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Chapter 9 Airmasses And Fronts

Airmasses

Airmass – a large body of air with relatively uniform thermal and moisture characteristics

How large is an airmass?

Area covered

Depth

Airmass characteristics and names

Moisture characteristics

| Name | Moisture Characteristics |
|--------------------|--------------------------|
| Maritime | Moist (forms over water) |
| Continental | Dry (forms over land) |

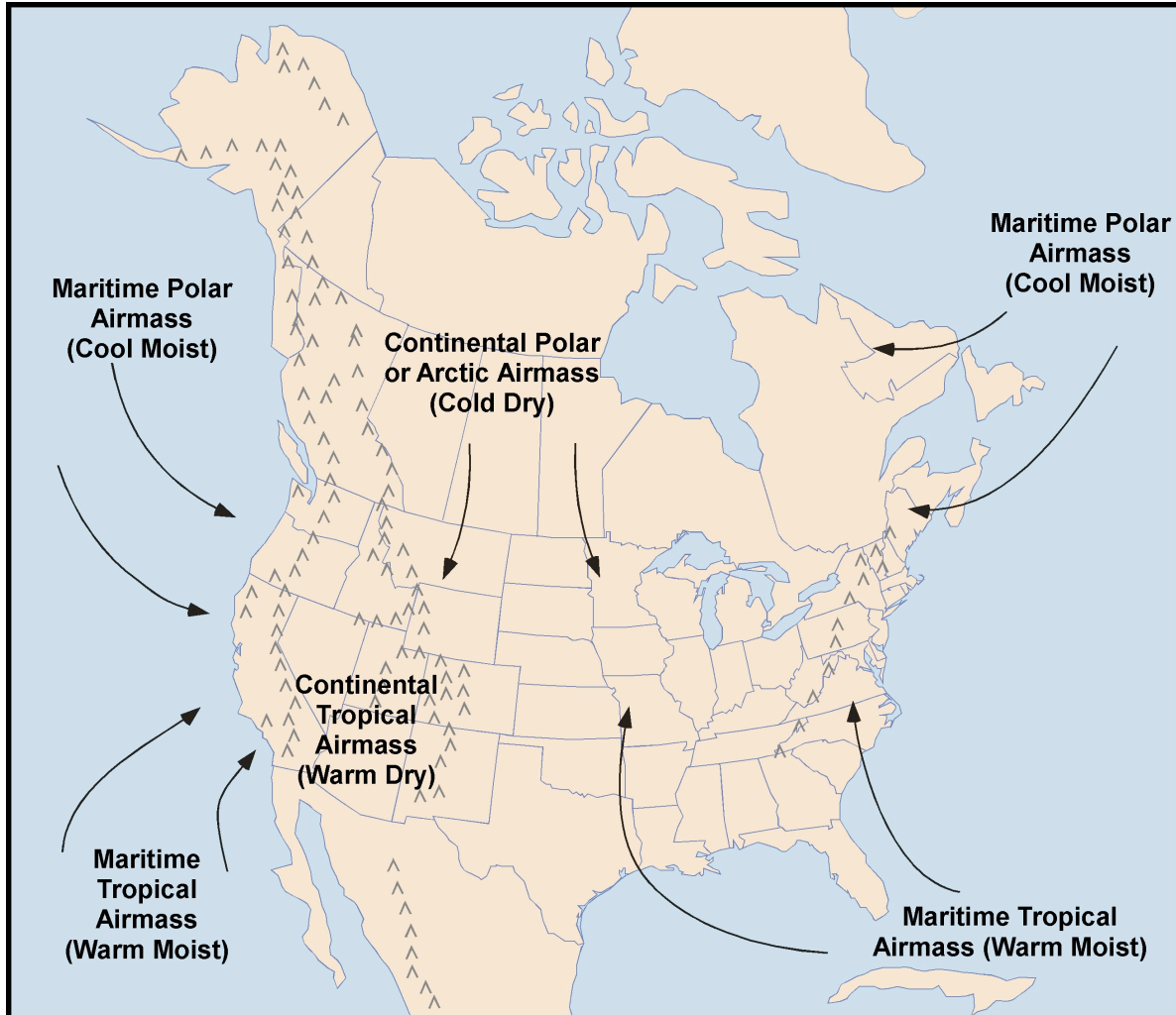
Thermal characteristics (Temperature)

| Name | Thermal Characteristics |
|-----------------|-------------------------|
| Arctic | Very cold |
| Polar | Cool to cold |
| Tropical | Warm to hot |

Airmasses are usually named for both their moisture and thermal characteristics (maritime tropical, continental polar, etc).

