

MOUNTAINEERING COUNCIL OF SCOTLAND
*****Information Service*****

INFORMATION SHEET

January 1998 - updated nov06

*** * Know your sky * ***
Weather Prediction Using:

WEATHER LORE and CLOUD FORMATIONS



Introduction

Getting a forecast either from one of the many radio, TV or internet forecasts is seen as a sensible part of planning a days outing on the hill. Such forecasts are on the whole very accurate, particularly for low lying ground. But they are only a forecast and cannot be 100% accurate, particularly in mountainous areas.

The most important aspect of a forecast for mountaineers is probably:

- * **Will a stable and good weather pattern change with the arrival of a ‘front’.**
- * **How long will it take to reach the mountain area where climbing is intended.**

The difference in answers to these two questions from winter through to summer is covered in more detail in other publications. This information sheet concentrates on forecasting the arrival of a front.

The approach of a frontal system may be faster or slower than anticipated by the Meteorological Office and as few people will carry a radio on the hill to get regular updates as the day progresses they may miss any changes (either missing a good day on the hill by beating a hasty retreat or deciding not to go at all or getting caught early in bad weather).

If a day-trip is planned then it is often a good idea to be able to make a quick decision about whether or not to embark on the trip or about where to go to make the best of the days weather. Frontal systems moving in slowly from the west may mean a good day can be had on the east, and vice versa.

By looking at cloud formations and thinking about some simple “rules of thumb”, which are often summed up in folklore sayings, then it is possible to make decisions early in the morning before setting out (thus backing up the Met. Office forecasts) and throughout the day as the weather changes.

Ye Olde Weather Lore

There are many old sayings which relate to weather prediction. Some of them are sheer folly and have no scientific or actual basis but there are many which can be very useful. They allow walkers and climbers to make firm and accurate predictions for the weather changes that are occurring in the immediate future. The sayings offer an easy to remember ‘aid memoir’ when out on the hill, but to make the best of these sayings it is necessary to have some knowledge of clouds, air mass movement and the principles of weather. Some more detail on these items are found later in this information sheet and should be referenced whilst digesting and understanding the sayings.

Here are some of the more useful ones :

“Red Sky at Night, Shepherds Delight”

The rays from the setting sun in the west are hitting the underside of clouds which form part of a cold front that is moving away to the east. Clear skies will follow.



“Red Sky in the Morning, Shepherds Warning”

The rays from the rising sun in the east are hitting the underside of clouds which form a warm front that is moving in from the west so heralding rain as the front approaches.



“When the Sun is in His House, it will rain soon”

This refers to a halo of light around the sun caused by the formation of cirrostratus clouds which make the sky look pale and ‘milky’. This indicates the approach of a warm front with precipitation in about 15 - 25 hours. The same signs are seen when a halo forms around the moon.



“Mackerel Sky and Mair’s Tails, Make tall ships carry low sails”

Mackerel skies refer to cirrocumulus clouds which resemble fish scales. Mair’s Tails are Cirrus clouds. Both indicate the approach of a warm front with high winds.



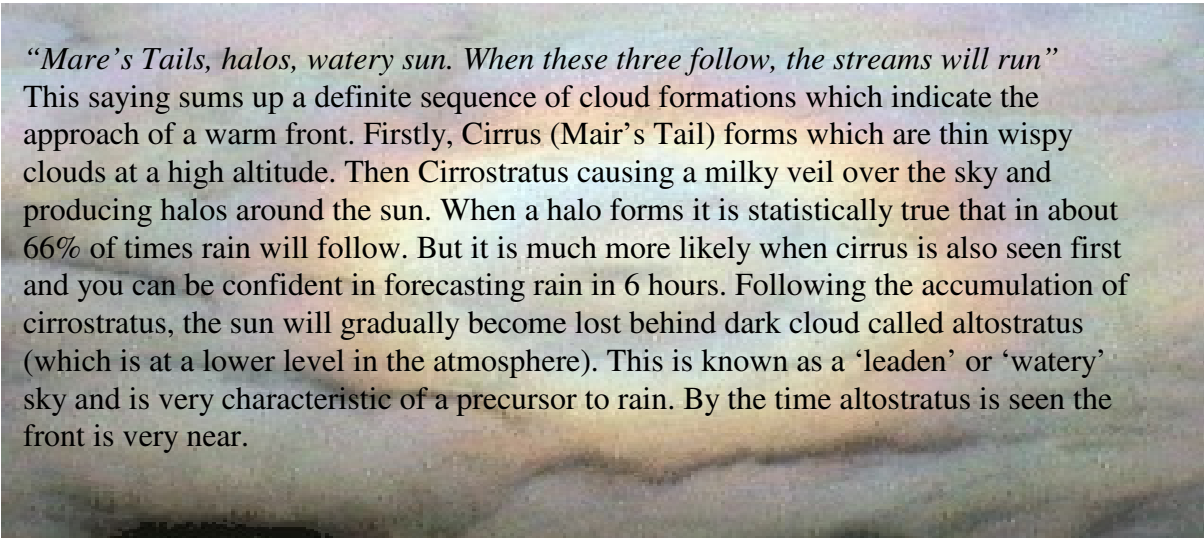
“If the mountains are clear in the morning there’ll be fountains by evening”

