

ESS 55 Earth's Atmosphere

Final Review

Lecture 5 Atmospheric General Circulation

- Ocean circulation
 - Six gyres: characters, names, locations
 - Geostrophic gyre
 - ◆ Surface wind
 - ◆ Ekman layer
 - ◆ Geostrophic currents
 - Thermohaline circulation

Lecture 6 Water in Atmosphere

- Indices of water vapor content
 - Indices
 - ◆ Mixing ratio; specific humidity; absolute humidity
 - ◆ Relative humidity
 - ◆ Dew point temperature
 - Saturation & dew point temperature
 - ◆ Saturation vapor pressure vs. temperature
 - ◆ 3 ways to saturate the air
 - ◆ Dew point temperature
- Dew, frost and fog
 - Formation of dew, frost and fog
 - 3 types of fog and their location in U.S.
- Adiabatic process
 - Adiabatic and diabatic process
 - Temperature change
- Lapse rate and stability
 - Dry adiabatic and Moist adiabatic lapse rate
 - Static stability
 - ◆ Absolutely stable/absolutely unstable/conditionally unstable
 - Potential temperature

- Adiabatic chart

Lecture 7 Clouds and Precipitation

- Clouds
 - Cloud formation
 - Cloud types
 - ◆ 4 basic cloud categories
 - ◆ 4 cloud types based on height: 10 principle clouds
 - Cloud and fronts
- Growth of cloud droplets
 - Radius and volume of cloud droplets and raindrops
 - Terminal velocity
 - Growth of cloud droplets
 - ◆ In warm clouds
 - ◆ In cold and cool clouds
 - Forms of precipitation

Lecture 8a Air Mass and Fronts

- Air mass
 - Classification of air mass
 - Five types of air mass and their characteristics
 - Air mass in U.S.
- Fronts
 - 4 types of fronts
 - Pressure and temperature change before and after fronts pass

Lecture 8b Mid-latitude Cyclones

- Life cycle of cyclones
- Vertical structure of cyclone
 - Surface lows and highs; upper level ridge and trough
 - Vorticity and divergence
 - Cyclone motion

- Rossby wave
 - Absolute vorticity, earth/planetary vorticity, relative vorticity
 - Rossby wave and conservation of absolute vorticity
 - Steering of cyclones

Lecture 8c Lightning, Thunder and Tornadoes

- Lightning and thunder
 - Major sequence for lightning
 - ◆ Cloud-to-cloud and cloud-to-ground lightning
 - ◆ Step leader, return stroke, dart leader
 - Thunder
- Thunderstorm
 - Air mass thunderstorm
 - ◆ Developing stage
 - ◆ Mature stage
 - ◆ Dissipating stage
 - Severe thunderstorm
 - ◆ Atmospheric conditions: wind shear, high water content
 - MCSs
 - ◆ MCCs
 - ◆ Squall line
 - ◆ Supercell
 - Distribution of thunderstorm
- Tornadoes
 - Tornado characteristics
 - Supercell tornado development: wall wind
 - Non-supercell development
 - Location of tornadoes: Tornado Alley
 - Timing of tornado: May
 - Tornado damage: Fujita intensity scale

