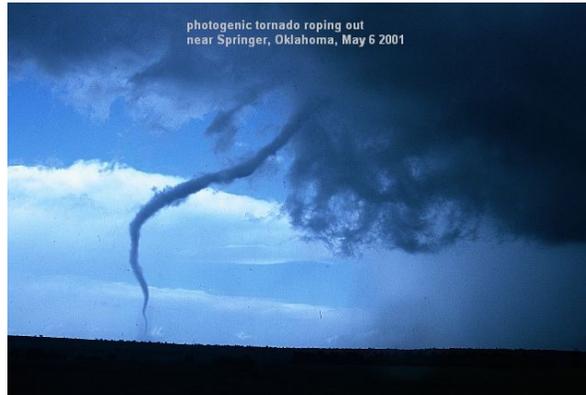


CLIM-314/GGS-314

Severe & Extreme Weather (Syllabus)

Spring, 2023
Prof. Zafer Boybeyi



Instructor and Contact information



Zafer Boybeyi
Associate Professor
Research I, Room 217
Mail Stop 6A2
Email: zboybeyi@gmu.edu
Phone: (703) 993-1560

Office Hours

Associate Prof. Zafer Boybeyi

Office Hours:

Monday: 10:00am – noon

Wednesday: 10:00am – noon

Additional hours by appointment

Tentative Travel:

N/A

Severe & Extreme Weather

- ✓ This course focuses on severe and extreme weather, covering the key concepts from thermodynamics, radiation, and dynamics that are essential for understanding severe and extreme weather events
- ✓ This course would be useful for any student wanting a one-semester overview of our weather



Severe & Extreme Weather

Specific Goals:

To provide students:

- ✓ an overview of the physical and dynamical processes which control the state and evolution of the Earth's weather
- ✓ an understanding of the key scientific discoveries and remaining unanswered questions in severe and extreme weather
- ✓ an overview of the primary scientific principles and analytical tools used in weather studies, including numerical weather prediction models

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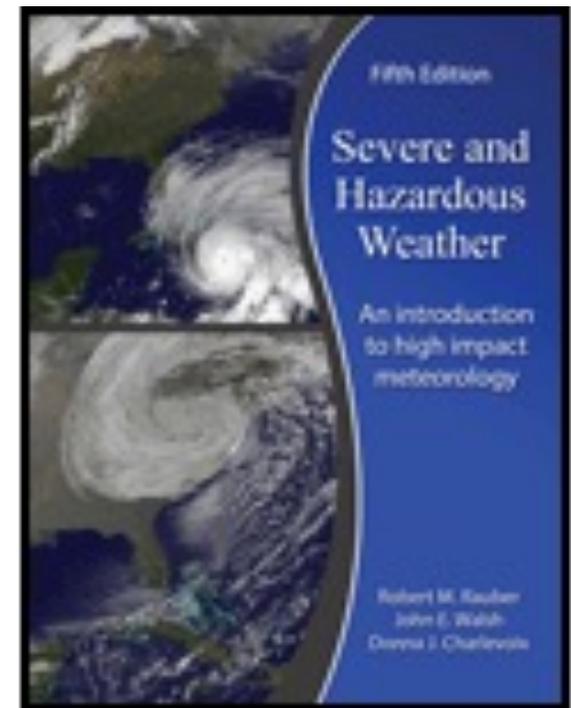
Required Text Book:

