General Meteorology

LECTURE 14

Sahraei

Physics Department,

Razi University

http://www.razi.ac.ir/sahraei/

Cyclones have converging air at surface that rises!

Surface winds blow counterclockwise around a cyclone (low pressure) and converge.





View from above

View from side

Anticyclone

- Which way does the wind blow? --> anticyclonic = clockwise!
 - Does air diverge or converge at the surface? --->Diverges!
- Does air converge or diverge above the high? - >Converges!



Anticyclones (Highs)

Surface winds blow clockwise around an anticyclone (high pressure) and diverge.





View from above

View from side

General Circulation of the Atmosphere

General refers to the average air flow, actual winds will vary considerably.

Average conditions help identify driving forces.

The basic cause of the general circulation is unequal heating of the Earth's surface

Warm air is transferred from the Tropics to the Poles Cool air is transferred from the Poles to the Tropics



Copyright © 2004 Pearson Prentice Hall, Inc.



Single Cell Model

Assume

1. The earth's surface is uniformly covered with water (so that differential heating between land and water does not come into play).

2. The sun is always directly over the equator (so that the winds will not shift seasonally). On the Equinoxes, which are generally on March 21 and September 21.

3. The earth does not rotate (so that the only force we need to deal with is the pressure gradient force).

Result: huge thermally direct convection cell (Hadley)





Three Cell Model

Allow earth to spin = three cells (Hadley, Ferrell, Polar)

Alternating belts of pressure starting with L at Equator

Alternating belts of wind with NE just North of Equator



Average Surface Wind and Pressure: The Real World

- Semi-permanent high and lows
- Northern vs. Southern Hemisphere
- Major features shift seasonally with the high sun
 - North in July
 - South in December









Extremely large body of air whose temperature and humidity are similar horizontally and vertically.

Source Regions: area where air mass originates, usually flat and uniform composition with light surface winds



Classification

Classification based upon temperature and humidity

P = polar
T = tropical
A = Arctic
m = maritime
c = continental

Air Mass Classification and Characteristics

| SOURCE REGION | ARCTIC REGION (A) | POLAR (P) | TROPICAL (T) |
|----------------|--|-----------------------|--|
| Land | cA | сP | cT |
| Continental(c) | extremely cold, dry stable; ice- and snow-covered surface | cold, dry, stable | hot, dry, stable air aloft; unstable surface air |
| Water | | mP | mT |
| Maritime (m) | | cool, moist, unstable | warm, moist; usually unstable |

Air Masses

- North America cP and cA
 - Source region: N. Canada, Alaska
 - Dry, cold, stable (A more extreme)
- Topic: Lake Effect Snow
 - > cP air passes over unfrozen lake, absorbs moisture and drops snow on leeward side of lake

Air Masses

North American mP

- Source region: North Pacific, North Atlantic
- Cool, moist, unstable
- North American mT
 - Source region: Gulf of Mexico, Caribbean, SE Pacific
 - Wet, warm, unstable
 - Pineapple Express, Bermuda High

is a non-technical term for a meteorological phenomenon characterized by a strong and persistent flow of atmospheric moisture and associated heavy precipitation from the waters adjacent to the Hawaiian Islands and extending to any location along the Pacific coast of North America.



© Brooks/Cole, Cengage Learning