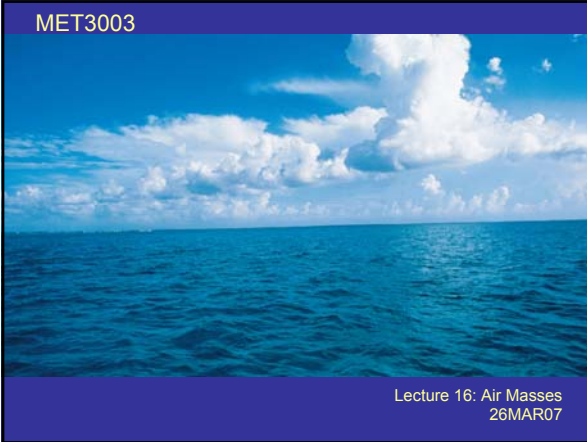




Lecture 16: Air Masses
26MAR07

What is an “Air Mass”

- It is, well, a mass of air, that...
 - Nominally ~1500 km in extent
 - Characterized by more-or-less uniform temperature and humidity
 - Inherited from the (land or sea) surface in its **Source Region**
- Changes in properties within an air mass are less than those between air masses
- Air masses carry their properties with them when they move away from their source region
- Causing **Air Mass Weather**

Example: High-Latitude Canadian Air Mass

- Takes on cold, dry characteristics of the “frozen north” in winter
- Pushes southward into the US
- Causing:
 - Cold north winds
 - Clear skies over land
 - Coastal stratus over the sea



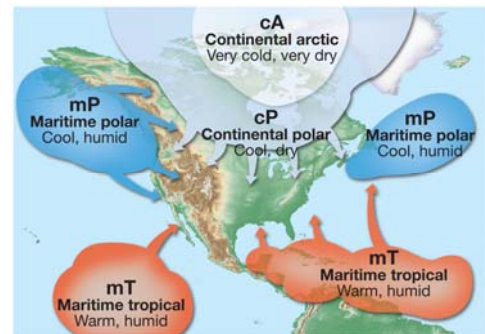
The Source Region

- Air takes on characteristics of the surface
 - Dry: Desert or icecap
 - Moist: Sea
 - Warm: Low latitude
 - Cold: High Latitude
- Uniform surface conditions across source region
- Air is “stagnant” in the source region
- Implies anticyclone or high pressure cell
 - Stationary or slowly moving

Characteristics of Air Masses

- **cA**: Continental Arctic—Very COLD, DRY
 - Ice cap, or frozen sea
- **cP**: Continental Polar---COLD DRY
 - Snow covered in winter, but not in summer
- **cT**: Continental Tropical---HOT, DRY
 - Desert
- **mT**: Maritime Tropical---WARM, MOIST
 - Low-latitude sea (equatorward of 30-35°)
- **mP**: Maritime Polar---WARM, MOIST
 - High-latitude seas (poleward of 50°)

Wintertime Source Regions



Summertime Source Regions

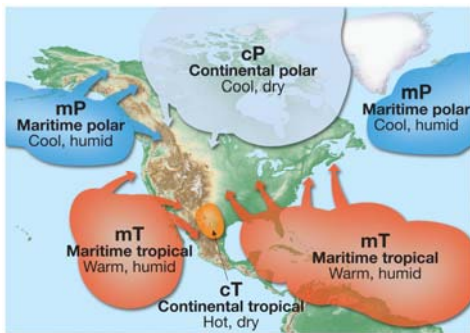


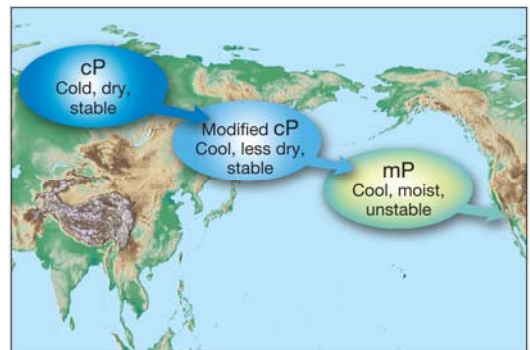
TABLE 8.1 Weather characteristics of North American air masses

Air mass	Source region	Temperature and moisture characteristics in source region	Stability in source region	Associated weather
cA	Arctic basin and Greenland ice cap	Bitterly cold and very dry in winter	Stable	a. Cold waves in winter
cP	Interior Canada and Alaska	Very cold and dry in winter	Stable entire year	a. Cold waves in winter b. Modified to cP in winter over Great Lakes bringing "lake-effect" snow to leeward shores
mP	North Pacific	Mild (cool) and humid entire year	Unstable in winter Stable in summer	a. Low clouds and showers in winter b. Heavy orographic precipitation on windward side of western mountains in winter c. Low stratus and fog along coast in summer; modified to cP inland
mP	Northeastern Atlantic	Cold and humid in winter Cool and humid in summer	Unstable in winter Stable in summer	a. Occasional "sea smog" in winter b. Occasional periods of clear, cool weather in summer
cT	Northern interior Mexico and southwestern U.S. (summer only)	Hot and dry	Unstable	a. Hot, dry, and cloudless, early influencing areas outside source region b. Occasional drought to southern Great Plains
mT	Gulf of Mexico, Caribbean Sea, western Atlantic	Warm and humid entire year	Unstable entire year	a. In winter it usually becomes the moving northward and brings occasional widespread precipitation or advection fog b. In summer, hot and humid conditions, frequent cumulus development and showers or thunderstorms
mT	Subtropical Pacific	Warm and humid entire year	Stable entire year	a. In winter it brings fog, drizzle, and occasional moderate precipitation to N.W. Mexico and S.W. United States b. In summer this air mass occasionally reaches the western United States and is a source of moisture for infrequent convective thunderstorms

