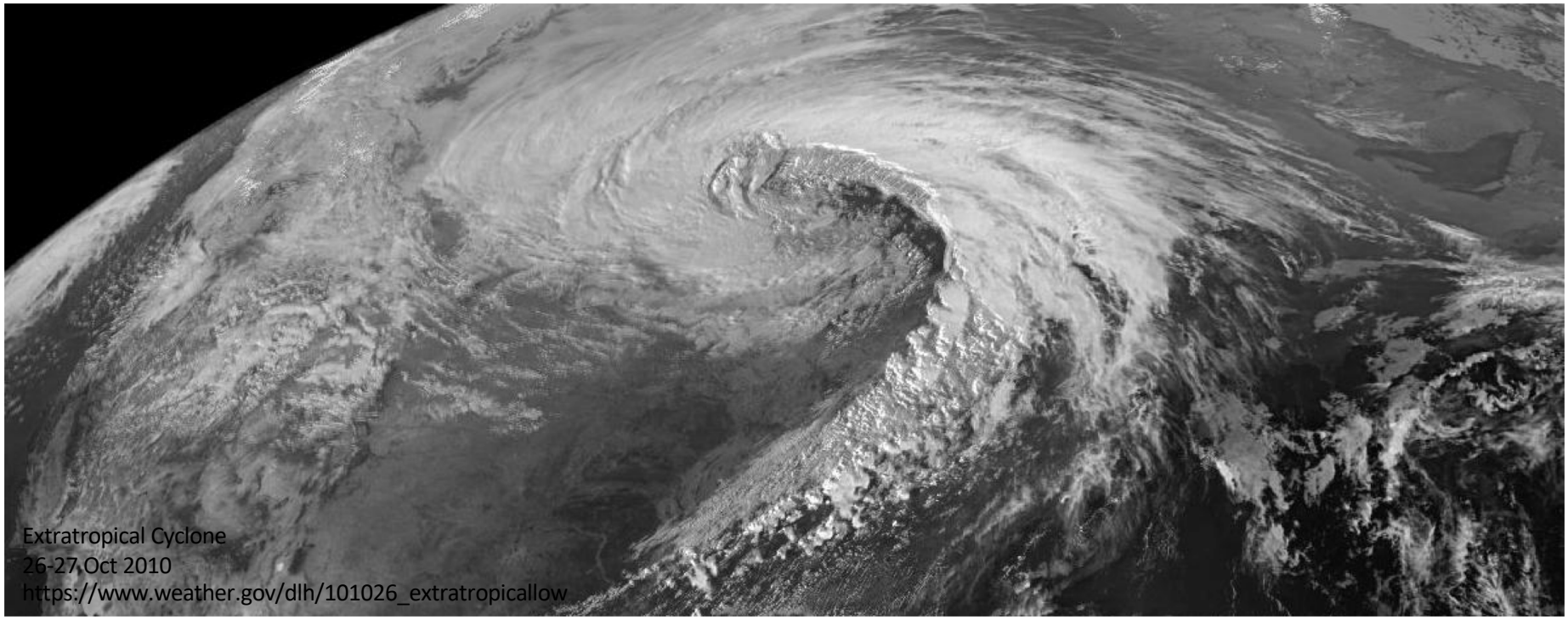
Atmos 5110/6110: Synoptic Meteorology I
Course Overview



Extratropical Cyclone
26-27 Oct 2010
https://www.weather.gov/dlh/101026_extratropicallow

Jim Steenburgh
Department of Atmospheric Sciences
University of Utah
jim.steenburgh@utah.edu
801-581-8727
488 INSCC (In Suite 480)

Introductions

- Name
- Where you are from
- Why you are interested in synoptic meteorology
- Major/Academic Year
- Share a great weather anecdote

Group Discussion

What is Synoptic Meteorology?

What Is Synoptic Scale?

- Synoptic Scale
  - A scale at which atmospheric phenomenon have horizontal dimensions that are much larger than their vertical dimensions

$$\frac{H}{L} \ll 1$$

$$H \sim O(10\ km)$$

$$L \sim O(1000\ km)$$

What Is Synoptic Scale?