How do airmasses form?

Where do airmasses form?



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Sea level pressure and airmasses

High sea level pressure is often associated with:

Cold airmasses – Arctic and Polar

Maritime airmasses in the summer (Bermuda high and Pacific high)

Low sea level pressure is often associated with:

Hot airmasses – Tropical

Maritime airmasses in the winter (Aleutian Low and Icelandic Low)

Fronts

Front – a boundary between different airmasses

Why do we care about fronts?

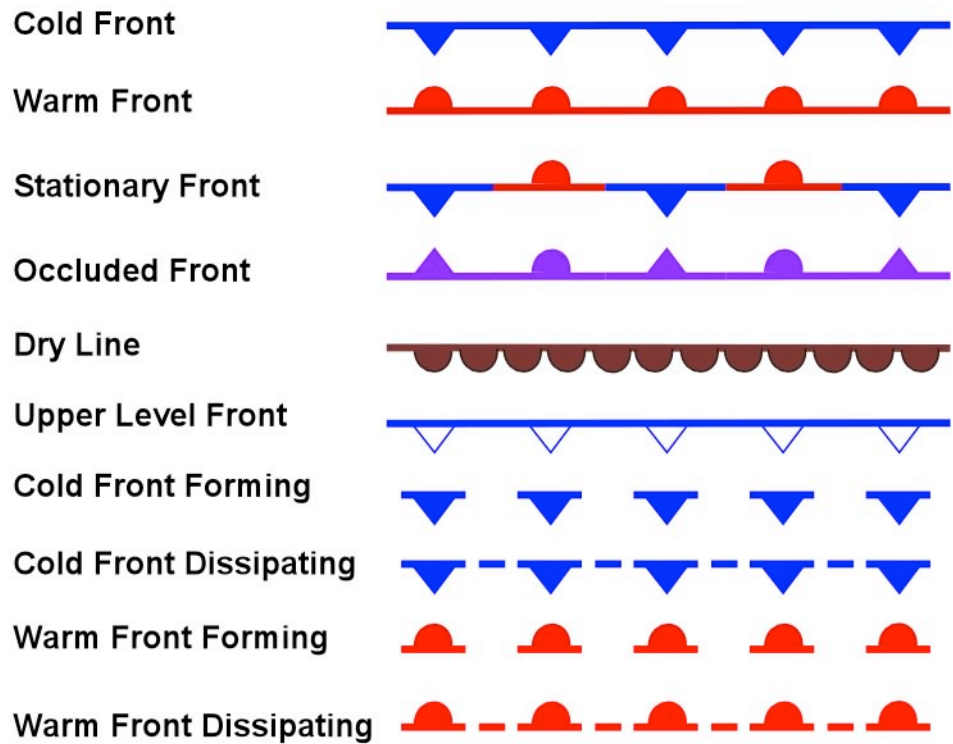
One airmass is usually lifted up and over the other airmass along a front, resulting in the formation of clouds and precipitation.

As we study different types of fronts you will want to know how the weather changes as the front passes.

Fronts are classified based on:

- Thermal and moisture characteristics of the airmasses
- Direction of movement of the airmasses
- Whether the front is contact with the surface or is only found aloft

There are six fronts that we will study in this class.



Cold front – a front that separates warm and cold airmasses, and the cold air is advancing and lifting the warm air