Very good visibility is sometimes a sign that there is rain to come. This is because dust / pollen held in the air by a stable high pressure is carried high into the atmosphere when lower pressure allows the air to rise, thus increasing visibility. As it rises it cools and produces water vapour and clouds.



“Wind during the night, rain in the morning”

Under normal circumstances of settled weather the wind will ease in the evening as the sun ceases to warm up the earth’s surface and so reduce the movement of air (wind). If after sunset the wind continues, it is usually a sign of a depression approaching.



“Mare’s Tails, halos, watery sun. When these three follow, the streams will run”

This saying sums up a definite sequence of cloud formations which indicate the approach of a warm front. Firstly, Cirrus (Mair’s Tail) forms which are thin wispy clouds at a high altitude. Then Cirrostratus causing a milky veil over the sky and producing halos around the sun. When a halo forms it is statistically true that in about 66% of times rain will follow. But it is much more likely when cirrus is also seen first and you can be confident in forecasting rain in 6 hours. Following the accumulation of cirrostratus, the sun will gradually become lost behind dark cloud called altostratus (which is at a lower level in the atmosphere). This is known as a ‘leaden’ or ‘watery’ sky and is very characteristic of a precursor to rain. By the time altostratus is seen the front is very near.

The speed of progression from one cloud form to another in this sequence also gives an indication of how fast the front will appear, and a fair indication of the speed at which it will pass over. If from first sight of Mair's Tails in the early morning the time between each cloud formation is about 4 / 5 hours then it is a fair bet that the front and its rain will be arriving in the evening or later and any rain will probably linger, perhaps for the whole of the following day. Conversely, when all three cloud formations are seen almost simultaneously then the front will arrive quickly (under 6 hours) but pass over quickly and give a good period thereafter.

General Principles of Weather

Good weather signs

Chaotic cirrus in the sky (cirrus clouds whose wispy tails point in all directions and are not very long) means there are no strong winds at that altitude and so indicate a continuation of fine weather. They often form in the afternoon when the country is dominated by an anticyclone (High) and indicate continued good weather the following day.

Assessing the direction from which any weather changes are approaching
Because Cyclones and Anticyclones are composed of masses of air circulating around a central point (one clockwise the other anticlockwise) which themselves then move across the surface of the earth, and a front moves independently of them, the direction of the wind that a mountaineer feels whilst on a hill is often different to the direction from which the front will appear from. There is a simple way of assessing whether you are in a cyclone or anticyclone and which direction to look in the sky to assess the approaching weather by using the following 'law'.

Buys Ballots Law:

If the wind (low, surface wind) is blowing on your back, then the low pressure is to your left and the high pressure to your right.

The wind direction is not necessarily the direction from which any weather changes will come from and this can be worked out by comparing the Low level winds to those high in the atmosphere - indicated by the direction of movement of the clouds and remembering the Buys Ballot Law. Thus:

With your back to the low wind:-

- if the upper wind is from your left then the low pressure is coming - **worsening weather**.
- if the upper wind is from the right then the high pressure is coming - **better weather**.

Link this with the type of cloud (as explained by the weather lore sayings above) then a good idea of the weather for the day (or at least for the next 6 hours) is possible.

The effects of the mountain on weather

Mountains cause air masses to rise higher into the atmosphere. This causes greater rain content of clouds and so greater precipitation, especially on the windward side.