Lecture 9 Tropical Storms and Hurricanes

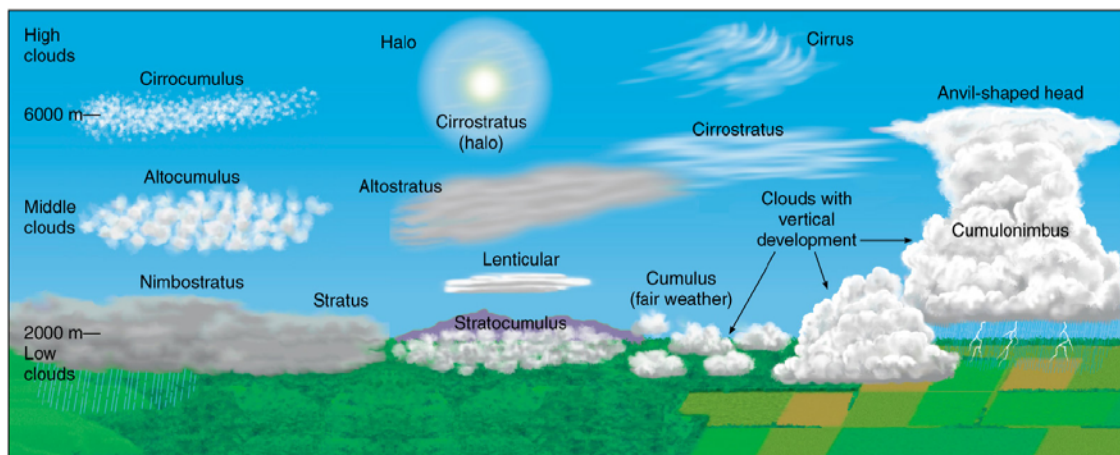
- Hurricane characteristics

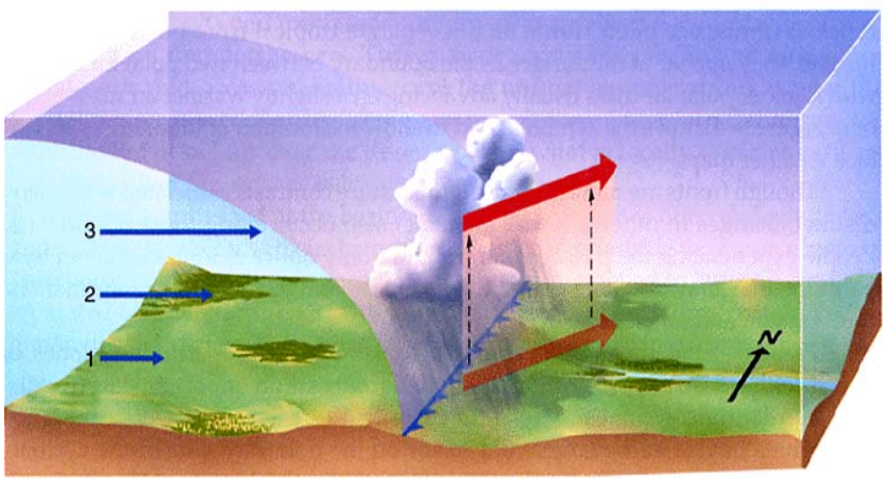
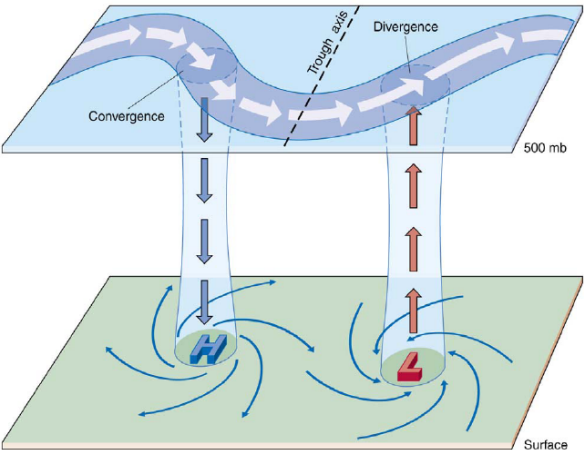
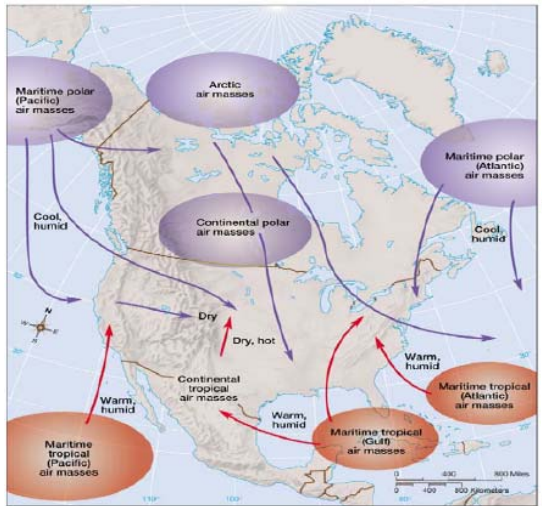
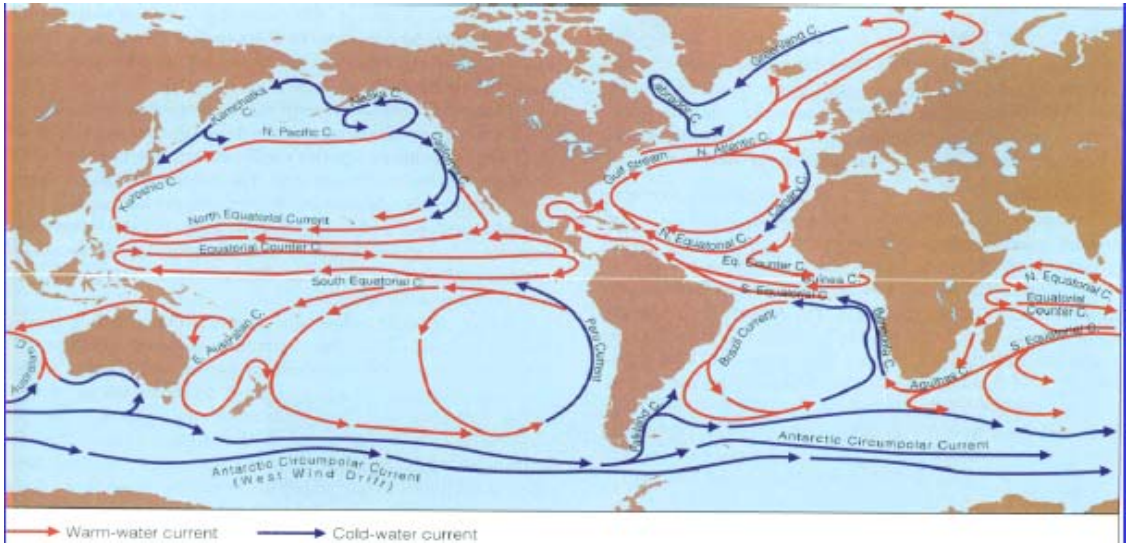
- Hurricane distribution and relationship with SST
- Hurricane seasons
- Hurricane structure
 - Temperature structure
 - Pressure structure
 - Central eye, eye wall and cloud bands
- Hurricane formation, movement and dissipation
 - Conditions for hurricane formation
 - Move poleward and westward
 - Dissipation
- Hurricane damage
 - Storm surge