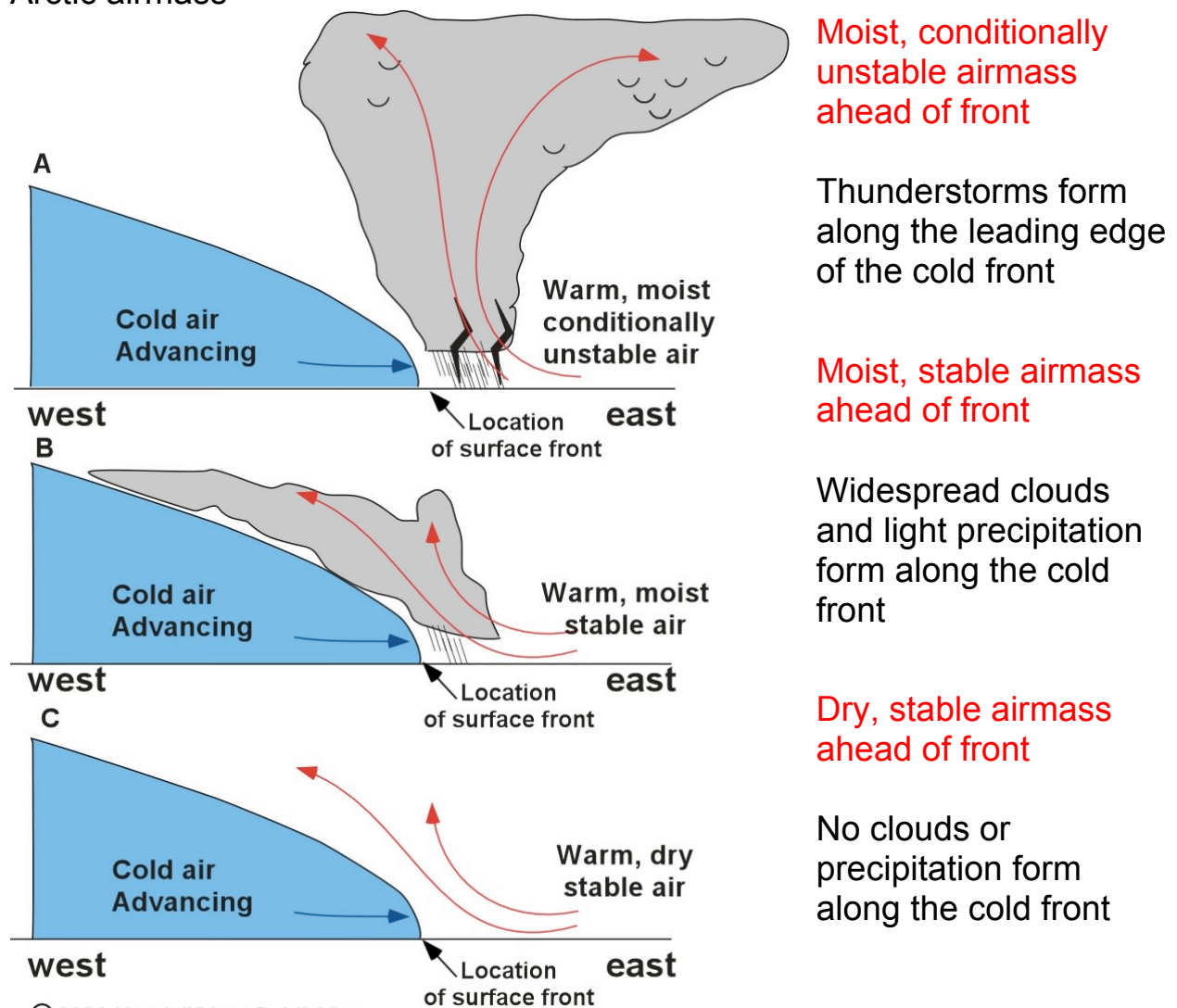
Weather associated with a cold front:

Ahead of a cold front the weather will be warm and often sunny.

As the cold front passes there may be clouds and precipitation and the temperature will drop sharply.

Behind the cold front the weather will often be clear and cold.

Arctic front – a cold front that marks the leading edge of an advancing Arctic airmass



Warm front – a boundary where the cold air is retreating and the warm air is advancing

Weather associated with a warm front:

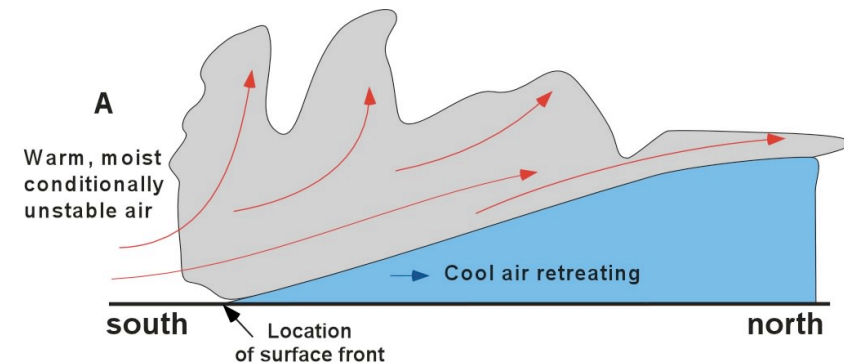
Ahead of the warm front the air is cool.

As a warm front approaches you will first notice high thin clouds ahead of the front.

As the warm front gets closer the clouds will become lower, get thicker, and light precipitation may begin to fall.

