

OVERVIEW OF WEATHER

Air Masses and Air Streams

Air in the atmosphere picks up the characteristics of the area it comes from. For example, the air above the Sahara Desert tends to be hot and dry. A large volume of air that has similar temperature and humidity is called an **air mass**.

Air masses are constantly moving. In some places air is going up; in other places it is falling. In between, air is moving parallel to the surface causing wind, which is referred to as an **air stream**.

When an air mass moves from its source region it will bring its "weather" with it. So air that starts over the Sahara stays hot and dry for a while and the air stream brings this hot, dry weather to central and east Africa. The same effects happened with moist cool air coming off the Pacific ocean and onto the BC coast or Vancouver Island.

High & Low Pressure Systems

Air masses are characterized by their internal barometric pressure measured in millibars. Although air pressure is a continuum the weather service separates this into high and low pressure systems. The dividing point is 1013 millibars:

- > 1013 millibar = high pressure system
- < 1013 millibar = low pressure system

A **high pressure system** is associated with **warmer weather**. If you are experiencing high pressure, it probably means that the air above you is falling, and compressing. As the air falls it gets warmer. This means it can hold more water vapour, so any clouds that exist will evaporate, leaving a clear sky. When skies are clear there is very little interference with ultraviolet rays and this causes the earth's surface to warm up. Nights will be cooler and days will be warmer in a High Pressure system.

By contrast, a **low pressure system** is associated with **cooler weather**. When you are experiencing low pressure, it usually means that air above you is rising, and expanding. The rising, expanding air will cool, forcing its water vapour to condense, and causing clouds to form and possibly rain. When skies are cloudy there is greater interference with ultraviolet rays and this causes the earth's surface to cool. Nights will be warmer due the clouds trapping in heat but the days will be cooler and often more wet.

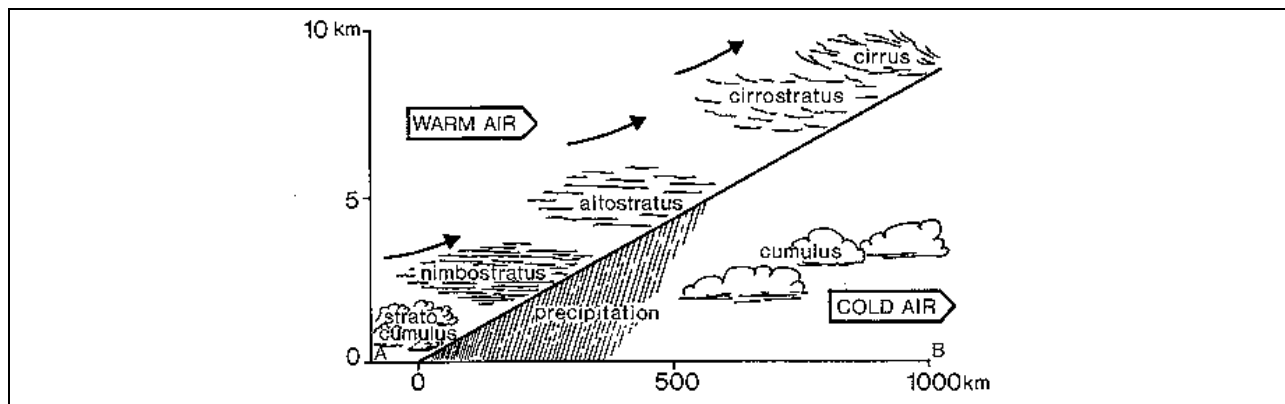
Air flow is always **clockwise around a high pressure** system and **counterclockwise around a low pressure** system in the northern hemisphere & opposite in the southern.

Weather Fronts

Weather fronts are where two air streams meet. These air streams have different pressure, temperature and humidity. The warmer air, being less dense, rises up over the cooler air. The warm air expands and therefore cools as it rises. Colder air can hold on to less water vapour. The water condenses out of the atmosphere, forms clouds and eventually rain. **The main thing to remember is that fronts mean rain.** There are two main types of front – warm fronts and cold fronts.

