ATMOSPHERIC MOTION I (ATM S 441/503)
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- Office hours: Mon/Tue 11:30~12:20 or by appointments
CLASS MEETS

- MWF 10:30-11:20am
- @ ATG 310
I. Introduction: Fundamental forces, rotating coordinates, Coriolis force, atmospheric statics.

II. Basic conservation laws: Momentum equation, continuity equation, thermodynamic energy equation, scale analysis.

III. Elementary applications of the basic equations: Isobaric coordinates, geostrophic flow, inertial flow, cyclostrophic flow, gradient wind, thermal wind, vertical motion.

IV. Circulation, vorticity, and potential vorticity: Circulation theorem, vorticity, potential vorticity, barotropic vorticity equation.

V. Atmospheric oscillations: Linear perturbation theory, basic properties of waves, linear waves.
PURPOSE OF THE COURSE

- To develop understanding of why large-scale (synoptic scale) midlatitude weather systems behave as they do
ATMOSPHERIC MOTION IN REALTIME (AND FORECAST)

- http://earth.nullschool.net/
- https://www.windyty.com
What information/knowledge do we need to fully describe the behavior of the atmosphere?

What are the forces that move the air parcel around? Among them, what are of primary importance in the midlatitude synoptic scale motion?

Why does the wind blow almost parallel to the height contours on a 500-mb map?

Why is there the jet stream in the mid-latitude?

Why do we need math to answer these questions?
GENERAL CIRCULATION MODEL
THE EMERGING PATTERNS (WEATHER/CLIMATE) AND THEIR EVOLUTION

BY SOLVING EQUATIONS IN EVERY BOX, WE GET..
YOU’LL HAVE ANSWERS TO THESE QUESTIONS AT THE END OF THE CLASS.

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ZONAL MEAN RADIATION BALANCE

Surplus Heat Energy Transferred By Atmosphere And Oceans To Higher Latitudes

SOURCE: HTTP://WWW.PHYSICALGEOGRAPHY.NET/FUNDAMENTALS/7J.HTML
ERA40 (ZONAL MEAN FIELD)

POTENTIAL TEMPERATURE (ANN)

SOURCE: HTTP://193.63.95.1/RESEARCH/ERA/ERA-40_ATLAS/
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Wind speed in east-west direction

\[ \frac{\partial T}{\partial x} \]

Temperature change (°C) per unit distance (m) in east-west direction

\[ u \frac{\partial T}{\partial x} \]

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GRADING

- Homework: 25%
- Quiz: 25%
- Mid-term: 25%
- Final: 25%
LECTURES

Handouts will be used in most lectures

- Handouts will make it easy to follow the derivations, and will enable us to take more time understanding the equations
- You should pay attention to keep the handouts in an organized fashion
- You need to write what you learned on it (otherwise, you will likely forget..)
HOW TO SUCCEED

- Lectures
  - Read the text book ahead and try to fill in the blanks in the handout
  - Bring questions to the class
  - Follow the lectures and ask question (make sure your brain wakes up before the class :)
  - Check your handout after the class (I’ll upload the filled-in version)
- Get familiar with the mathematical concepts and use of math symbols as early as possible (I’ll be happy to help)
- Talk (even argue) with peers about the materials
COURSE WEBSITE

- https://canvas.uw.edu/courses/1318126