- Synoptic Scale
  - A scale at which atmospheric phenomenon have horizontal dimensions that are much larger than their vertical dimensions

Scale	Approximate length scale	Approximate time scale
Microscale	< 1km	< 1 hour
Mesoscale	1–1000 km	1 hour – 1 day
Synoptic scale	1000–6000 km	1 day – 1 week
Planetary scale	> 6000 km	> 1 week

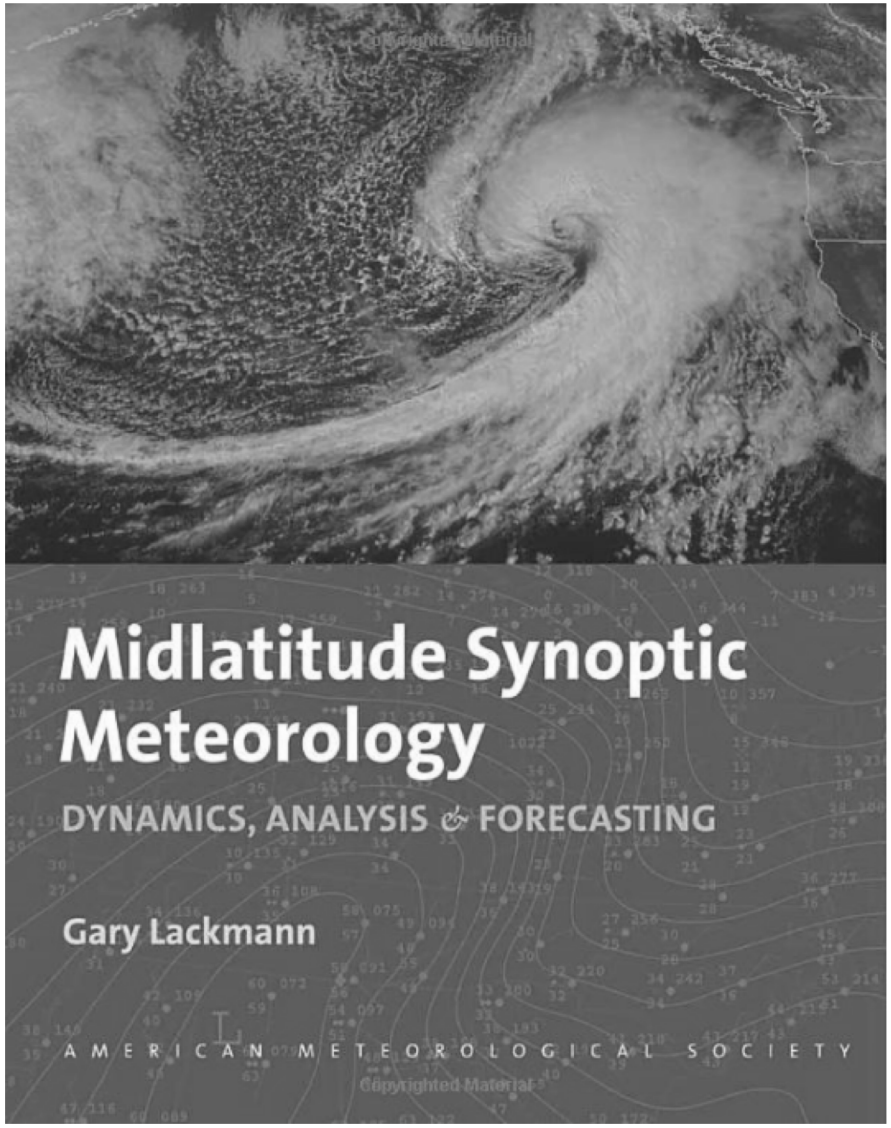
Learning Objectives

- At the end of this course, you should be able to apply and synthesize dynamics, observational analysis, and numerical analysis across scales to diagnose and understand the past, present, and future weather

Format

- Two classes per week (9:10-10:30 TH)
  - 711 WBB
  - Mixture of lecture, real-time weather analysis and discussion, and active learning activities
- Companion Course
  - Atmos 5120: Weather Discussion
  - 1:00-1:30 TH
  - 711 WBB