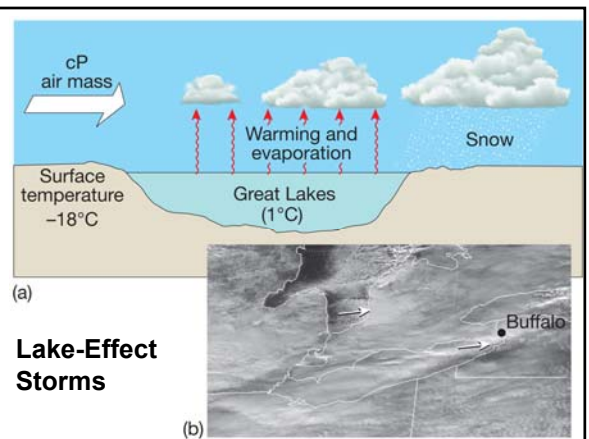
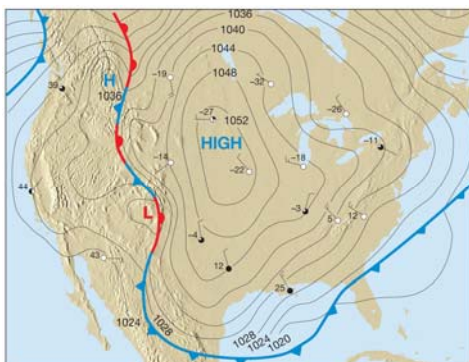
Air Mass Modification

- Air mass moves from its source region
 - Changes its own characteristics
 - Changes the weather at its destinations
- Mechanisms of change
 - Evaporation
 - Heating (or cooling) from below
- Suffix **k** denotes colder air moving over a warm surface
 - Example: cPk
 - Cumulus or stratocumulus, showers or drizzle
- Suffix **w** denotes warmer air moving over a cold surface
 - Example: mPw
 - Clear or *Advection Fog*

Modified Siberian Air in California

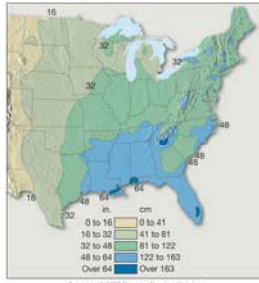


Polar Outbreaks



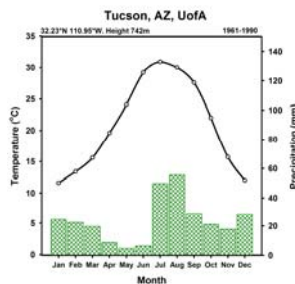
mT Air and East-Coast Summers

- Southeasterly flow around Bermuda High
 - Brings mT air
 - From Caribbean to New Jersey
- US summer weather is the same from Miami to DC
- Causes rain throughout US east of Rockies

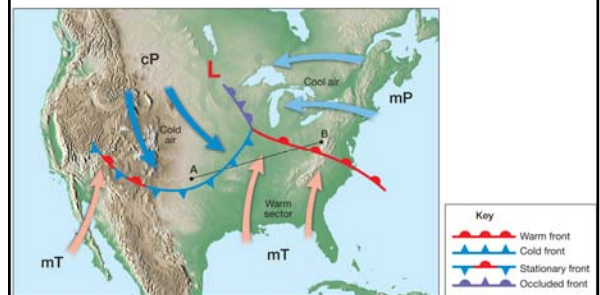


Arizona Monsoon

- SW wind brings mT air
- From
 - Gulf of Baja California
 - NOT Gulf of Mexico
- Solar heating of desert causes convection
- Lots of rain falls in heavy showers
- But most of it evaporates



Boundaries Between Air Masses are Called Fronts



Summary

- **Air Masses** have uniform temperature and moisture over a large area
- Acquired from the **Source Region**
- Know characteristics of cA, cP, mP, cT & mT with k & w suffixes
- Know how air-mass modification works
- Know about **Polar Outbreaks** and **Lake Effect Storms**
- Understand how mT air affects US summertime weather and its alternation with cP air affects wintertime weather
- Understand how mP air affect the weather in WA, OR & CA
- Be able to explain the SW US "Monsoon"
- For next time: **Read Chapter 9**