ATM S 442/504 Winter 2019

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Lab Instructor: Professor Lynn McMurdie
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Office hours: Th 2:30-3:30 in 623 or 526, or by appointment

Link to Course Schedule

Class Meeting Times and Location

Lectures: MWF 1:30-2:20 in ATG **Labs:** T 1:30-4:20, in ATG 610

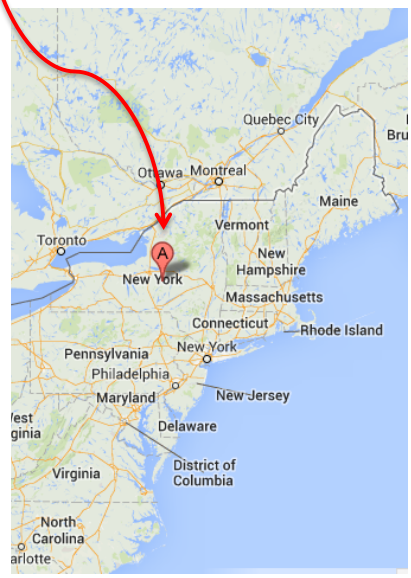
Course Description

This course surveys the dynamics of synoptic and mesoscale disturbances including extratropical cyclones, inertia-gravity waves, and topographically forced flows. We will also consider atmospheric adjustment to geostrophy in extratropical latitudes. Insight into the dynamics of these features is gained through systematic simplification of the governing equations applied to idealized, but realistic, approximations of atmospheric structure. In the final portion of the course we will examine the importance of the synoptic scale phenomenon for understanding the general circulation of the atmosphere.