Mountains have the effect of slowing the movement of air masses and weather systems, which causes rain to last longer in mountainous regions.

Mountains holding up weather in summer can mean an exaggeration of the prevailing weather systems. Mountains can actually reduce the number of depressions occurring but instead they can, under high temperatures and humid air, add to upward air movement and trigger thunderstorms, the mountains trapping the storms for hours or even days.

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Forecasting this is difficult but as a general rule:

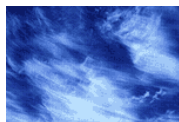
If a warm or hot breeze from the south / south east has been blowing for a few days and the Buys Ballot Law indicates a low pressure is coming, then thundery storms may be likely. The signs in the sky for this are altocumulus castellanus clouds (small fluffy clouds in clear skies that look like dispersed versions of cirrocumulus or mackerel clouds) that act as indicators of approaching thunder. As thundery weather nears, the clouds themselves are obvious as towering cumulonimbus (dark grey undersides and brilliant white anvil shaped tops) the classic ‘thunderheads’.

The Fohn or Chinook winds

These are terms given to winds that rise over the mountains (usually warm winds), thus cooling and forming clouds and releasing rain or snow, but then due to massive condensation, they release heat into the air. The air flow then has less moisture and is warmer again, possibly warmer than originally. It descends the glens and valleys on the far side of the range as warm dry winds causing extremely rapid rises in temperature. Mainly prevalent in the Alps and the Rockies, it happens to a lesser extent in the lee (east side) of the Grampian mountains and can lead to huge, fast thaws of winter/spring snows.

Other cloud predictors:

The Mother-of-pearl cloud



Brilliantly coloured single clouds in the upper atmosphere. Formed by minute ice crystals and usually only occur in regions where the upper atmospheric layers are extremely cold such as Greenland and Norway. They do however, occur in Scotland and are usually visible around sunrise or sunset when there are no clouds at lower levels. See page 7 for more details.

Lenticular clouds (‘Donkey’s’) over mountain tops



These appear as bright white spherical clouds whose upper surface are concave and smooth. They normally form over the summits of mountains and are a tell-tale sign of an incoming front. See page 7 for more details.

Odd sayings without a ring of truth

There are a number of sayings associating the activities of animals with forthcoming weather patterns. Most of these are fanciful and have no substantive evidence to say they can be used as forecasts but they are interesting none the less. They are more probably indicators of what the weather is actually already doing.

“One Swallow does not make summer”

“Croaking frogs predict the rain”

“Gulls flying inland mean heavy gales”

“If a spider shakes its web in the morning it will be a fine day, but if it tears its web, a stormy wind is on its way”

“A crowing cock in the early morning is a sign of good weather, but if it crows by day and night there will be rain”

“If a cock violently flaps its wings, take your umbrella”

“A pig with straw in its mouth is a sign of thunder”

Use these sayings with a pinch of salt!