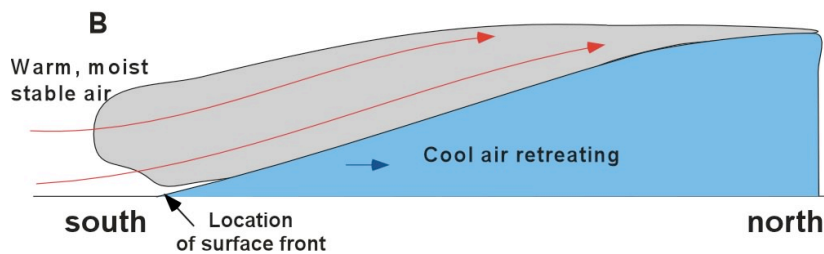
Right before the warm front passes the clouds will be very low and thick and the precipitation will be at its heaviest.

Once the warm front passes the skies will clear and the temperature will warm.



Moist, conditionally unstable airmass behind the front

Thunderstorms form along and ahead of the warm front



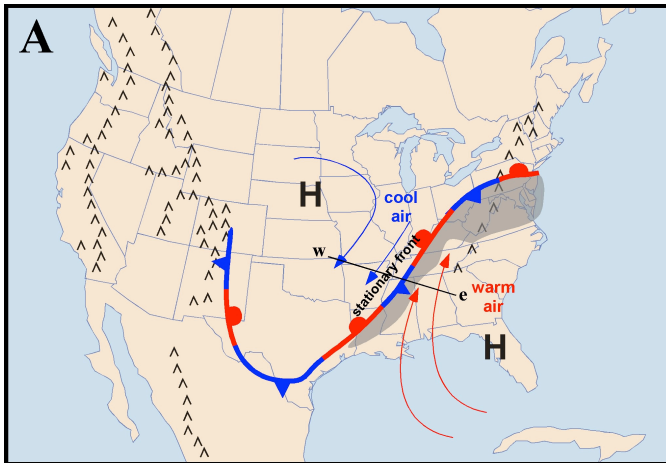
Moist, stable airmass behind the front

Widespread clouds and light precipitation form along and ahead of the warm front

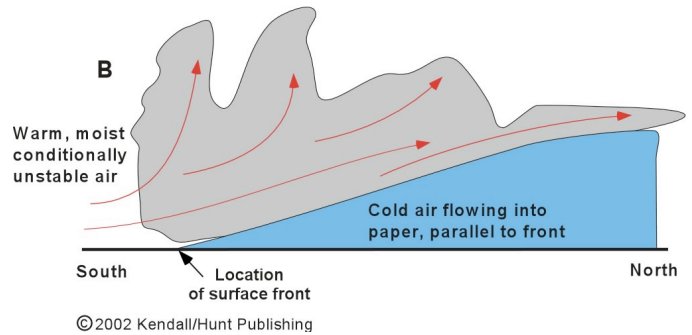
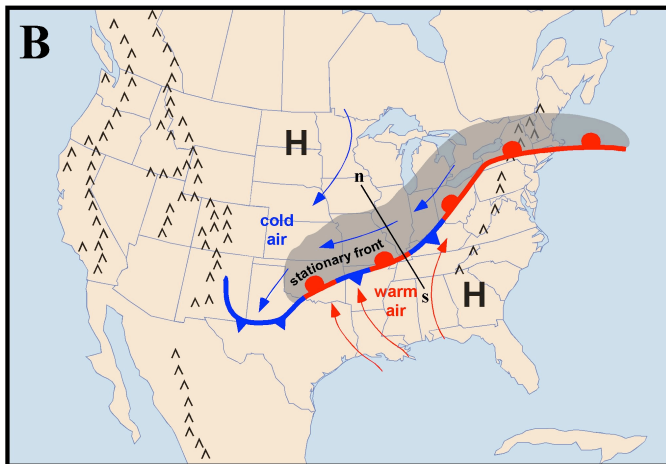
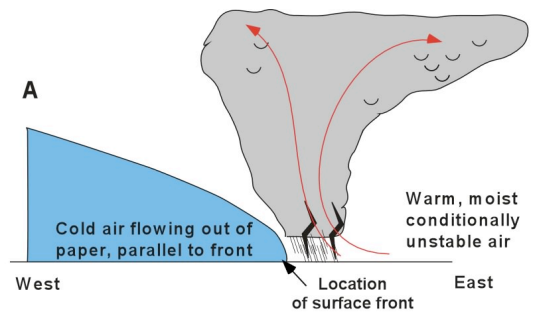
Stationary front – a boundary that separates cold and warm airmasses, where neither airmass is advancing nor retreating

Even though a stationary front is not moving the warm air can still be lifted by the front.

