

The Crossed-Winds Rule, and associated clouds

The crossed-winds rule is predicated on two important facts. First, the upper air flow is essentially west to east. One has to recognize that this is a generality because the upper air, governed by the jet stream, meanders rather like a river. Second, the surface winds in frontal systems (low pressure systems, cyclonic storms; call them what you will) spiral counter-clockwise in towards the centre of low pressure. The upper winds 'steer' the low pressure system so that the relative position of one to the other is always, basically, the same.

Now, to keep things simple we will assume that the upper air is flowing from west to east. Upper air movement is detectable by observing the highest clouds; cirrus (mare's tails), cirro-cumulus (mackerel scales/mackerel sky). This is most easily done by using a fixed point of reference between you and the sky. I usually use the corner of a roof, the top of a telephone pole, top of a spruce or fir...you get the idea. With little trouble you will detect the direction in which those clouds are moving even though they are 8 to 10 km away; hence they do not seem to move very fast. If you can detect the movement without a point of reference, then the clouds are moving at about 100 m/s, or 360 kph!! Back to the surface winds. Because the winds are spiralling counter-clockwise and the frontal system is moving from west to east (because it is being steered by the upper winds), the winds ahead of the impending system are going to be generally from a southerly direction. The rule then is as follows:

"If with your back to the lower wind, the upper wind is coming from your left you may assume that there is a likelihood of a frontal system approaching from the west".

Recognize that because the upper air meanders, it is quite possible for the upper air to be from the northwest in which case you would expect the lower wind to be from the southwest; or, the upper air from the southwest and the lower wind from the south east. Note that the relationship of upper and lower air is constant. At the same time, on occasion, you can get crossed winds with no serious deterioration in weather. This can occur if the air is very dry and hence there is insufficient moisture in the air to cause much development of cloud and consequently the possibility of rain. Also the pressure gradient between high and low pressure may be small (a shallow low). Both of those factors lead to a system without much energy. If a frontal system is in the offing then you would expect that along with the crossed winds you would get gradual deterioration in weather, from the west, over a period of a few hours. The faster the system is moving, the more quickly will the weather deteriorate. In weather folklore terms:

"Long foretold, long last; short warning, soon past."

The normal sequence is, first, for the high cloud that indicated the direction of the upper air; namely the cirrus (mare's tails) and cirro-cumulus (mackerel sky).

"Mare's tails and Mackerel scales make tall ships carry low sails"

Often you will get an almost invisible veil of cirro-stratus and you will detect this as a ring around the sun or moon.

"Last night the moon had a golden ring,
 Tonight no moon we see.
 The skipper he blew a wiff from his pipe
 and a scornful laugh, laughed he.
 Colder and louder blew the wind,
 A gale from the north-east,
 The snow fell hissing in the brine
 and the billows frothed like yeast!
 etc.

(Henry Wadsworth Longfellow. The wreck of the Hesperus)

It all ends quite tragically.

After that, the cloud base will progressively decrease in height and the clouds will thicken. Quite often you get a layer of middle cloud, cirro-stratus that will allow you to see the sun's disk 'as if through frosted glass'. Then progressively thicker and lower clouds, rain clouds (nimbostratus) and then the precipitation.

The diagram below is taken from Alan Watts, "Instant Weather Forecasting in Canada".

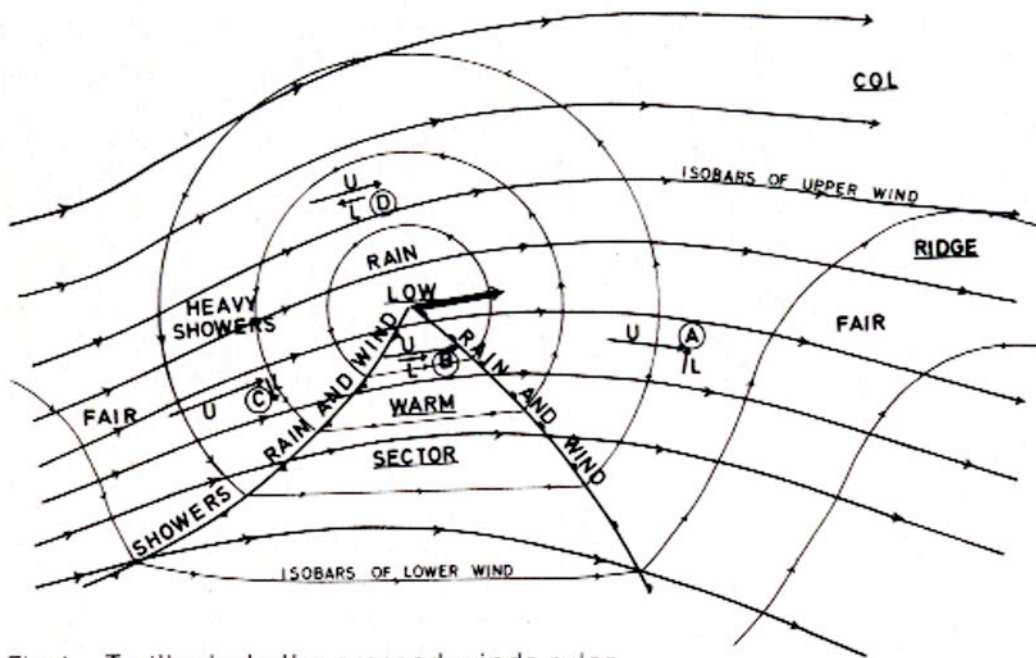


Fig 1 To illustrate the crossed-winds rules.

U refers to upper wind and **L** refers to lower wind