Weather Patterns and Severe Storms

Storms are caused by clashing ‘Air Masses’ – called Fronts
So what are Air masses?

Characteristics

- Large body of air
  - 2,000 kilometers or more across
  - Perhaps several kilometers thick
- Similar temperature at any given altitude
- Similar moisture at any given altitude
- Move and affect a large portion of a continent
Air masses

Classification of an air mass

- Four basic types of air masses
  - Continental polar (cP)
  - Continental tropical (cT)
  - Maritime polar (mP)
  - Maritime tropical (mT)
Air masses are classified on the basis of their source region.
And what are Fronts?
Fronts occur when different air masses meet

❖ Types of fronts

• **Warm front**
  • Warm air moves and replaces cooler air in front
  • Shown on a map by a line with semicircles
  • Clouds become lower as the front nears
  • Slow rate of advance – moderate lifting
  • Light-to-moderate precipitation
The Warm Front

Diagram showing the warm front with warm air moving over cool air, resulting in moderate precipitation.
• The Cold Front – more interesting for Canadians – in both summer and winter

• Cold air moves to replace warmer air in front
• Shown on a map by a line with triangles
• Advances faster than a warm front
• Associated weather is more violent than a warm front
  • Intensity of precipitation is greater
  • Duration of precipitation is shorter
The Cold Front

- **Cumulonimbus (Cb)**
- **Warm air**
- **Cold air**
- **Cold front**
- **Heavy precipitation**
So how do we predict Fronts and Weather?

Well not very well!
Stages in the life cycle of a middle-latitude cyclone
Cloud patterns typically associated with a mature middle-latitude cyclone.
Middle-latitude cyclone

- Idealized weather
  - Middle-latitude cyclones move eastward across Canada
    - First signs of their approach are in the western sky – the Alberta Clipper
    - Requires two to four days to move across the continent
Severe weather types

- **Hurricanes**
  - Most violent cyclone storms on Earth
  - To be called a hurricane
    - Wind speed in excess of 119 kilometers per hour is the standard
  - Profile
    - Form between the latitudes of 5 degrees and 20 degrees where the water temperature exceeds 26 C.
Hurricane Sandy October 27th 2012
Other severe weather types

Tornadoes

- Local storms of short duration
- Features
  - Violent local windstorms
  - Rotating column of air that extends down from a cumulonimbus cloud
  - Low pressures inside causes the air to rush into the tornado
  - Winds approach 480 km per hour
Severe weather types

Tornadoes

- Tornado forecasting
  - Difficult to forecast because of their small size
- Tornado watch
  - To alert the public to the possibility of tornadoes
  - Issued when the conditions are favorable
  - Covers 65,000 square km (25,000 square miles)
- Tornado warning is issued when a tornado is sighted or is indicated by weather radar

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Severe weather types

❖ Tornadoes

• Occurrence and development
  • Average of 770 each year in the United States but only about 20 each year in Canada – mostly in southern Ontario
  • Most frequent from April through June
  • Associated with severe thunderstorms
  • Exact cause of tornadoes formation is not known
  • Conditions for the formation of tornadoes
    • Occur most often along a cold front
    • During the spring and early summer months
Severe weather types

- **Tornadoes**
  - **Characteristics**
    - Diameter between 150 and 600 meters
    - Speed across landscape is about 45 kilometers per hour
    - Cut about a 10 km long path
    - Most move toward the northeast
    - Maximum winds range beyond 500 kilometers per hour
    - Intensity measured by the Fujita intensity scale
Average annual tornado incidence for a 27-year period