Tornadoes

**Conditions**

*The interaction of air streams with different temperatures, densities, humidity and wind flows.*

1) **Cold dry air moves over warm moist air**
   - The cold air sinks and warms adiabatically
   - This creates a band of warm, dry air sandwiched between 2 air streams (inversion)
   - Temperature inversion

2) **Ground temperatures rise during the day**
   - The warm, moist air is heated from below
   - It rises.
   - It is trapped by the temperature inversion of warm, dry air.
   - Pressure builds up in the warm moist air.

3) **Trigger mechanism breaks the temperature inversion**
   - Trigger mechanism e.g. cold front
   - Warm moist air rushes through the cold air streams.
   - This creates a low pressure centre.
   - Leads to rapid and large cumulonimbus cloud development, often up to the tropopause.

**Distribution**

**Spatial**

1) Mid-latitude regions (20-60 N/S) where tropical and polar air meet via global atmospheric circulation.
2) From cumulonimbus cloud development around hurricanes.
3) Where there are strong vertical contrasts of temperature, winds and moisture.
4) **Tornado Alley**
   a. 5/more a year
   b. Contrasting air masses with temperature differences up to 20-30 C meet along cold fronts
   c. Flat plains encourage rapid movement of air and wind shear
   d. Flat ground lets cool dry Canadian air mix violently with warm moist Mexican Gulf air
5) **Southeastern US** e.g. Arkansas, Alabama, Mississippi, Georgia
6) Also in New England US e.g. Arkansas, Mississippi, Georgia – tornadic storms in early spring
   7) **Australia**: weak; in the east where there are cold fronts
   8) **UK**: weak; lowlands; about 32 small low intensity tornadoes yearly
   9) Other **European** countries, India, Bangladesh, Uruguay, China, Japan
   10) Equatorial regions lack contrasting air masses and Coriolis force
   11) Polar regions lack warm moist air

**Temporal**

1) Any time but particularly when contrasts between air masses are most marked
   a. USA: mid-March to August (peak April to July)
   b. UK: September to January

**Classification and measurement**

By width and length of path and wind speed.

**Fujita Intensity Scale** (USA) – according to damage

**Tornado Intensity Scale** (UK) – developed by TORRO; uses wind speed (Beaufort scale) and damage observed