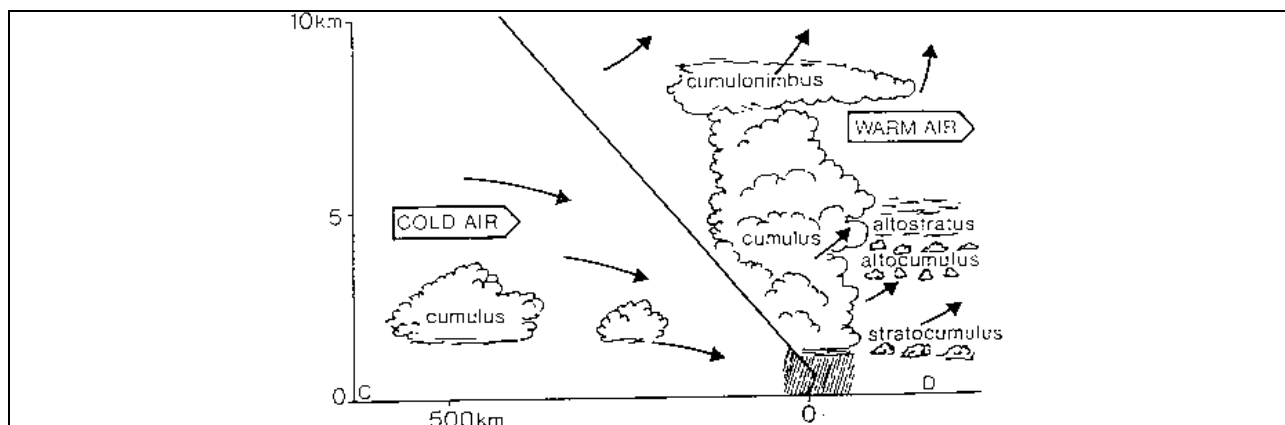
Warm Fronts

Warm fronts are where warm air "catches up" with colder air. The angle that the warm air moves up is gentle at the warm front. Clouds are slowly formed over a large area and this makes long periods of drizzle.



Cold Fronts

Cold fronts are where cold air "catches up" with warmer air. At the cold front, the cold air cuts underneath the warm air and forces the warm air up a much steeper angle. At cold fronts the air is cooled quickly and forms a narrow band of thick cumulonimbus clouds. These produce a short burst of very heavy rain or even hail.



Weather over the Pacific Ocean

A Pacific Maritime Climate characterized by rainy, mild winters and cooler, dry summers controls northwest weather patterns. Winter storms generate out of the Gulf of Alaska, strike the coast from the southwest or southeast and bring warm moist air onto the northwest coast. In summer the North Pacific High dominates the weather pattern, bringing winds over the cooler water and striking the coast from the northwest. The water vapour in this cool air condenses to form fog along the coastal regions in the summer. The driest weather in the region occurs when the high pressure systems develop east of the Coastal Mountains, causing warm, dry air from the interior to flow westward towards the coast.

Winter Storms on our BC Coast:

Winter storms on the B.C. coast are generally divided into Gulf of Alaska Lows, Pacific Coastal lows and Arctic Outbreaks.

Gulf of Alaska Lows:

These tend to form south of the Aleutian chain as a front between colder air to the north and warmer air to the south meet. As the two air masses collide air pressure falls rapidly, the low increases in size and wind speed increases and pressure drops. A front extends south from the center of the low. The front lies between the low at sea and the high pressure system over the interior. Along this front there are southeasterly gale to storm force winds, rain and heavy seas up to 9 meters on the coast. These Gulf of Alaska Lows can start happening right around the third week of September and may bring **Low** pressure after **Low** pressure several times per week to the coast.

After the front passes over the coast wind speeds decrease, visibility improves and seas diminish. Heavy swells of 4 to 6 meters formed by strong west and northwest winds at the western flank of the low arrive on the coast up to 12 hours later. This is from the wake of the storm and the periods between the swell tend to be bigger.

Pacific Coastal Lows

These tend to form over the coast of B.C. and Washington. They usually intensify very quickly from a weak system to a very severe storm in as little as 9 hours. Preceding the coastal low the seas may reach 5 to 8 meters on the coast with poor visibility in rain and sometimes fog. The strongest winds occur to the east or southeast just ahead of the front and can reach southeasterly at 70 knots or Hurricane force. Typically they will be in the Gail category. Winds behind the front can often reach 34-65 knots and again this is in the wake of the system. The calmest part of the system would be in the north east where winds can often be half of what they are at the front or wake.

Arctic Outbreaks

During the winter, arctic cold air masses build within the inter-mountain valleys of the ranges from the Rocky Mountains to the Coastal Range. Settling into British Columbia's interior valleys from the north, the air is trapped between the mountains, and many continue to grow colder. Most of these air masses mix with mild, moist Pacific air and dissipate. A few, however, become so large and heavy that they cascade like a broad waterfall across the coast, flooding over ocean waters.

The broad arctic air flood is channeled down the coastal river valleys and through the fjords, usually producing gale-force winds. Racing like rivers rushing down to the sea at speed often as high as 110 km/h (70 mph) with extremes to 185 km/h (115 mph), outbreak winds can be very damaging. Arctic outbreaks bring extreme weather to the continental coast, coastal waters and the offshore islands, particularly the Gulf Islands.

Common conditions associated with arctic outbreaks include gale or storm force winds, moderate to heavy snowfalls and squalls, and over the waters, severe icing, high waves, rough seas and poor visibility. The most well-known arctic outbreak wind on the British Columbia coast bursts out of Howe Sound, past Bowen Island and onto the Strait of Georgia. This is known as the Squamish.

Summer Storms

Summer storms are not as intense as winter storms because the contrast between warm and cold air masses is not as great. Thus, the fronts that approach coastal B.C. are not as intense. Prevailing winds during the summer are from the northwest. When a front approaches the coast, however, the wind shift can come from the south or southeast. This is accompanied by a narrow band of clouds and light rainfall.

Behind the front pressure rises quickly as the high pressure along the coast rebuilds. This produces strong northwest winds. The strongest northwesterly winds occur in the Georgia Strait where the airstream is funneled between the mainland and Vancouver Island.

Diagrams on all these pressure systems will follow.