Text and Materials



- *Midlatitude Synoptic Meteorology*
  - Gary Lackmann
- Introduction to Dynamic Meteorology
  - James Holton and Gregory Hakim
  - Also useful but not required
- Course notes
- Students should complete reading and learning module assignments before class as outlined in course notes

Schedule

- Course Overview
- Fundamental Math Concepts
- Fundamental Meteorology Concepts
- Skew-T Review
- Divergence and Deformation
- Vertical Motion
- Circulation and Vorticity
- The Vorticity Equation
- Scale Analysis of the Vorticity Equation
- Structure and Behavior of Upper-Level Waves
- Potential Vorticity
- Upper-Level Flow Climatology and Blocking
- QG Theory and Applications
  - Approximations and Equations
  - Omega Equation
  - Q-Vectors
  - Height Tendency Equation
  - Behavior of Upper-Level Troughs and Ridges
- PV Thinking and the Dynamic Tropopause
- Extratropical Cyclones
  - Climatology
  - Cyclogenesis
  - Norwegian Cyclone Model and Extensions
  - Shapiro-Keyser Model
  - Occlusion Process

Grading

- 15% labs (probably 7-8)
  - Grades on late assignments reduced 15 points (out of 100) per day past due date without prior approval
- 25% Midterm I
  - 26 September class period
- 25% Midterm II
  - 5 or 7 November class period
- 25% Final
  - 8 AM 9 December
- 10% weather discussion participation

Computer Skills

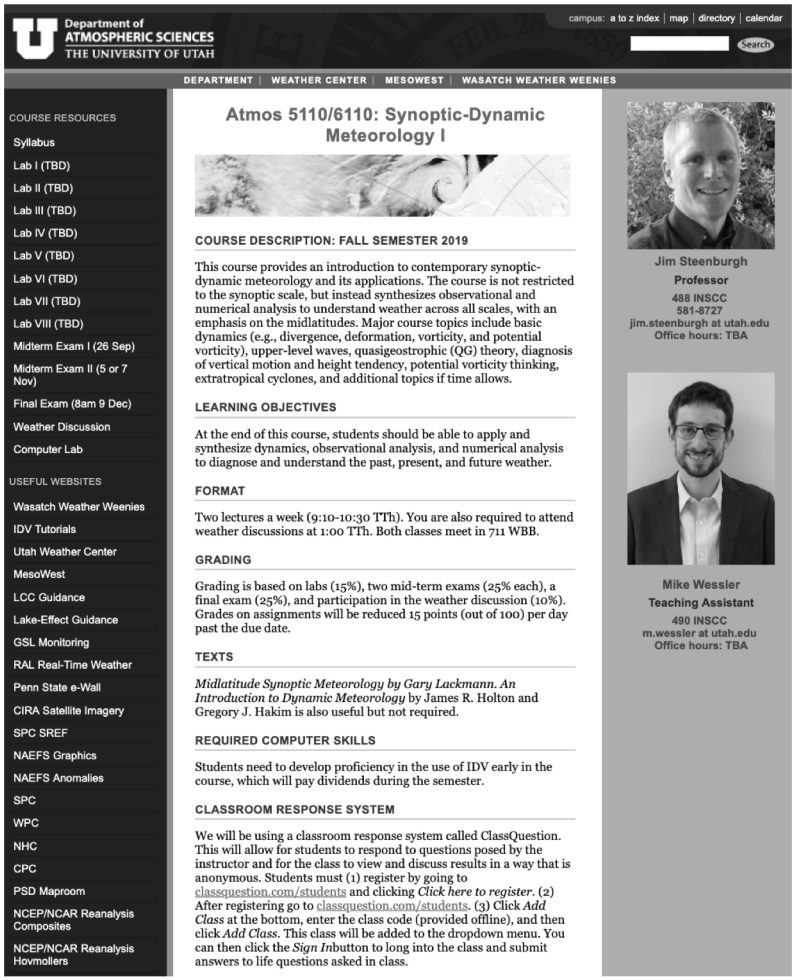
- You must quickly become proficient with IDV, how to use a mac, and accessing web-based meteorological data and imagery
- Start with Lab I
- Spend time “feeling the weather in your veins” every day

