

## **GEO165 Meteorology**

### **Summary Sheet on the Use of Airmasses in Forecasting**

#### **AIRMASS DEFINITION:**

An **airmass** (or air mass both work for web searches) is a large body of air covering from thousands to hundreds of thousands of square miles. Because it was nearly stagnant for a sufficiently long period of time the airmass acquired the characteristics of the region where it was stagnant. Regions where this commonly happens are called **source regions**.

#### **AIRMASS NAMING CONVENTION:**

Airmasses are named for the properties of the source regions:

**Moisture content:** continental vs. maritime.

**Temperature:** equatorial, tropical, polar, arctic

**Stability:** **k=colder than surface**, therefore destabilized by heating from below resulting in showery weather and cumuliform cloud types, sometimes grading into stratocumuliform cloud types.

**w=warmers than surface**, therefore stabilized by cooling from below resulting in fog, stratus and steady, light rain or drizzle

**cPk** = dry cold air colder than surface (continental, polar, cold)

**mTw**= warm, moist air, warmer than surface maritime, tropical, warm)

#### **AIRMASS MODIFICATION:**

Along quasi-horizontal surfaces an airmass is close to being uniform, until it leaves the source region then it is progressively modified.

Example 1: A winter airmass stagnant over far northern Siberia will be extremely cold. Because of the lack of moisture (frozen continent) and the lack of energy to vaporize any moisture that is available it will also be extremely dry. As the airmass moves away from the source region it is **de-stabilized**, especially if it passes over open water then showers/snow showers will result. This is how lake effect snow develops.

Example 2: An airmass, stagnant over the tropical Atlantic Ocean for a sufficiently long period of time will be warm and quite muggy. This airmass, in contrast to the one over Siberia, has plenty of energy to do the work of evaporation and plenty of moisture available to evaporate. If this airmass passes over an extensive area of snow cover as if flows northward over the U.S. during winter it will be stabilized, the relative humidity will increase as it is cooled and some moisture is evaporated/sublimated from the snow cover and fog and drizzle/freezing drizzle may result.

### **AIRMASSES - DEFINING CHARACTERISTICS:**

Airmass characteristics include the temperature typical of the source region and moisture typical of the source region. Stability, derived from the moisture and temperature of the source region becomes important as the airmass interacts with new surfaces over which it travels.

### **USE OF AIRMASSES IN FORECASTING:**

When a front arrives in a region why is it important to identify the new airmass?

1. The airmass will bring with it the characteristics it acquired over the source region.
2. The airmass will have been modified and it is of UTMOST importance to:
  - a. Identify the path the airmass took and the conditions of the surface over which it passed.
  - b. Decide how long the journey took and therefore how much the airmass was modified
  - c. Address the change of stability. For example a very dry cA airmass may have traveled over very wet ground from melting snow during warm weather earlier. *Note: an airmass of the type cAw makes little sense and is not used. cA air by definition is the coldest air and it is never warmer than any surface. The moisture it acquired is confined to a shallow layer adjacent to the surface, but as the modified cA airmass moves over warmer ground, snow showers may develop because of destabilization by*

heating from Earth's surface, aided by the release of latent heat.

- d. An additional example of an important use of airmass analysis is when mTw air is invading a region during winter. When the airmass traverses a large snow covered region, the moisture-laden air is cooled and water is evaporated from melting snow. The combination of moisture increase and molecular kinetic energy decrease creates a widespread, dense fog.

**When analyzing surface charts always enter the airmass type to aid in map discussions.**