Comparison of tropical vs extra-tropical cyclones

Today’s WV loop
Lecture 4: Extra-tropical Cyclones

- Polar front review - climatology
- Satellite images
- Extra-tropical cyclones
Global scale: the Polar Front

Transition from polar air to tropical air is the Polar Front

140121 12z, 500mb temperature in C
Fronts experiment

Real time data, polar view
Polar Front – Climatology
January Mean

http://web.mit.edu/wdmc/Public/gfd/frontsIDV.html
Instantaneous:

Isosurface of potential temperature
Instantaneous:

Isosurfaces of potential temperature and wind
The upper level jet on 140121 12z
Water vapor satellite image on 140121 15z
Where are the mid-latitudes cyclones come from?
General circulation experiment -
to understand how the cyclones form

Two main ingredients:

1. Earth rotation

2. North south temperature difference
   (warming of the equator and cooling of the pole)
Cyclones facts:

1. develop along the Polar Front,

2. stir the north-south temperature gradient, and are responsible for the poleward transfer of heat,

3. move from west to east with the jet,

4. have a lifetime of ~5 days.
Cyclones development

Cyclones stir the north-south temperature gradient.

They are responsible for the pole ward transfer of heat.

Vertical structure of the warm and cold fronts
Case study: example of advection