# METEOROLOGICAL STATISTICS
ATMS 405
SPRING 2023

The applications of various statistical methods pervade the atmospheric sciences. From simple descriptive techniques to more complex analyses, meteorologists and climatologists routinely rely on statistical methods and procedures to draw conclusions about physical processes in the atmosphere, to analyze historical data, to forecast the weather, and to verify those forecasts. No matter what you plan to accomplish after you earn your degree from UNC Asheville, you will certainly benefit from a broad knowledge of the statistical methods used in the atmospheric sciences.
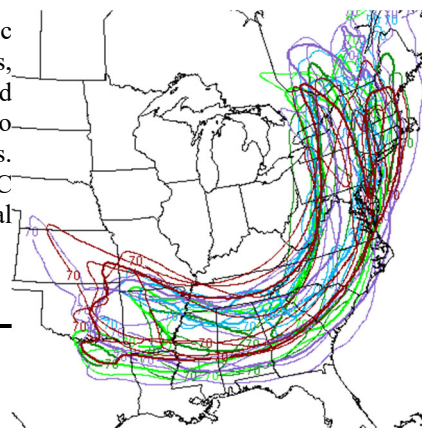
PROFESSOR

Dr. Christopher Godfrey
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Office hours: Via virtual meetings through Google Meet on **Wednesdays and Thursdays 11:15 a.m.–12:15 p.m.**, or by appointment. You may call my office (it bounces to my cell phone) during regular business hours. You may send me as many email messages as you wish. Check Moodle or my office door for the Google Meet link.

CLASS INFORMATION

Meeting times:	TR 3:15–4:30 p.m.
Location:	Robinson Hall, room 238
Required text:	Wilks, D. S., 2011: *Statistical Methods in the Atmospheric Sciences*. 3rd ed. Academic Press, 676 pp. (You may also choose to use the new fourth edition, published in 2019.)
Website:	http://www.atms.unca.edu/cgodfrey/courses/atms405/

GETTING QUESTIONS ANSWERED

I will be available on Google Meet during scheduled office hours. Just drop in. If at any other time you have a question, you are more than welcome to call me or send me an email. E-mail is by far the best way to reach me and you will usually get a speedy reply. You may also schedule an appointment with me for an in-person or virtual meeting. Please don't hesitate to ask questions about class, other coursework, or the stresses of college life whenever the need arises.

IMPORTANT DATES

Thursday, 2 March 2023	Midterm Exam	3:15–4:30 p.m.
Tuesday, 2 May 2023	Final Exam	11:30–2:00 p.m.

COURSE OUTLINE

This course outline is approximate, but the list of topics and corresponding book sections serves as an excellent schedule of reading assignments. (Important note: Section numbers correspond with the 3rd edition of the textbook.)

Date	Topic	Reading
10 January	Introduction, Probability	Chapter 1
12 January	Probability	Chapter 2
17 January	Probability	Chapter 2
19 January	Guest lecture	
24 January	Exploratory data analysis, Organizing data	3.1–3.2
26 January	Exploratory data analysis, Organizing data	3.3–3.4, except 3.3.6
31 January	Exploratory data analysis, Organizing data	3.3–3.4, except 3.3.6
2 February	Correlation	3.5–3.6
7 February	Discrete distributions	4.1–4.3
9 February	Discrete distributions	4.1–4.3
14 February	Continuous distributions	4.4–4.5
16 February	Continuous distributions	4.4–4.5

21 February	Sampling distributions, Testing	5.1
23 February	Parametric tests	5.2
28 February	Parametric tests	5.2
2 March	**Midterm Exam**	
7–9 March	**Spring Break–No Class**	
14 March	Mid-term review	
16 March	Nonparametric tests	5.3
21 March	Nonparametric tests	5.3
23 March	Field significance, False discovery rate	5.4
28 March	Least squares regression	7.1–7.2
30 March	Least squares regression	7.4
4 April	Classical statistical forecasting, MOS, Perfect prog	7.3.2, 7.5
6 April	Ensemble forecasting	7.6-7.7
11 April	Ensemble forecasting, Subjective probability forecasting	7.8
13 April	Forecast verification (nonprobabilistic)	8.1–8.3
18 April	**Undergraduate Research Symposium–No Class**	
20 April	Forecast verification (probabilistic)	8.4–8.5
25 April	Forecast verification (field, ensemble)	8.6, 8.7
2 May	**Final Exam**	11:30–2:00 p.m.

EVALUATION

There will be homework assignments, one midterm exam, and one comprehensive final exam to assess your newfound knowledge of statistics. Expect about eight homework assignments, which will be due every one to two weeks as we make sufficient progress through the course. Homework is due at exactly 5:00 p.m. on the scheduled due date. Please plan accordingly. I will accept homework up to 24 hours late (5:00 p.m. the following calendar day) for a 50% late penalty. Homework more than 24 hours late will not be graded.