Clouds

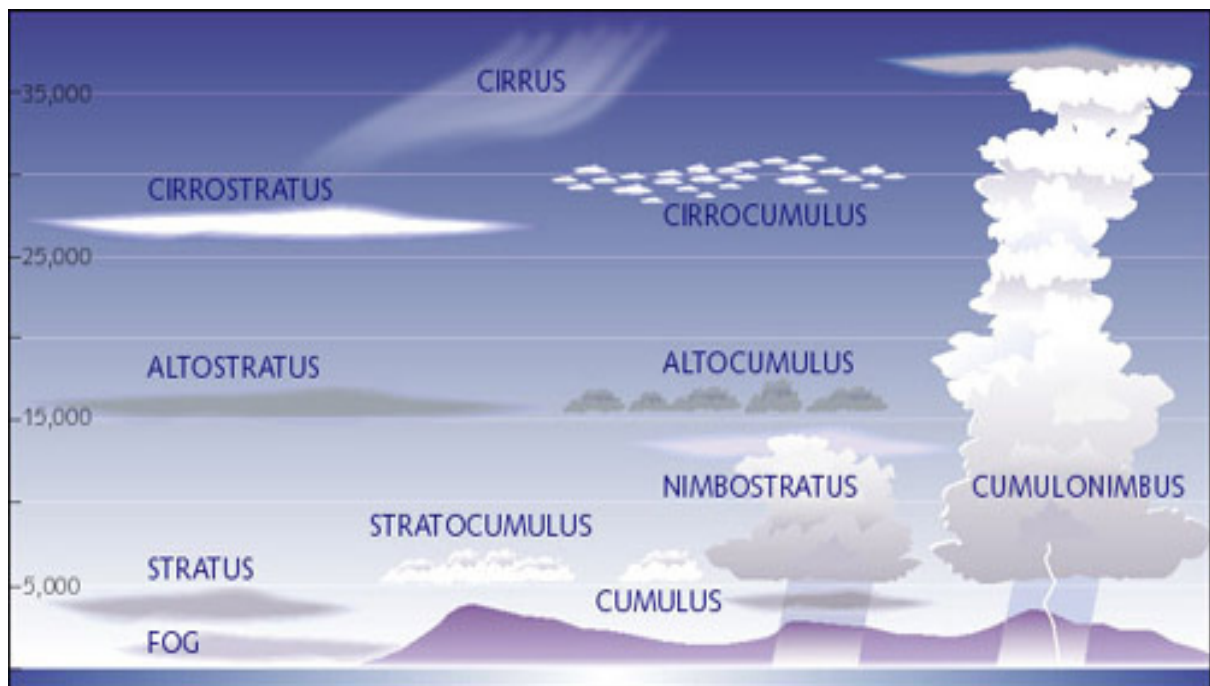


Image from www.intellicast.com



Cirrus

A white, ice crystal clouds, wispy in appearance, often appears as mare's tail. This is because as ice crystals from the cloud encounter winds and so "tail" off. They are a sign of stable weather but with a front approaching



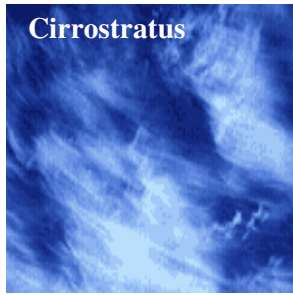
Cirrocumulus

A milky-white cloud with a dappled or wave like appearance. During the day, refraction of the sun's rays may cause one or more "mock-suns" to appear on either side of the sun. A sign of stable weather.



Cumulus

Fair weather Cumulus, small heaped clouds with flat bottoms and rounded tops. Most commonly seen in an otherwise blue sky. Usually a sign of fair weather.



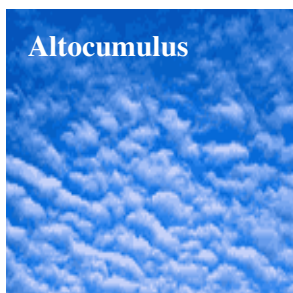
A thin veil of ice crystals usually covering most or all of the sky. A “halo” may appear about the sun or moon due to refraction of light rays in the ice crystals. Often a sign of approaching storms.



Gray or blue-grey clouds composed of water droplets or a mix of water droplets and ice crystals. Sun may be dimly visible as through ground glass. Often a sign of approaching rain or snow.



A special type of altostratus clouds often found lapping mountain tops on their downward side. It is a lens shaped cloud. May look like a flying saucer. The cloud forms from a wave in the wind flow induced by the mountains. Often these waves are stationary and so the clouds do not move, although the winds are strong. Sometimes several clouds may be stacked vertically like a stack of pancakes. Often a sign of forthcoming bad weather in mountain areas.



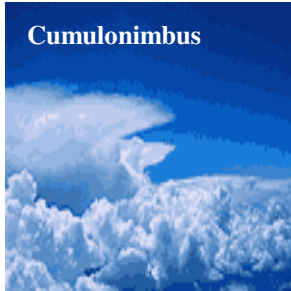
A patchy cloud with wave-like or dappled appearance. Distinguished from Cirrocumulus by the colour which is grey or blue-grey (Cirrocumulus is milky-white). Sometimes referred to as a “Mackerel sky”. Front of a storm.



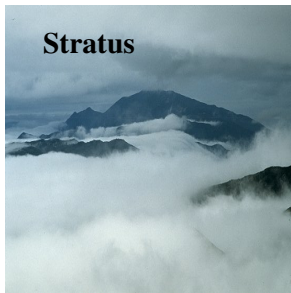
A low layered cloud varying in colour. A sign of blustery and relatively cool conditions with possible showers or rain or snow.



