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Lecture 9 – AIR MASSES

9.1 GENERAL

- An *air mass* is defined as a large body of air that has a fairly uniform horizontal distribution of temperature and moisture content
- Air masses are at least around **1000** miles in horizontal extent
- The region where an air mass is formed is called the *source region*
- In order to form, an air mass must remain in its source region for a week or more
- Source regions must be large and uniform
- Air masses are associated with anticyclones (areas of high pressure)
- The major source regions for air masses are either found in the tropics or in the polar regions

9.2 SOURCE REGIONS

- Regions where air masses originate are known as **source regions**
- In order for a huge mass of air to develop uniform characteristics, its source region should be generally flat and of uniform composition, with light surface winds
- The longer the air remains stagnant over its source region, the more likely it will acquire properties of the surface below
- Consequently, ideal source regions are usually those areas dominated by high pressure
- They include the ice- and snow-covered arctic plains in winter and subtropical oceans and desert regions in summer
- The middle latitudes, where surface temperatures and moisture characteristics vary considerably, are not good source regions

9.3 AIR MASSES CLASSIFICATION

- Air masses are classified according to the latitude of their source region, and according to the nature of the surface of the source region whether they are formed over land or over water as shown in table (9.1)
- Latitude of the source region
 - Arctic air masses (**A**)
 - Polar air masses (**P**)
 - Tropical air masses (**T**)
- Nature of the surface of the source region
- *maritime* air masses (**m**)
- *continental* air masses (**c**)
- The five categories of air masses are
 - continental arctic – **cA**
 - continental polar – **cP**
 - continental tropical – **cT**
 - maritime tropical – **mT**
 - maritime polar – **mP**

9.4 PROPERTIES OF AIR MASSES

- **Continental Polar (cP)**
 - Cold and dry
 - Stable
 - An air mass characterized by low temperatures and dry air

- **Continental Arctic (cA)**
 - Very cold and dry
 - Stable
 - An air mass characterized by extremely low temperatures and very dry air

- **Maritime Polar (mP)**
 - Cool and moist
 - Unstable
 - An air mass characterized by low temperatures and high humidity

- **Maritime Tropical (mT)**
 - Hot and moist
 - Unstable
 - An air mass characterized by high temperatures and high humidity

- **Continental Tropical (cT)**
 - Hot and dry
 - Unstable
 - An air mass characterized by high temperatures and low humidity

Table (9.1) : The Types of Air Masses

Air Mass Classification and Characteristics		
SOURCE REGION	POLAR (P)	TROPICAL (T)
Land continental (c)	cP Cold, dry, stable	cT Hot, dry, stable air aloft; unstable surface air
Water maritime (m)	mP Cool, moist, unstable	mT Warm, moist; usually un- stable

9.5 AIR MASSES MODIFICATION

- Once an air mass moves out from its region of origin, it can become modified by the surface over which it is passing
- (i)
- If an air mass is colder than the surface over which it is passing it receives the designation, *k*
- Cold air over a warm surface will be unstable
- A *k* air mass will often be associated with cumuliform clouds
- **In other word** , when the air mass is colder than the underlying surface, it is warmed from below, which makes the air unstable at low levels
- In this case, increased convection and turbulent mixing near the surface usually produce cumuliform clouds, and showers of rain or snow

- (ii)
- If an air mass is warmer than the surface over which it is passing it receives the designation, *w*
- Warm air over a cold surface will be stable
- A *w* air mass will often be associated with stratiform clouds
- **In other word** , when the air mass is warmer than the surface below, the lower layers are chilled by contact with the cold earth
- Warm air above cooler air produces stable air with little vertical mixing
- In moist air, stratiform clouds accompanied by drizzle or fog may form