Computer Configuration

- Configure your .tcshrc file following Jim's instructions

- Go to http://www.inscc.utah.edu/~steenburgh/classes/5110/complab.html and configure IDV

Course Web Page & Syllabus



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COURSE RESOURCES

- Syllabus
- Lab I (TBD)
- Lab II (TBD)
- Lab III (TBD)
- Lab IV (TBD)
- Lab V (TBD)
- Lab VI (TBD)
- Lab VII (TBD)
- Lab VIII (TBD)
- Midterm Exam I (26 Sep)
- Midterm Exam II (5 or 7 Nov)
- Final Exam (8am 9 Dec)
- Weather Discussion
- Computer Lab

USEFUL WEBSITES

- Wasatch Weather Weenies
- IDV Tutorials
- Utah Weather Center
- MesoWest
- LCC Guidance
- Lake-Effect Guidance
- GSL Monitoring
- RAL Real-Time Weather
- Penn State e-Wall
- CIRA Satellite Imagery
- SPC SREF
- NAEFS Graphics
- NAEFS Anomalies
- SPC
- WPC
- NHC
- CPC
- PSD Maproom
- NCEP/NCAR Reanalysis Composites
- NCEP/NCAR Reanalysis Hovmollers

Atmos 5110/6110: Synoptic-Dynamic Meteorology I

COURSE DESCRIPTION: FALL SEMESTER 2019

This course provides an introduction to contemporary synoptic-dynamic meteorology and its applications. The course is not restricted to the synoptic scale, but instead synthesizes observational and numerical analysis to understand weather across all scales, with an emphasis on the midlatitudes. Major course topics include basic dynamics (e.g., divergence, deformation, vorticity, and potential vorticity), upper-level waves, quasigeostrophic (QG) theory, diagnosis of vertical motion and height tendency, potential vorticity thinking, extratropical cyclones, and additional topics if time allows.

LEARNING OBJECTIVES

At the end of this course, students should be able to apply and synthesize dynamics, observational analysis, and numerical analysis to diagnose and understand the past, present, and future weather.

FORMAT

Two lectures a week (9:10-10:30 TTh). You are also required to attend weather discussions at 1:00 TTh. Both classes meet in 711 WBB.

GRADING

Grading is based on labs (15%), two mid-term exams (25% each), a final exam (25%), and participation in the weather discussion (10%). Grades on assignments will be reduced 15 points (out of 100) per day past the due date.

TEXTS

Midlatitude Synoptic Meteorology by Gary Lackmann. An Introduction to Dynamic Meteorology by James R. Holton and Gregory J. Hakim is also useful but not required.

REQUIRED COMPUTER SKILLS

Students need to develop proficiency in the use of IDV early in the course, which will pay dividends during the semester.

CLASSROOM RESPONSE SYSTEM

We will be using a classroom response system called ClassQuestion. This will allow for students to respond to questions posed by the instructor and for the class to view and discuss results in a way that is anonymous. Students must (1) register by going to classquestion.com/students and clicking *Click here to register*. (2) After registering go to classquestion.com/students. (3) Click *Add Class* at the bottom, enter the class code (provided offline), and then click *Add Class*. This class will be added to the dropdown menu. You can then click the *Sign In*button to long into the class and submit answers to life questions asked in class.

