Mid-Latitude Storms

Nature’s Giant Eggbeaters
SFSU Workshop 11/2/02

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1. Energy imbalances between tropics (low latitudes) and polar regions (high latitudes) - winter and summer
2. Hot and getting hotter, cold and getting colder…
3. Something needs to happen to mix the hot and cold air (to even out imbalances)
4. Mid-latitude storms come to the rescue
5. All about mid-latitude storms - not quite…
6. Good place to get fog pictures
Warming up the earth

• Solar energy received depends on the angle at which sunbeams arrive
• Flashlight analogy
High and low latitudes

Meteorologically Significant Latitude Zones

- High latitudes
- Middle latitudes (midlatitudes)
- Low latitudes

Latitude Zones:
- 90° N
- 60° N
- 30° N
- 0°
- 30° S
- 60° S
- 90° S
Angle at which sunbeams arrive

• The angle depends on the time of year, time of day and your location (latitude)
• Let’s compare what happens at a high latitude location (Alaska) and a low latitude location (Mexico) during summer and winter
Figuring out how much solar energy different places get

1. Go to http://virga.sfsu.edu/javascripts/wx
2. Visit “Earth-Sun Geometry” module
3. Select Latitude for Alaska (60 N) and for Mexico (20 N)
4. Let it run for a year. How do the angles of the two sunbeams compare in summer? Winter? When is the difference between the two sunbeams the greatest?
What happens to the air temperature as a result?

- Look at areas that have **cold air (blue)** and **warm air (red)**
- Notice where the (white) boundary between the cold and warm air is
- The boundary is “wavy” and it moves!
- Mid-latitude storms form at that “wavy” boundary
Snapshot of temperature differences between latitudes
What do mid-latitude storms look like from space?
Identifying mid-latitude storms

- They occur in the mid-latitudes
- Their clouds are arranged in a “comma” shape in the northern hemisphere
- Their clouds are arranged in an “upside down comma” shape in the Southern Hemisphere
Mid-latitude storms in motion

- To see the temperature differences between high and low latitudes in motion go to:
  http://virga.sfsu.edu/scripts/temp_700_mw_archloop.html

- To see the storms that develop as a result of these differences go to:
  http://virga.sfsu.edu/scripts/mwir_archloop.html
What do mid-latitude storms do?

- They mix cold air from the high latitudes with warm air from the low latitudes (giant eggbeaters!)
- They produce a lot of clouds and rain as a result
- They produce almost all the rain we get in San Francisco during the winter
When a lot of mid-latitude storms visit San Francisco

- Movie of February 1998 - a very wet month (during the last El Niño period)

Visit:
Finally…fog pictures

• Best place to see what parts of California have fog.
• Daytime pictures only

• http://www.wrh.noaa.gov/satellite/1km/Monterey/VIS1MTR.GIF