GRADING

Homework Assignments	50%
Midterm Exam	25%
Final Exam	25%

I reserve the option to curve the final grades upward at my discretion. In fact, it is highly likely that I will do so by applying statistical techniques. I also reserve the right to adjust the percentages shown here, but only if doing so would benefit the class as a whole.

ACADEMIC INTEGRITY

Since the point of this or any class is to learn, you may collaborate on homework assignments, but *you absolutely must make sure that you hand in your own work*. If you choose to use a data analysis package, such as Excel, then you may not share worksheets, nor may you share R or Python code. Please enter any necessary data, formulae, or code and create charts on your own. Copying your friend's answers will not only be obvious to me, but will result in both of you sharing the credit for that answer. For example, if you do a fantastic job on the homework assignment and then let three of your friends copy *any part of it*, you will each receive a maximum grade of 25% for the assignment. The midterm and final exams are open book and open notes, but you may not consult classmates or use your phone, supplemental materials, or the Internet.

NOTES

Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students requiring reasonable accommodations must register with the Office of Academic Accessibility by providing supporting documentation. The Office of Academic Accessibility is located in the OneStop Student Services Center, 011 Ramsey Library, phone (828) 232-5050.

FURTHER NOTES

- Those who are graduating this semester may not take the final exam at a different time.
- Some homework problems will require plots or analyses that a program or software package may handle best. You are welcome to learn and use any available package or programming language (e.g., Excel, Python, Matlab, RStudio, SAS, etc.). See https://en.wikipedia.org/wiki/List_of_statistical_packages for a comprehensive list of options.

COVID-19 ADDENDUM

Though there is currently no mask mandate in UNC Asheville classrooms, a deadly virus is still prevalent in our community. If you are feeling ill, or if there is any reason to suspect that you may have been exposed to someone who is sick, please **DO NOT COME TO CLASS**. There is no penalty for missing class if you are sick. I am happy to provide a recorded lecture video upon request. I ask for your patience and flexibility as we all navigate a global pandemic.
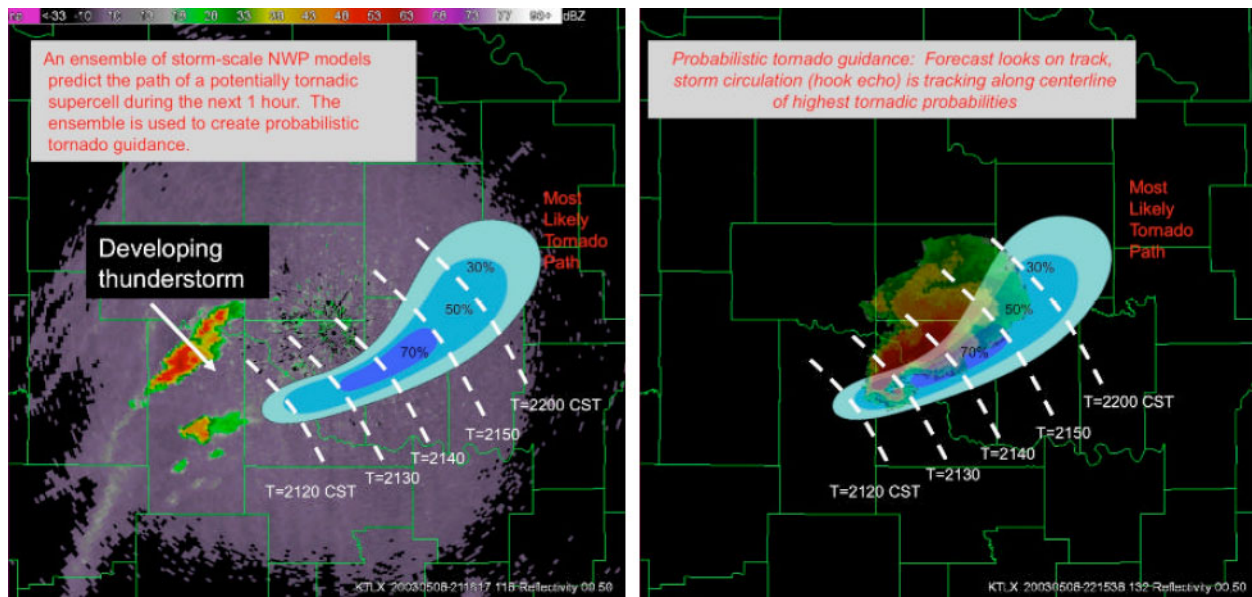
A conceptual illustration of a convective-scale warn-on-forecast system (NSSL, http://www.nssl.noaa.gov/projects/wof).