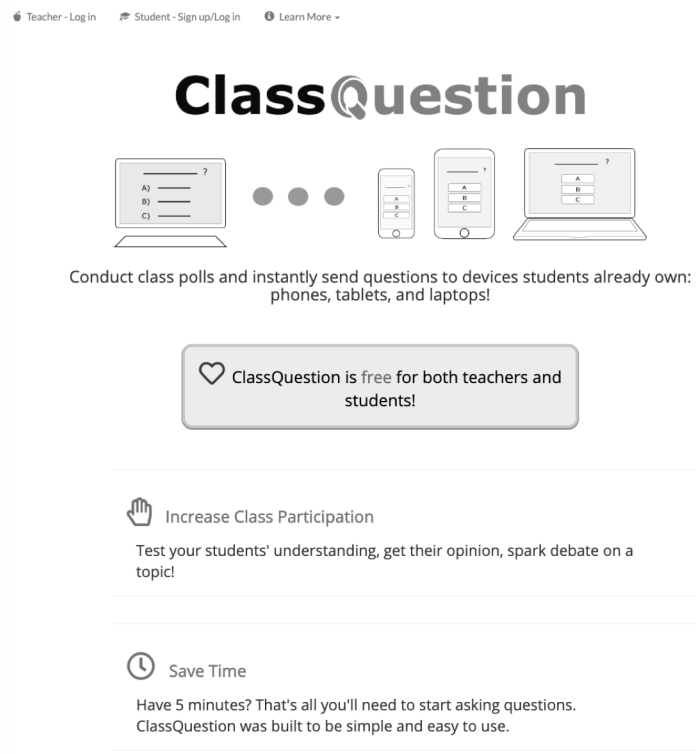
Jim Steenburgh
Professor
488 INSCC
581-8727
jim.steenburgh at utah.edu
Office hours: TBA

Mike Wessler
Teaching Assistant
490 INSCC
m.wessler at utah.edu
Office hours: TBA

