

Earth Space and Atmospheric Sciences 2115

Mesoscale Meteorology

Professor Paul L. Sirvatka

Description: In depth study of meteorological phenomena with short temporal and small spatial scales. Topics will include tools for mesoscale analysis, mesoscale modeling, morphology of convective systems including squall lines, MCS's and supercells and their associated threats including flash flooding and tornadoes, thermally-forced circulations, fog and mesoscale winter events. Other topics of current research interest will also be covered.

Prerequisite: Earth Science 1115 or consent of instructor

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Office Hours: MTuWTh 2:00 – 4:00, TuTh 10:00 – 11:00
I will also be available at other times. Please try to set up an appointment if you wish to see me at any time. Please feel free to contact me with questions using email as well.

Text: [A Survey of Mesoscale Meteorology](#), Markowski and Richardson, available on-line at <http://weather.cod.edu/~sirvatka/meso/>

[Severe Convective Storms](#), C.A. Doswell III editor, Meteorology Monographs, American Meteorological Society, 2001.

Additional Materials: #2 pencils and a good set of colored pencils are required *daily*. A three-ring notebook is necessary to assist in maintaining sufficient organization.

Attendance: Attendance is extremely important. Much of the material is covered only in class. It is expected that you will attend all classes. Contact the instructor as soon as possible in the event of an unavoidable absence. Labs and quizzes cannot be made up. Only in exceptional circumstances can tests be given at a time other than the announced date. Exceptions must be pre-arranged. A missed test is a zero.

Grading:

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| Midterm exam | ~ 200 points |
| Final exam | ~ 200 points |
| Meted Modules | ~ 150 points |
| Notebook/Misc | ~ 50 points |

Grades will be curved based upon expected results and class participation and attitude. Generally speaking, the grades will be as follows:

A: ≥ 480 points
B: 400 - 479 points
C: 300 - 399 points
D: 200 - 299 points
F: < 200 points

All work must be completed. An incomplete will be given only in an exceptional circumstance. It is the student's responsibility to withdraw from the course due to non-attendance. Failure to withdraw will result in an "F". Late assignments will be penalized to a maximum credit of 50% at the discretion of the instructor. Students wishing to take this course on a pass/fail basis must earn a grade of a "C" or higher to receive a "Satisfactory" for the course. In order to fulfill the general education requirements a letter grade must be received.

Course Objectives: Upon successful completion of this course the student should be able to do the following:

1. Define mesoscale and delineate mesoscale phenomena
2. Recognize strengths and weaknesses of mesoscale models and apply them appropriately
3. Describe mesoscale processes along boundaries
4. Demonstrate an ability to interpret mesoscale analysis tools such as radar, skew-T diagrams and hodographs
5. Summarize boundary layer processes in urban and rural settings
6. Analyze situations where orographic or thermally-forced flows play an essential role in sensible weather
7. Explain processes leading to significant fog events and their dissipation
8. Recognize significant mesoscale weather events within larger synoptic scale phenomena
9. Describe fundamentals and complexities of convective initiation
10. Differentiate thunderstorm genres and explain the reasons for various thunderstorm types
11. Describe mesoscale processes in the development of squall lines and various threats associated with mesoscale convective systems
12. Summarize theories of tornadogenesis of supercell and non-supercell tornados
13. Explain the development of large hail
14. Identify environments which lead to flash flooding
15. Summarize methods of analysis and forecasting to correctly assess and predict mesoscale phenomena

Expectations: The student is expected to attend all classes, participate fully in classroom discussions and cooperate in learning experiences with other classmates. The expected workload is two hours of work for every hour of time spent in class. This will vary from week to week with some weeks having more

work required and other weeks having less. Nonetheless, because this class is a sophomore level course, higher *quality* work is expected.

Final Exam: A final exam will be given. The date is still to be determined.

Meted Modules: Modules are found at <http://www.meted.ucar.edu/> There will be 25 modules with a post quiz. You will be able to take the quiz only once, so study well and use all materials at your disposal. The top 15 scores will be used to determine your grade. Each one will be worth 10 points. Send your scores to sirvatka@weather.cod.edu. Module quiz scores will only be accepted up to taking either taking the midterm or final depending on the section in which the modules are assigned. It is to your benefit that all quizzes be taken.

Additional resources: http://weather.cod.edu/~sirvatka/meso/Weather_Journals.html
This is a copy of a page found at the COD Library web site. Use this to search for published papers on various topics in scientific journals and magazines.

Final Notebook: You will be required to put together a notebook (or two) of the material used in this class. This will include taking note or outlines from the textbook reading, notes in class and other material from the modules. Your notebook will be graded before the final exam on the following basis:

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|------------------|-----------|
| Quality of Notes | 30 points |
| Organization | 10 points |
| Completeness | 10 points |

Rewriting classroom notes will be an important part of this notebook so evidence should be included that classroom material gets re-worked. Up to an additional 20 points may be awarded for exceptional work and effort. Remember, this notebook may be used by you for many years to come.

Class: Class will consist of unpacking material contained within the text, going through some of the modules and adding information when needed. There may also be time when time will be allotted to work on the modules in the weather lab.