Severe & Hazardous Weather

Robert M. Rauber, John E.
Walsh and Donna J. Charlevoix

Kendall/Hunt Publishing
Company, 2008

ISBN 978-0-7575-5043-0



Severe & Extreme Weather

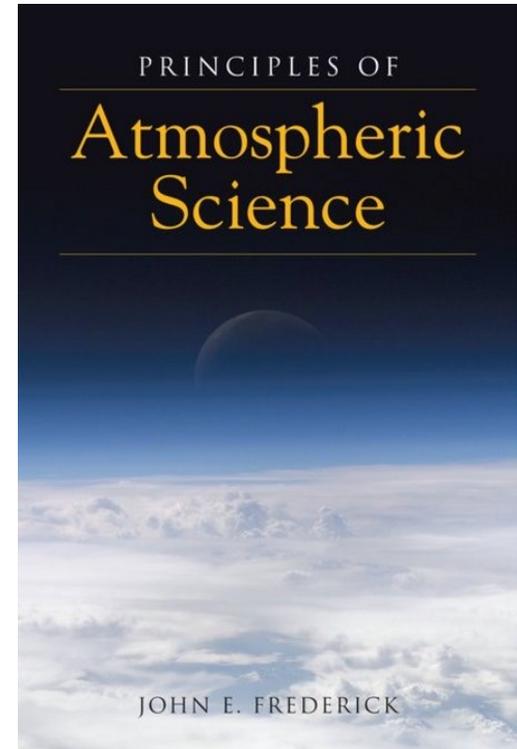
Recommended Text Book:

*Principles of Atmospheric
Science*

John E. Frederick

Jones and Bartlett, 2008

ISBN 0763740896



Course Outline

Class format will consist of:

- ✓ Lectures covering material (chapters) in the suggested textbook
- ✓ Homework assignments
- ✓ Surprise quizzes
- ✓ Class discussion on current severe weather events
- ✓ Group Project
- ✓ Midterm exam
- ✓ Final exam (comprehensive)

Course Outline

Group Project

- First, identify a severe weather case and analyze the meteorological environmental conditions, including synoptic maps and available supporting observations such as sounding, surface observations, satellite images etc.
- Then, analyze key characteristics of the selected severe weather case such as intensity, max wind speed, duration, amount of precipitation and type, etc.
- Finally, write few pages term paper, submit the paper electronically and present the results in class using for example power point presentation. For each group presentation will be about 15 minutes.

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Text book's chapter structure:

- ✓ Major content (Be sure to read everything before you come to class!)
- ✓ Chapter summary
- ✓ Review questions (Excellent review for exams)
- ✓ Problems

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Format:

- ✓ There will be approximately two lecture topics covered per week. These lectures will include class discussion of topical issues.
- ✓ Chapters from the required textbook will provide the basic framework of the course and most of the qualitative discussions.
- ✓ While the John Frederick text (recommended) will provide supplemental quantitative material which will be provided to you via class notes (i.e., power point presentation).

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Course Website:

Blackboard

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Course Content:

- ✓ Chapter 1 (Properties of The Atmosphere)
- ✓ Chapter 2 (Meteorological Measurements)
- ✓ Chapter 3 (Weather Maps)
- ✓ Chapter 4 (Forecasting and Simulating Severe Weather)
- ✓ Chapter 5 (Climate & Global Change)
- ✓ Chapter 6 (Atmospheric Stability)
- ✓ Chapter 7 (Forces & Force Balances)
- ✓ Chapter 8 (The Development of High & Low Pressure Systems)
- ✓ Chapter 9 (Airmasses & Fronts)
- ✓ Chapter 10 (Extratropical Cyclones Forming East of The Rocky Mountains)
- ✓ Chapter 11 (Extratropical Cyclones Forming Along The East & Gulf Coasts)
- ✓ Chapter 12 (Freezing Precipitation & Ice Storms)
- ✓ Chapter 13 (Lake-Effect Snowstorms)

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Course Content (Con't) :

- ✓ Chapter 14 (Cold Waves)
- ✓ Chapter 15 (Great Plains Blizzards)
- ✓ Chapter 16 (Mountain Snowstorms)
- ✓ Chapter 17 (Mountain Windstorms)
- ✓ Chapter 18 (Thunderstorms)
- ✓ Chapter 19 (Tornadoes)
- ✓ Chapter 20 (Hailstorms)
- ✓ Chapter 21 (Lightning)
- ✓ Chapter 22 (Downbursts)
- ✓ Chapter 23 (El Nino, La Nina & Southern Oscillation)
- ✓ Chapter 24 (Tropical Cyclones)
- ✓ Chapter 25 (Floods)
- ✓ Chapter 26 (Drought)
- ✓ Chapter 27 (Heat Waves)