http://www.inscc.utah.edu/~steenburgh/classes/5110/

Syllabus, links to labs, notes, reading materials, schedule

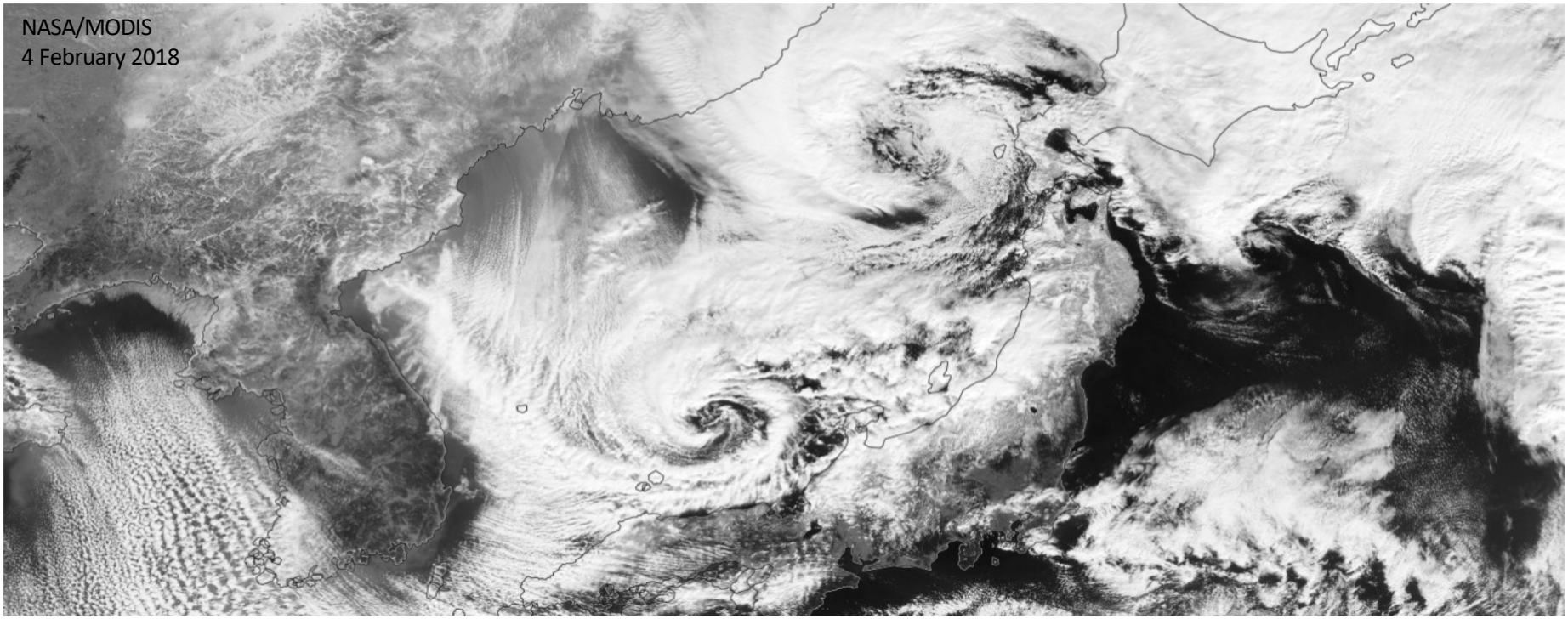
Classroom Response System



- Register at classquestion.com/students
  - Click on “click here to register”
  - Register
  - Go to classquestion.com/students
  - Click “add class”
  - Enter class code QJCCV
  - Click “add this class”

- Then I’ll ask a question!

Atmos 5120/6120: Weather Discussion
Course Overview



Jim Steenburgh
Department of Atmospheric Sciences
University of Utah
jim.steenburgh@utah.edu
801-581-8727
488 INSCC (In Suite 480)

Learning Objective

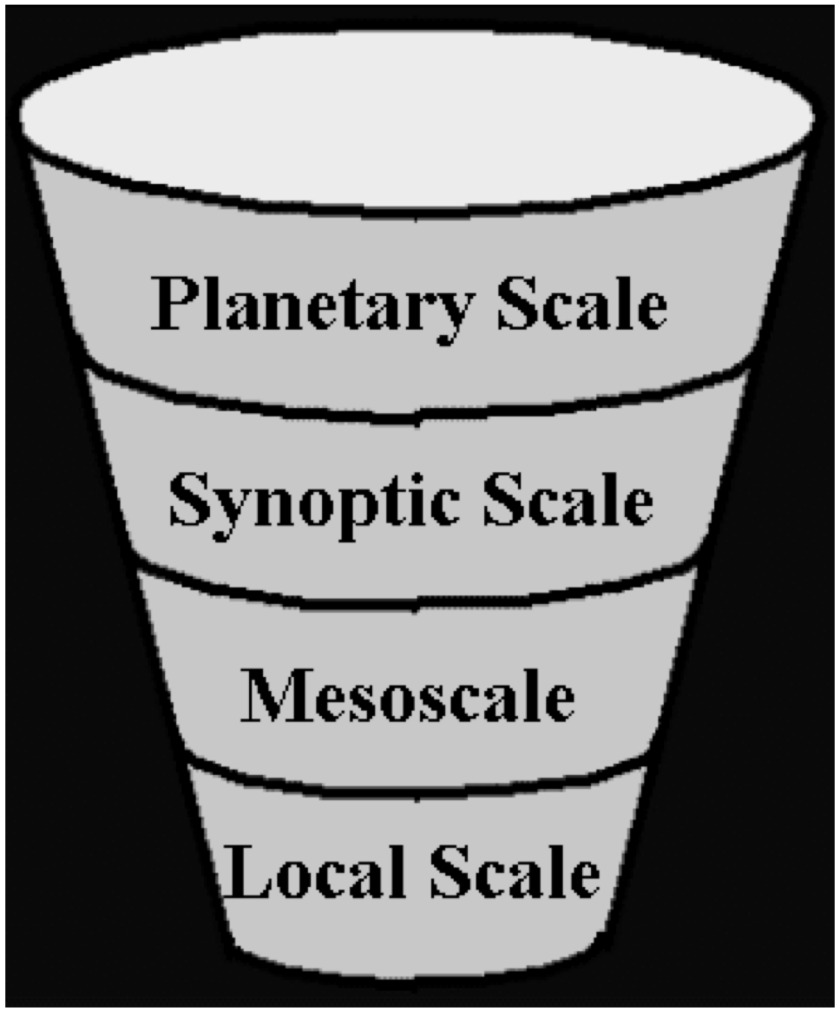
- To develop your ability to apply fundamental principles of the atmospheric sciences to diagnose, understand, and predict the weather

