ATM205 Fall 2014

Review for final exam: The exam will cover Ch. 4 to 12 and 14-15 of Ahrens, and those parts of Stull that are covered in class.

You can review by making sure you know how to solve problems like those that appeared in problem sets 4 to 13 and the classworks. Solutions for the problem sets are posted on the class web page. Also, review the Questions for Review at the end of each chapter of Ahrens.

Equations/calculations you need to remember and know how to use
- Newton’s laws of motion
- The pressure gradient force
- The Coriolis force
- The geostrophic wind (you only need to know how to use it)
- Conservation of angular momentum (you only need to know how to use it)
- Use of Stull Table 5-1 to find e, e_s, and RH given T and T_d
- Use of e to find \( \rho_v \), r, and q
- Lifting an air parcel: use of thermodynamic diagram (Stull pp. 120-125)
- Use of thermodynamic diagram to determine stability of a sounding
- Use of Kohler’s curve to determine whether droplets grow or evaporate
- Cyclostrophic wind

Remember: for most of the equations, you need to use SI units for the equations to work. You must show all work and write down the correct units to get full credit.

Key concepts you should know:
- Relationship between pressure aloft and temperature
- What mean sea level pressure means
- Newton’s laws of motion
- The pressure gradient force
- The Coriolis force
- Friction
- Geostrophic winds
- Relationship between pressure patterns and wind direction on
  - Upper level charts
  - Surface charts
- The different scales of atmospheric motion
- Thermal circulations – sea and land breezes; monsoon
- The three cell model of the general circulation
  - The different wind and pressure belts and relationship to precipitation
- Semi-permanent and not semi-permanent pressure systems
- General wind patterns aloft
- The jet streams – reasons for existence
  - The polar front jet – sharp temperature gradients
  - The subtropical jet – conservation of angular momentum
- Major surface ocean current patterns
- Coastal and equatorial upwelling
- El Nino and Southern Oscillation
- Structure of a hurricane
- How hurricanes form and dissipate
- The movement of hurricanes
- Destruction caused by hurricanes
- Classification and naming convention
- Types of fog
- How clouds are classified
  - The 4 major cloud groups and 10 major cloud types
  - Characteristics of each of the 10 cloud types
- Use of satellite pictures: visible, IR, water vapor
- Air masses – properties and origin
- Fronts
  - Types, structure, identification, and weather associated with passage
- The polar front theory of cyclone lifecycle
- Necessary ingredients for the development of a cyclone
  - Relationship between cyclone and upper level wave
- The conveyor belt model of a developing wave cyclone
- Vorticity:
  - absolute and relative vorticity
- Evaporation, condensation, and saturation: what all these mean
- Differences between absolute humidity, specific humidity, mixing ratio, and relative humidity
- Vapor pressure and saturation vapor pressure
- What dew point means, and use of dew point to find e or r
- What stability means
- How to determine stability:
  - Stable, absolutely unstable, conditionally unstable, neutral
- Mechanisms triggering cloud development
- How atmospheric stability affects cloud development
- The role of condensation and ice nuclei in formation of precipitation
- The curvature and solute effects: use of Kohler curves
- How precipitation forms in warm clouds and cold clouds
- Relationship between vertical temperature profile and type of precipitation
- Ordinary thunderstorms: life-cycle
- Severe thunderstorms, and conditions favorable for their development
- Lightning and thunder
- Tornadoes
  - Cyclostrophic winds