Chapter 3
Convective Dynamics

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Textbook materials for reading

• Holton p.287 – 303
• Houze 268 – 295
• Bluestein Vol II p 445- 462
• (more later when we get into squall lines and supercells)
3.1. Introduction

• Issues with Thunderstorms / Convection
  ▪ Types of storms
  ▪ Necessary conditions for convection
  ▪ Large-scale organization of convection
  ▪ Feedback to environment
  ▪ Dynamics of convective storms
  ▪ Factors that control movement and rotation
  ▪ Prediction of convection/storms

Thunderstorms

• Definition: A thunderstorm is a local storm, invariably produced by a cumulonimbus cloud, that always is accompanied by lightning and thunder. It usually contains strong gusts of wind, heavy rain, and sometimes hail.

• We often use the word "convection" to describe such storms in a general manner, though the term convection specifically refers to the motion of a fluid resulting in the transport and mixing of properties of the fluid. To be more precise, a convective cloud is one which owes its vertical development, and possibly its origin, to convection as a result of positive buoyancy or convective instability
Modes of Convection / Storm Classification

- Although a continuous spectrum of storms exists, meteorologists find it convenient to classify storms into specific categories according to their structure, intensity, environments in which they form, and weather produced.
The most basic classification includes:

- Single-cell or air-mass storm Typically last 20-30 minutes. Pulse storms can produce severe weather elements such as downbursts, hail, some heavy rainfall and occasionally weak tornadoes.

- Multicell cluster storm A group of cells moving as a single unit, with each cell in a different stage of the thunderstorm life cycle. Multicell storms can produce moderate size hail, flash floods and weak tornadoes.

- Multicell Line (squall line) Storms - consist of a line of storms with a continuous, well developed gust front at the leading edge of the line. Also known as squall lines, these storms can produce small to moderate size hail, occasional flash floods and weak tornadoes.

- Supercells Defined as a thunderstorm with a rotating updraft, these storms can produce strong downbursts, large hail, occasional flash floods and weak to violent tornadoes.
Web Resources

• **Single-Cell (Airmass) Thunderstorms**
  (http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/svr/type/sngl/ovr.rxml)

• **Thunderstorms**
  (http://snrs.unl.edu/amet498/versaw/)