Format

- Two student-led discussions per week (TH)
  - Student prep begins prior day(s)
    - Meet with TA
  - Prep on computer 12:25-1:00
  - Review of prior discussion/forecast 1:00-1:05
  - Discussion 1:05-1:35
  - Forecast parameters
    - Today's Maximum Temperature (12-06 UTC)
    - Mixed Layer Top (00 UTC)
    - Cloud cover (00 UTC)
    - PoP (%, 18-00 UTC)
    - PQPF 10/50/90 (18-00 UTC)
    - PoS (% 18-00 UTC)
    - PQSF 10/50/90 (18-00 UTC)
    - Tonight’s Min (00-18 UTC)
    - Tomorrows Max (12-00 UTC)
    - PoP (%, 00-00 UTC)
    - PQPF 10/50/90 (00-00 UTC)
    - PoS (%, 00-00 UTC)
    - PQSF 10/50/90 (00-00 UTC)

Preparation

- Weather discussion requires preparation and "feeling the weather in your veins"
- *Skip no classes to prepare for discussion*
- Prepare by observing the weather closely in the days prior to your discussion
- Day prior
  - Examine weather in depth
  - Prepare an outline/plan for your discussion
  - Meet with the TA and discuss
- Day of
  - If you have time, review the weather again
  - Prior to discussion, pull up graphics and organize along an outline using the "forecast funnel"
- See my words of wisdom
  - http://www.inscc.utah.edu/~steenburgh/classes/5120/wisdom.html



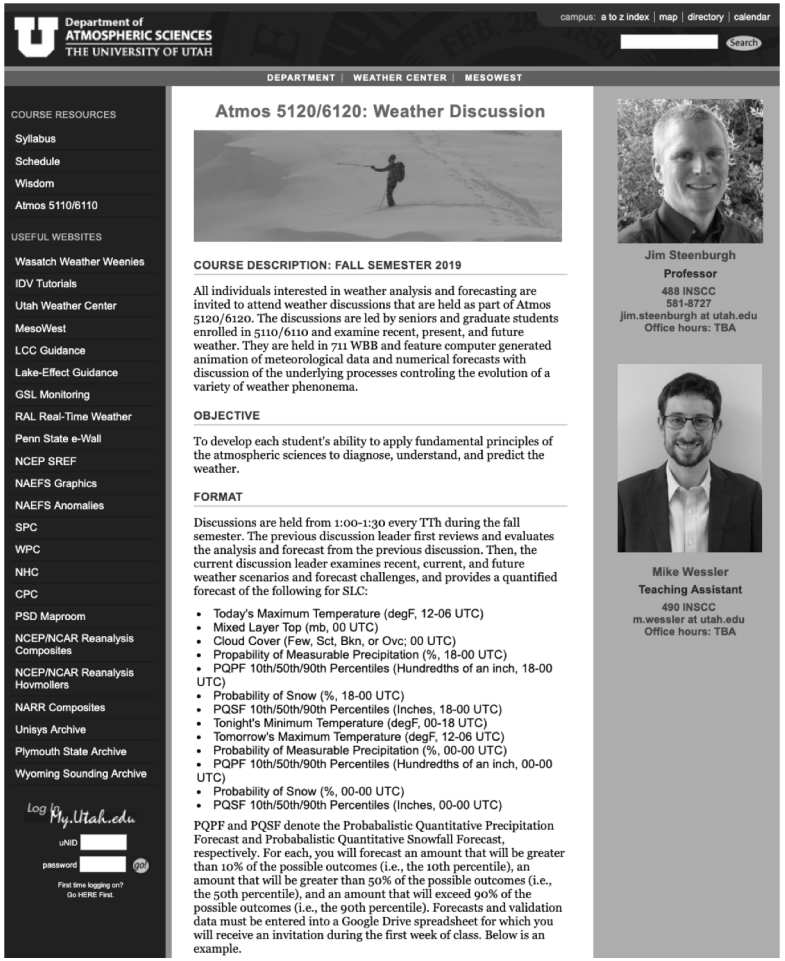
Grading

- Weather Discussion is a CR/NC class, but 10% of your Atmos 5110/6110 grade is based on *participation* in the weather discussion

