ESS5 2006 Midterm study guide

Chapter 1:

- Thickness of the atmosphere
- Composition of the atmosphere: permanent gases and variable gases
- Air pressure, what is the sea level pressure?
- What is the volcanic outgassing? Why is it important?
- Vertical structure of the atmosphere: names of layers, properties of every layer, temperature variation in every layer ……
- Units of pressure and temperature

Chapter 2:

- Solar radiation and terrestrial radiation
- Spectrum of solar radiation
- Atmospheric window
- Stefan-Boltzman's law: what does it tell us?
- Wein's law: what does it tell us?
- Absolute zero temperature: what does it mean in term of the motion of air molecular?
- Solar luminosity, solar flux and solar constant

Chapter 3:

- Definition of greenhouse effect and properties of greenhouse gases
- Greenhouse effect on Mars, Earth and Venus
- Selective absorption of atmosphere
- Rayleigh scattering and Mie scattering: Why sky is blue? Why sky is red?
- Energy balance on Earth: how much (percentage) solar radiation is absorbed/scattered by the atmosphere, cloud, and the surface?

Chapter 4:

- Forces that affect wind speed and direction: pressure gradient force, Coriolis force, friction and centrifugal force.
- Hydrostatic balance: What does it mean? How many forces are involved?
- geostrophic balance and gradient wind balance
- Super-geostrophic and sub-geostrophic flow
- Cyclone and anti-cyclone: Is it high or low pressure system?

Chapter 5:

- Saturation and unsaturation
- Water vapor indices: Which changes with temperature changes? Which doesn't?
- Make sure you understand the differences among these indices.
- Five kinds of fog

Chapter 6:

- What are the adiabatic/diabatic processes?
- Lapse rates: Environmental lapse rate, dry adiabatic lapse rate and moist(wet) adiabatic lapse rate.
- How to determine if the atmosphere is absolute or conditional stable or unstable?
- Four air lifting mechanism: frontal, orographic, convergence and convective lifting
- Properties of every cloud type.
- Low clouds and high clouds