AOSC 470/600 EXAM #1 Potential Topics (FALL 2017)

1. Observations
    a. In-situ versus remotely sensed (and examples of each)
    b. Satellite imagery
        i. Vis/IR/WV – how/when to use

2. NWP/DA/Ensembles (general, short answer type questions)
    a. What is a NWP model? What is meant by discretization?
    b. Spectral versus grid point? Global versus Regional
        i. When used? Advantages of each? Disadvantages?
    c. What is meant by "parameterization"
        i. What processes are typically parameterized?
    d. What is data assimilation?
    e. Ensemble versus deterministic? What do "ensembles" provide?
    f. What are Model Output Statistics? How are they generated?

3. Dynamics/Fundamentals (Martin Chs 1-5)
    a. Eulerian v. Lagrangian
    b. Fundamental Equations
    c. Advection
    d. Force Balances
    e. Balance Conditions (geostrophic, hydrostatic)
    f. Scale Analysis
    g. Geostrophy, Rossby Number
        i. Demonstrate geostrophic wind is non-divergent on an f-plane
    h. Curvature
        i. Gradient Wind Balance
        ii. Super/Sub-geostrophy in troughs and ridges
    i. Mass continuity, relating divergence to ***vertical derivatives*** of vertical motion
    j. Thickness/Hypsometric equation
    k. Thermal Wind
        i. What is it?
        ii. Relating temperature gradients to jets
        iii. Veering/Backing : Temperature advection
        iv. Examples of cold (warm) core (anti) cyclones
    l. 2D kinematics
        i. vorticity, divergence, shearing deformation, stretching deformation
    m. Vorticity
        i. What is it? Curvature/Shear
        ii. Relation to Circulation
        iii. How did we get vorticity equation?
        iv. What is meant by absolute vorticity conservation (frictionless, barotropic flow)
4. Ageostrophy
    a. Relation to acceleration of total wind (k-cross)
        i. Be sure to know how to take k-cross or minus-k-cross a vector. (RH Rule)
        ii. Evaluate divergence of ageostrophic wind. Relation to UVM/DVM through continuity (Curvature, Jet Streaks, or Both)