A. Cold and warm air are both flowing parallel to the stationary front



Clouds and precipitation form along leading edge of the front



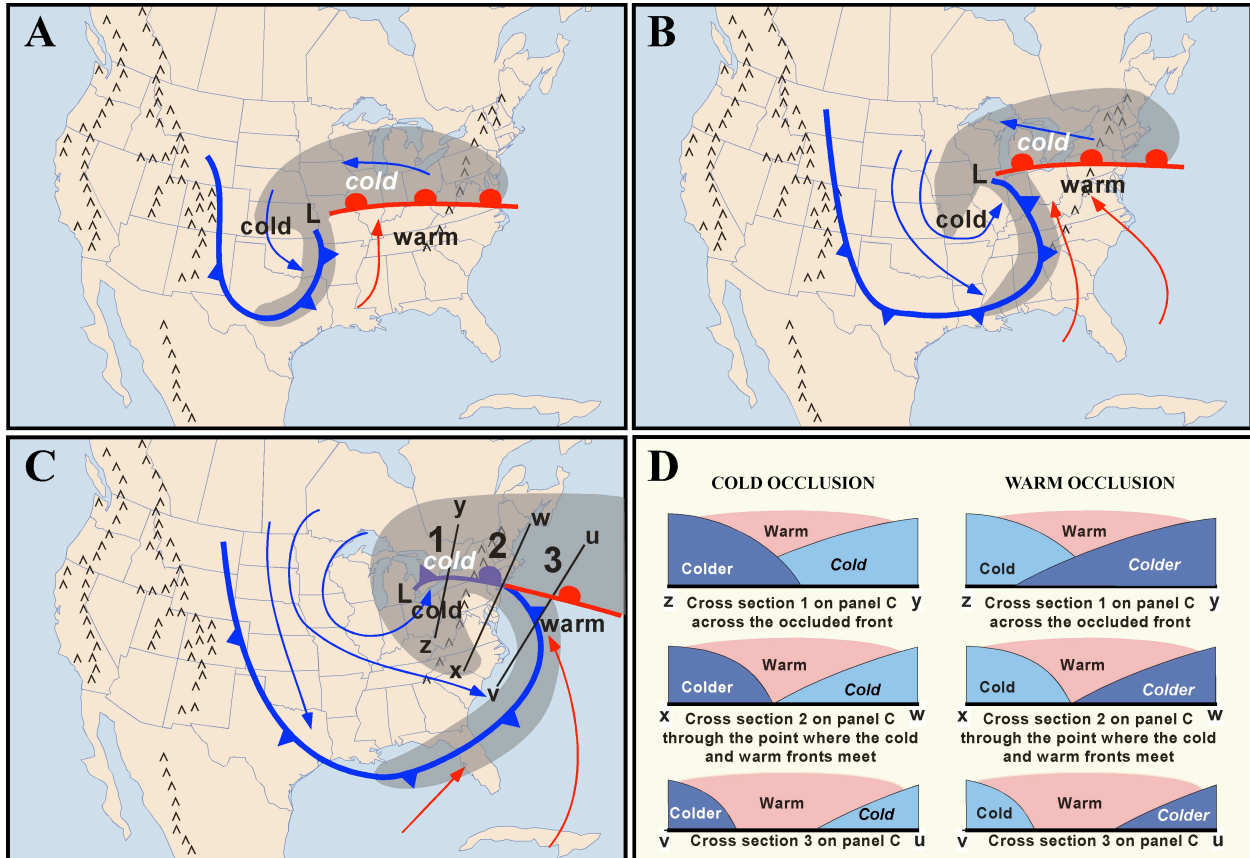
Clouds are widespread and form on the cold side of the front

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B. Cold air is flowing parallel to the front, but the warm air is flowing towards the front and up and over the cold air

Occluded front – a boundary between cold and colder airmasses with warm air aloft

How does an occluded front form?



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How do warm and cold occlusions differ?

- Temperature behind cold front
- Temperature ahead of cold front
- Temperature ahead of warm front

Weather associated with an occluded front:

As a cold occluded front passes the temperature changes from cold to colder, and clouds are widespread.

As a warm occluded front passes the temperature changes from colder to cold, and clouds are widespread.