- Students are not allowed to miss a discussion they are leading
  - Reschedule if there is a conflict or you are ill

- You can miss no more than 2 other discussions
  - Missing 3 reduces the maximum points you can earn for the 5110/6110 grade by 50 %
  - Missing 4 results in no credit being given for the course

Atmos 5120 Web Page & Syllabus



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COURSE RESOURCES

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USEFUL WEBSITES

Wasatch Weather Weenies
IDV Tutorials
Utah Weather Center
MesoWest
LCC Guidance
Lake-Effect Guidance
GSL Monitoring
RAL Real-Time Weather
Penn State e-Wall
NCEP SREF
NAEFS Graphics
NAEFS Anomalies
SPC
WPC
NHC
CPC
PSD Maproom
NCEP/NCAR Reanalysis Composites
NCEP/NCAR Reanalysis Hovmollers
NARR Composites
Unisys Archive
Plymouth State Archive
Wyoming Sounding Archive

Log in My.Utah.edu
uNID
password
First time logging on? Go HERE First.

Atmos 5120/6120: Weather Discussion

COURSE DESCRIPTION: FALL SEMESTER 2019

All individuals interested in weather analysis and forecasting are invited to attend weather discussions that are held as part of Atmos 5120/6120. The discussions are led by seniors and graduate students enrolled in 5110/6110 and examine recent, present, and future weather. They are held in 711 WBB and feature computer generated animation of meteorological data and numerical forecasts with discussion of the underlying processes controling the evolution of a variety of weather phenonema.

OBJECTIVE

To develop each student's ability to apply fundamental principles of the atmospheric sciences to diagnose, understand, and predict the weather.

FORMAT

Discussions are held from 1:00-1:30 every TTh during the fall semester. The previous discussion leader first reviews and evaluates the analysis and forecast from the previous discussion. Then, the current discussion leader examines recent, current, and future weather scenarios and forecast challenges, and provides a quantified forecast of the following for SLC:

- Today's Maximum Temperature (degF, 12-06 UTC)
- Mixed Layer Top (mb, 00 UTC)
- Cloud Cover (Few, Sct, Bkn, or Ovc; 00 UTC)
- Propability of Measurable Precipitation (%, 18-00 UTC)
- PQPF 10th/50th/90th Percentiles (Hundredths of an inch, 18-00 UTC)
- Probability of Snow (%, 18-00 UTC)
- PQSF 10th/50th/90th Percentiles (Inches, 18-00 UTC)
- Tonight's Minimum Temperature (degF, 00-18 UTC)
- Tomorrow's Maximum Temperature (degF, 12-06 UTC)
- Probability of Measurable Precipitation (%, 00-00 UTC)
- PQPF 10th/50th/90th Percentiles (Hundredths of an inch, 00-00 UTC)
- Probability of Snow (%, 00-00 UTC)
- PQSF 10th/50th/90th Percentiles (Inches, 00-00 UTC)

PQPF and PQSF denote the Probabalistic Quantitative Precipitation Forecast and Probabalistic Quantitative Snowfall Forecast, respectively. For each, you will forecast an amount that will be greater than 10% of the possible outcomes (i.e., the 10th percentile), an amount that will be greater than 50% of the possible outcomes (i.e., the 50th percentile), and an amount that will exceed 90% of the possible outcomes (i.e., the 90th percentile). Forecasts and validation data must be entered into a Google Drive spreadsheet for which you will receive an invitation during the first week of class. Below is an example.

Jim Steenburgh
Professor
488 INSCC
581-8727
jim.steenburgh at utah.edu
Office hours: TBA

Mike Wessler
Teaching Assistant
490 INSCC
m.wessler at utah.edu
Office hours: TBA

http://www.inscc.utah.edu/~steenburgh/classes/5210/

Syllabus, Schedule, Words of Wisdom, Etc.

ADA Accomodations

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangement for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

U of U Counseling Services

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426 SSB

801-581-6826

24/7 Crisis Line: 801-587-3000

Campus Safety

Campus Police: 801-585-COPS (801-585-2677)

https://safeu.utah.edu