Thick, layered cloud, usually grey or dark-grey. Likely to produce rain or snow that covers a large area and lasts a relatively long time (hours).



Low, grey, flat water droplet cloud (called fog if it touches the ground) with no clear with no clear structure. Drizzle may occur from these clouds are very tall cumulus cloud, with a large cauliflower shape often with a anvil top causing thunderstorms. Large cumulonimbus clouds may extend to 60,000 feet or higher and may produce very heavy rains, hail, strong winds and even tornadoes.



Low, grey, flat water droplet cloud (called fog if it touches the ground) with no clear with no clear structure. Drizzle may occur from these clouds

Some Meteorological terms

Cyclone - Known as a 'depression' or 'low' as in low pressure. Normally associated with rain, wind and unsettled weather.

Anticyclone - Known as a 'high' as in high pressure. Normally associated with stable weather.

Frontal Weather System

A weather system almost always combines a warm front and a cold front. The warm front leads the way (containing behind it warm air and therefore it flows forward over the top of colder air it is displacing) with first cirrus, then altostratus clouds at high altitude indicating its coming and stratus or nimbostratus clouds at lower altitudes giving rain at the point where the front is at ground level. Behind the warm front is warm air that is usually stable and dry but cloudy. The cold front follows on behind as more cold air replaces the warm air. This is composed of cumulus giving rain and cumulonimbus at higher altitudes following on behind

A Warm Front

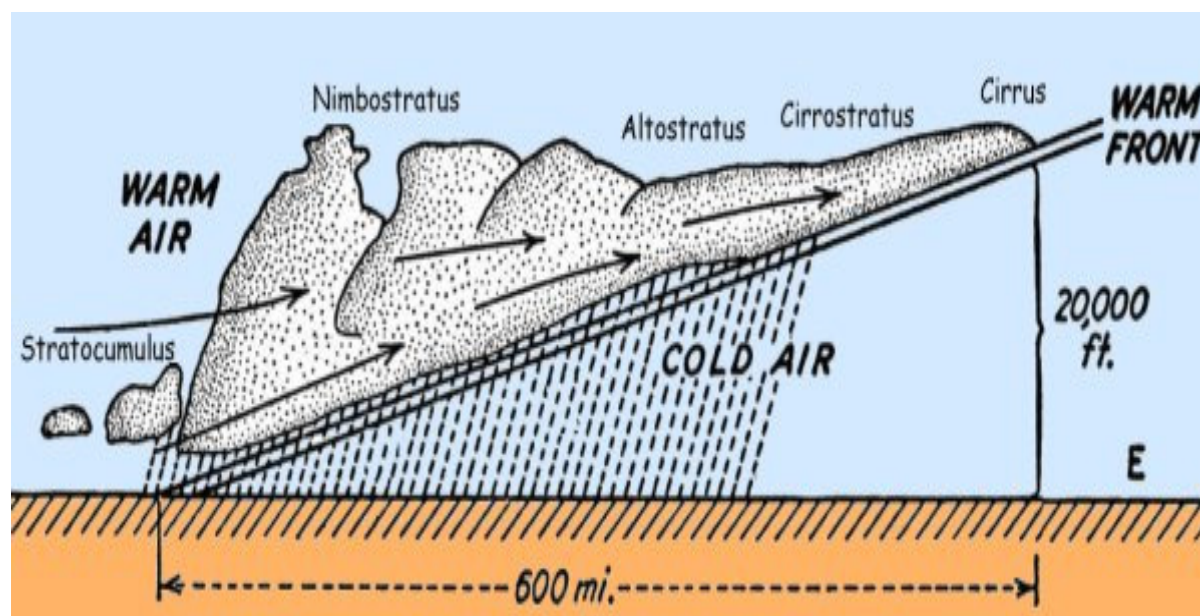


Image from www.ace.mmu.ac.uk

A warm front exists when warm air is rising over cold air. In vertical cross-section, the boundary takes the form of a gradual slope (roughly 1:100) and lifting is slow but persistent. As the air lifts into regions of lower pressure, it expands, cools and condenses water vapour as flat sheet cloud (altostratus), from which rain can start to fall once cloud has thickened to about 2,500 metres from the ground. Cloud continues to lower towards the boundary at ground level, known as the surface front. This lower level cloud is called stratus or nimbostratus, from which appreciable amounts of rain may fall. Sometimes, nimbostratus cloud may be only a few hundred feet above the ground, and can completely cover hilltops and mountains.

