or added to. *It is your responsibility to download the lecture slides from the course website – slides will not be handed out in class.* You are encouraged to also take notes during lectures to supplement the powerpoint slides.

Laptop computers are allowed during class in order to download lectures, take notes electronically, and access websites mentioned during lecture if desired. The use of laptops must be done responsibly, for class purposes only. Any other use of laptops during class for purposes not related to class is not allowed. No cell/smart phone use is allowed during class.

Assignments, Exams, Grading: Grades will be assigned according to performance on assignments and exams.

Assignments will involve both science problems and writing. Writing will be graded according to its clarity, conciseness, the degree of relevance to what is asked in the assignment, and the amount of such errors as (among other things): typographic and spelling errors, proper use of punctuation marks, improperly aligned paragraphs/margins/tabstops, inconsistent formatting, for example of font size and type, and the presence of extraneous spaces in the writing. Please make every effort to turn in assignments in class on the due date. I reserve the right to dock points for assignments turned in after the due date.

Exams will be about half science problems and half short answer. Exams will be graded only on content (i.e. writing errors will not be docked).

See course calendar below for exam dates and due dates for assignments. In all, there will be four exams (Exam 1, 2, 3 and the Final Exam) and four assignments (Assignments 1, 2, 3 and 4). So there will be eight total items of scored work in the class. The **final course grade** will be calculated by assigning percentages to the course work as follows:

- Assignment 1: 5%
- Assignments 2, 3 and 4: 10% each
- Highest scoring exam: 20%
- Remaining three exams: 15% each

After adding up the scores on all exams and assignments weighted according to the above percentages, letter grades will then be assigned as follows: 85 – 100 = A; 70–85 = B; 60 – 75 = C; 50 – 60 = D; below 50 = F. A +/- grading system will be used for final grades.

Academic Integrity, Plagiarism, Copying, Cheating, etc ...

The policy on academic integrity can be found at http://www.sjsu.edu/senate/S07-2.pdf. Here, formal university definitions of actions that violate academic integrity (plagiarism, copying, cheating, etc ...) are given. It is the student's responsibility to know these definitions, as well as the consequences of any academic integrity violations. Among these is the **requirement** that faculty members report all infractions of academic integrity to the Office of Judicial Affairs.

Campus policy in compliance with the Americans with Disabilities Act:
If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with DRC to establish a record of their disability.

Incompletes: An "incomplete" will be given for the course only under the following conditions:

1. At least 60% of the course work has been completed ***and***
2. *Unexpected* circumstances prevent the completion of the remaining work.

An incomplete will **not** be given to circumvent rules concerning the dropping of courses.

Tentative Course Calendar

Exam/Assignment	Date/Due Date
Assignment 1	Thursday, February 10
Exam 1	Thursday, February 24
Assignment 2	Thursday, March 10
Exam 2	Thursday March 24
Assignment 3	Thursday, April 14
Exam 3	Thursday, April 28
Assignment 4	Thursday, May 5
Final Exam	Monday, May 23 (1445-1700)

University Calendar

See http://www.sjsu.edu/academic_programs/calendars/academic_calendar. Especially for important dates such as add and drop deadlines.