Occluded fronts often form during the mature and dissipating stages of a mid-latitude cyclone's life cycle

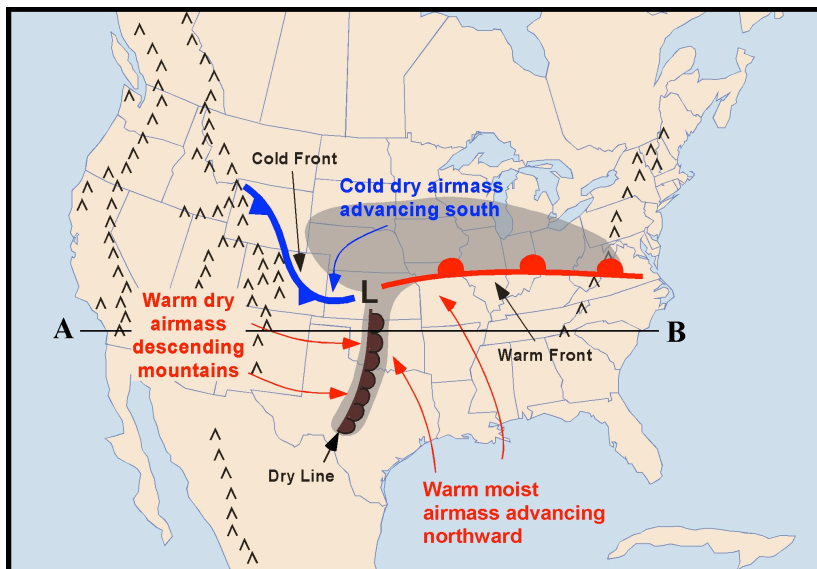
Dry line – a front characterized by sharp moisture differences rather than sharp temperature differences

Weather associated with a dry line:

Ahead of a dry line the weather is warm and humid.

As the dry line passes a line of thunderstorms may form.

After the dry line passes the weather remains warm but is much less humid.

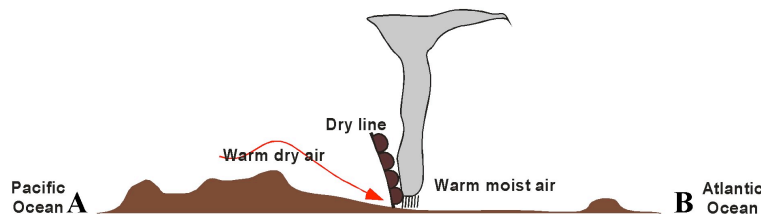


What types of airmasses are associated with the dry line?

At the same temperature moist air is less dense than dry air.

Which airmass is lifted along a dry line?

What types of weather are associated with the dry line?



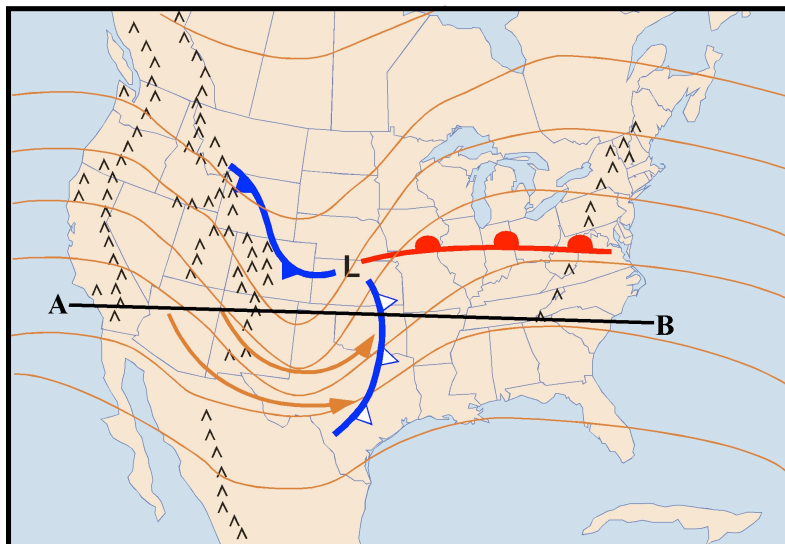
Upper level front – an airmass boundary that is present aloft but not at the surface

This type of front often separates dry air that has descended from the upper troposphere or lower stratosphere from moist air that has ascended from the lower troposphere.

Weather associated with an upper level front:

There is often little temperature change at the surface as an upper level front passes.

A line of thunderstorms may occur as an upper level front passes.



What types of weather are associated with an upper level front?