Because frontal systems have a velocity of their own, an observer on the ground will witness a succession of cloud types with cloud gradually thickening before rain arrives. These telltale signs can be used by the observer to predict the onset of bad weather within a few hours. When the surface warm front arrives, there may be a burst of rather heavier rain, and this offers a hopeful sign that a drier interlude is on the way. Clouds will break, rain cease, and there may be a noticeable rise in temperature as the warm air engulfs the observer.

A Cold Front

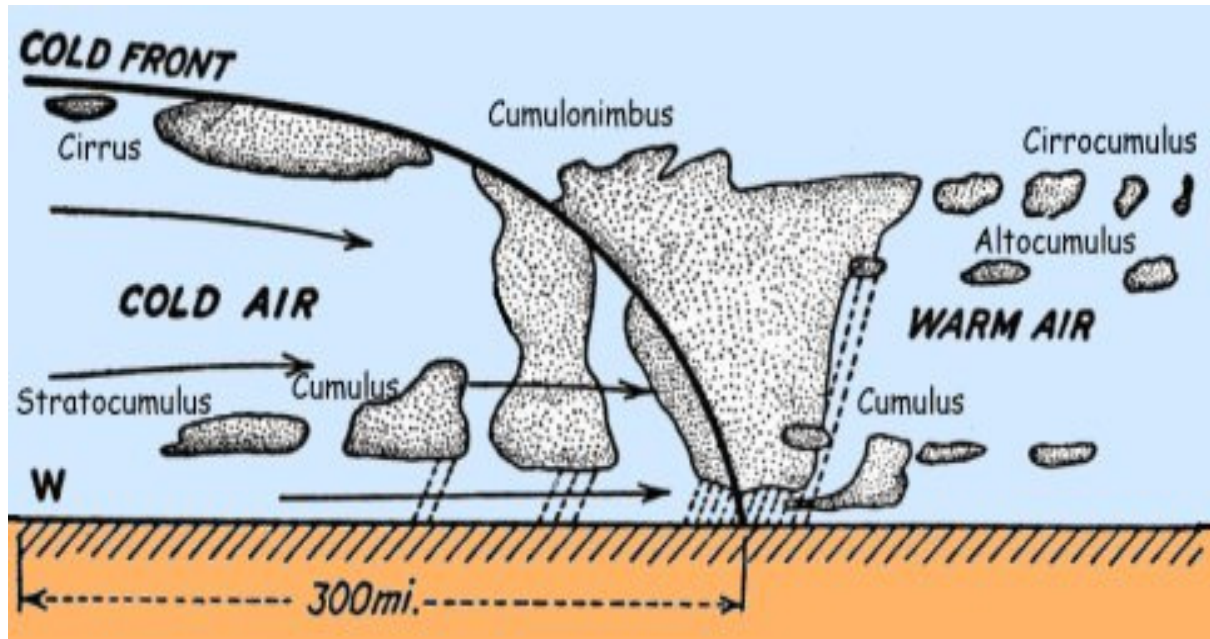


Image from www.ace.mmu.ac.uk

Cold fronts are usually associated with depressions. A cold front is defined as the transition zone where a cold air mass is replacing a warmer air mass. At a cold front cold air following warm air undercuts the warm air, heaving it upwards with a more violent thrust compared to the steady rise of air at a warm front. The air associated with a cold front is usually unstable and conducive to cumulonimbus cloud formation. Because the up thrust is delivered along a boundary between the two air masses, the cumulonimbus form a well-defined line in contrast to the well-spaced clouds forming during thermal convection. Usually, rainfall associated with cold fronts is in the form of heavy deluge. More rain may fall in a few minutes as the cold front passes than during the whole passage of a warm front. As the cold front passes, the clouds roll by and the air temperature may become noticeably cooler, with temperatures dropping by 5°C or more within the first hour.

WEATHER FORECASTS

What to look out for:

WEATHER FORECAST SERVICES

Mountain Weather Information Service

www.mwis.org.uk

Mountaineering Council of Scotland

The Old Granary

West Mill Street

Perth

PH1 5QP

Tel: 01738 493942

Fax: 01738 442095

www.mcofs.org.uk

Email: info@mountaineering-scotland.org.uk