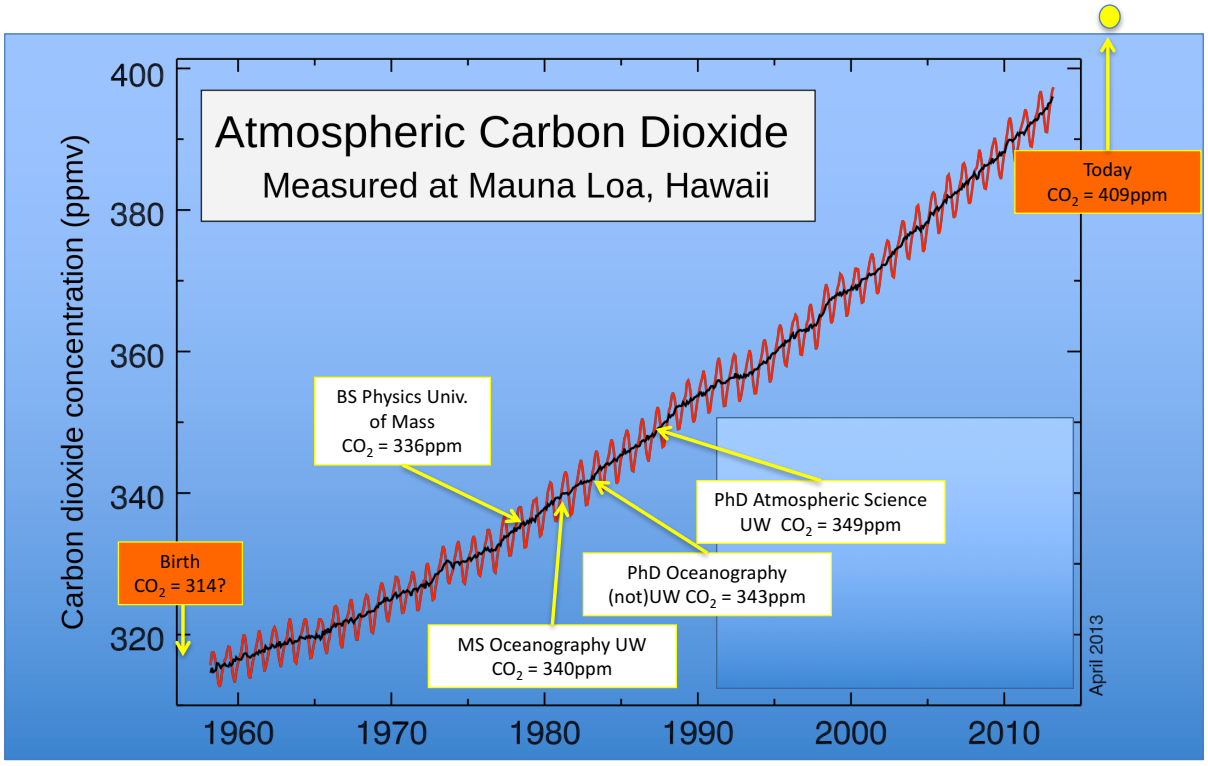
https://canvas.uw.edu/courses/1253751

About Me

- Home: West Eaton, NY
  - Population: 176



My life After the Farm



My Research

- Understand how the ocean and atmosphere interact to create climate variability. Eg.
  - El Nino/Southern Oscillation (ENSO)
  - Multidecadal variability (e.g., the PDO and the AMO)
  - Drought Cycles in Africa, the US and Eurasia
- Understand past climates
  - Changes in orbital forcing (monsoons, ice age cycles)
  - Different continental geometry and mountain topography
- Understand past and future worlds with high carbon dioxide
- Impact of climate variability and change on world food supply

ATM S 442/504 Winter 2019

Tentative Syllabus (Q = quiz Fridays)

Week 1	**Jan. 7-11**	**Waves : Basic concepts, Shallow water waves**
Week 2	Jan. 14 – 18	Waves: Rotation and Inertial Gravity waves
Week 3	Jan. 23 – 25	Geostrophic adjustment; Internal Gravity Waves
Week 4	Jan. 28 – Feb 1Q	Rossby Waves, free and spin-down
Week 5	Feb 4 – 8	Orographically forced Rossby Waves; Quasi-geostrophic (QG) equations
Week 6	Feb. 11 – 15Q	quasi-geostrophic (QG) equations and Potential Vorticity
Week 7	Feb. 20 – 22	Anatomy of a Midlatitude Cyclone
Week 8	Feb. 25 – Mar 1Q	Midlatitude Cyclone Theory: Baroclinic Instability
Week 9	Mar 4 – 8	Midlatitude Cyclones Theory: the messy details; the Initial Value approach
Week 10	Mar. 11 – 15	General Circulation

Holidays: 21 January (Martin Luther King Day); 18 February (Presidents Day).

Examples of things we will study

- Internal Waves (youtube/qwdDKtn5HD0)
  - Saint Andrews Cross
- Gravity waves issued from a modelled squall line
- Extremely trapped gravity waves
- Rossby waves
  - (oceanservice.noaa.gov/facts/rossby-wave.html)
  - Atmosphere:
    - Mid-latitude storms are Rossby waves – responsible for precipitation and tansport energy and water vapor from equator to pole
    - Short vs. Long Rossby waves (https://atmos.washington.edu/~ovens/wxloop.cgi?npole_h500_anom5d+/-168//)
  - Ocean:
    - Transports energy westward in ocean basins; equatorial Rossby waves an important ingredient in El Nino-Southern Oscillation (ENSO)
- Weather in a tank (Rossby waves), w/ Lodovica Illari (MIT)

ATM S 442/504 Winter 2019

Textbook: Holton, J.R. and G.J Hakim, 2013: *Introduction to Dynamic Meteorology, 5th Edition.* Elsevier. Text book errata are logged here (link to an external site)

Grading Policy

Homework 30% (Due Fridays, beginning of class)
Labs 30% (Due Tuesdays, beginning of class)
Three or four Quizzes 15% (Fridays)
Comprehensive Final Exam 25% (Monday 12 March 2:30--4:20 pm ATG 310)

Makeup Final by prior arrangement only with the lecturer (makeup will have an oral and written component). Late homework may be allowed one time with lecturer approval prior to its due date. First homework due in week 2 and first quiz is in week 3. You may work in groups, but each student must write up their work. Graduate and undergraduate students will be graded independently.

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