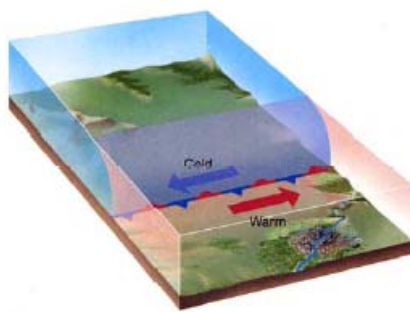
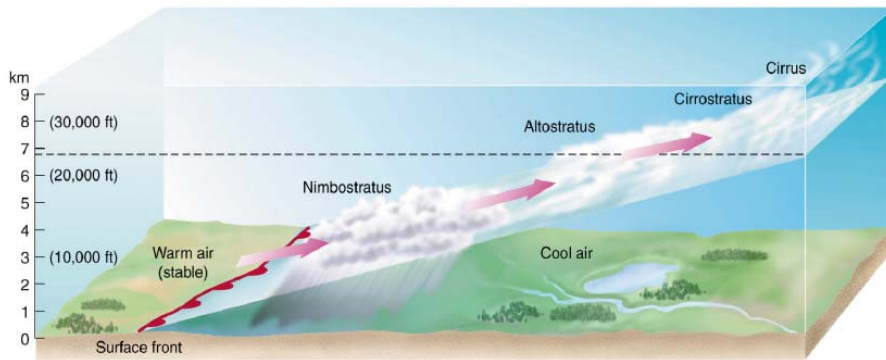
Lecture 10 ENSO

- El Nino
 - What is El Nino?
 - Location
 - Time scale
- Southern Oscillation
 - What is Southern Oscillation?

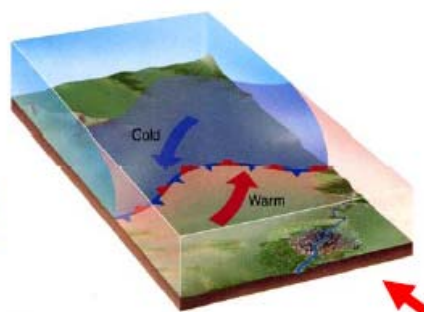
Some figures



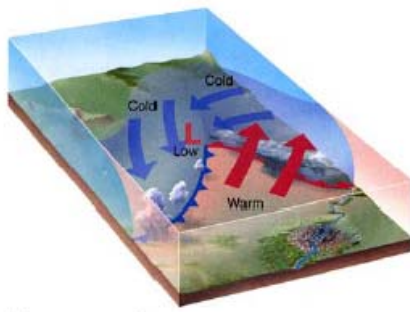




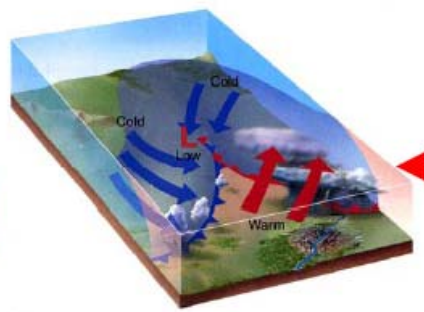
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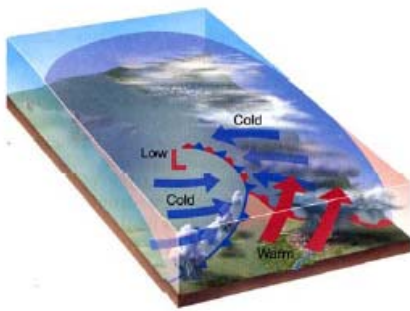
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(e)



(from *Weather & Climate*)