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Class Duration: (Jan 23, 2019 - May 6, 2023)

Tentative Schedule:

Jan 23	Syllabus & Introduction
Jan 25 & 30	Chapters 1 & 2
Feb 1 & 6	Chapters 3 & 4
Reading Assignment	Chapter 5
Feb 8 & 13	Chapters 6 & 7
Feb 15 & 20	Chapters 8 & 9
Feb 22 & 27	SKEW-T/Log-P Diagram & Chapter 10
March 1 & 6	Chapter 11 & 12
Mach 8	Midterm Exam
March 13 & 15	(Spring Break)
March 20 & 22	Chapters 13 & 14
March 27 & 29	Chapters 15 & 16 & 17
Apr 3 & 5	Chapters 18 & 19
Apr 10 & 12	Chapters 20 & 21 & 22
Apr 17 & 19	Chapters 23 & 24
Apr 24 & 26	Chapter 25 & 26 & 27
May 1	Group Project Presentations
May 3	Group Project Presentations
May 15	Final Exam (10:30am - 1:15pm)

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Learning Outcomes

- ✓ By the end of the semester this course student will have developed a basic understanding of the following:
 - ✓ Characterization of severe & extreme weather
 - ✓ Dynamics & physics of severe & extreme weather events
 - ✓ Solar heating which drive atmospheric thermodynamics and motions
 - ✓ Earth's energy budget
 - ✓ Atmospheric moisture and the role of water in severe weather considerations.
 - ✓ Cloud formation & precipitation
 - ✓ The atmospheric issues related to global change
 - ✓ Severe weather prediction

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Tentative Grading Policy:

- ✓ Homework: 15%
 - ✓ Every passing day from due date, 10% off
- ✓ Surprise Quizzes: 5%
- ✓ Group Project: 10%
- ✓ Midterm exam: 30%
- ✓ Final Exam (Comprehensive): 40%

You are responsible for all material from the text, and any additional assigned readings.

Severe & Extreme Weather

Numerical Grade Ranges:

A	94-100%
A-	90-93%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D	60-69%
F	Below 60%

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- ✓ LAPTOPS are permitted in class for taking notes.
- ✓ But PLEASE don't use laptops during class time for other activities such as web surfing and email.
- ✓ Cell phones must be turned off or on vibrate. Please do not take calls or text in the lectures.

Frederick - Tentative Reading Schedule

Chapter 1: Chemical Composition and Structure

Chapter 2: Solar and Terrestrial Radiation:
Atmospheric Energy Balance

Chapter 3: Atmospheric Water

Chapter 4: Winds - The Global Circulation and
Weather Systems

Chapter 5: Chemical Processes and Atmospheric
Ozone

Chapter 6: The Earth's Climate

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Useful websites:

American Meteorological Society:

<http://www.ametsoc.org/>

National Aeronautics and Space Administration:

<http://www.nasa.gov>

National Oceanic and Atmospheric Administration:

<http://www.noaa.gov/>

The Weather Channel:

<http://www.weather.com/>

GMU Honor Code

✓ GMU is an Honor Code university; The principle of academic integrity is taken very seriously and violations are treated gravely.

Honor Code: *To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this*

Honor Code

Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

<http://www.gmu.edu/departments/unilife/pages/honorcode.html>

Academic Integrity

- ✓ What does academic integrity mean in this class?
 - ✓ Essentially when you are responsible for a task, you will perform that task.
 - ✓ When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form.
 - ✓ Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions.
 - ✓ When in doubt (of any kind) please ask for guidance and clarification.

Students with Disabilities

- ✓ If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474.
- ✓ All academic accommodations must be arranged through that office.