The power of observation

Rupert Holmes explains why, despite the advances in forecasting, your own observations on the weather are still vitally important

B.A.E. Inc/Alamy

Rupert Holmes

ABOVE A cold front is associated with a sudden transition to a line of tall cloud that spans several atmospheric layers

RIGHT Cloud formations signal an approaching warm front

Despite the improvements in weather forecasting over the past few decades, it can still be enormously beneficial to compare your own observations with predictions. Forecasting is pretty good at telling you what's going to happen, but predicting the exact timing, or location of events can still be a challenge.

There are a couple of reasons for this – firstly forecasts often cover a huge geographical area, which means there's little scope for detail. Secondly a weather feature may move a little faster or slower than predicted. Alternatively cloud cover might be slightly heavier than forecast, which prevents the sun from breaking through, or even creates a little light rain.

A further problem for forecasters is that it's very difficult to pin down exactly what the wind strength will be – a small change in the location of weather systems may result in the gradient wind changing by up to two points on the Beaufort scale.

Our own observations are hard data, rather than predictions, that can help to fine tune our understanding of the forecast and build a more accurate picture of the likely weather for our location.

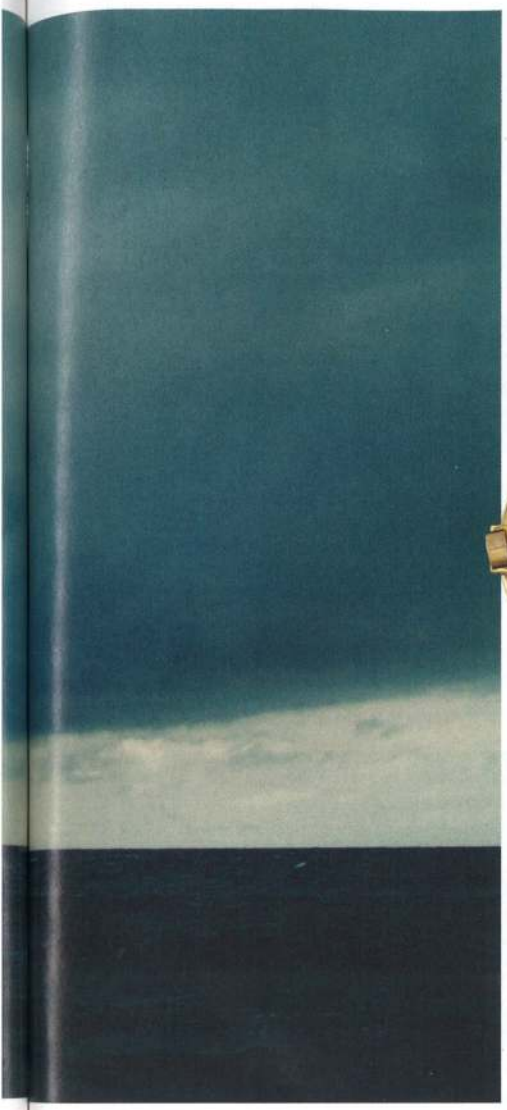
For instance, if the sun doesn't burn through a thin layer of cloud on a summer's morning we know that we're less likely to see thermal enhancement of the wind during the afternoon. Or if the wind is stronger than forecast in the morning, observing the sky and keeping tabs on changes in atmospheric pressure may be able to tell you whether a system is moving across sooner than predicted, or whether the low has become deeper and more intense than expected.

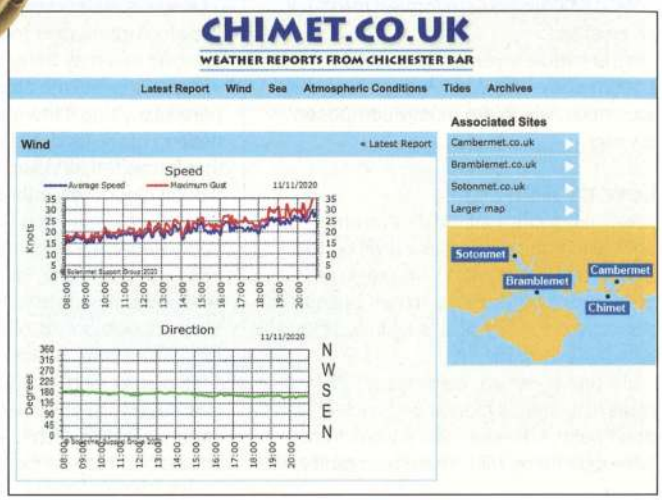
Observing frontal progress

The key characteristics of a low pressure system are predictable, so your own observations of wind speed and direction, precipitation and barometric pressure can help track its progress. You can then predict more accurately the timing and strength of conditions you will experience as the system develops and moves.

Coastal station reports, which are broadcast after the shipping forecast, make it possible to track the changes that mark the passage of fronts and other key weather features. These regular reports can be bolstered by real time data from other sources – often web based.

I also use online rainfall radar animations extensively. Rain can have a big effect on the wind strength and direction; it can be really useful to pick out showers and cold fronts that may bring big gusts.





Rupert Holmes

Eye Ubiquitous/Alamy

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ABOVE Gale force winds and sun in a Meltemi in the Aegean

INSET Keeping an eye on the barometer – and logging readings – can be as useful now as it was 100 years ago

RIGHT It's now easy to access real-time weather data

'Our own observations can help to fine tune our understanding of the forecast'

In the case of slow-moving fronts in older established weather systems it's useful to know that blustery showers can move along the front itself, generally heading towards the centre of the low.

Observations can also help to determine how marked each of the fronts in a depression are.

For example, a very weak low may still have identifiable fronts, but these may not develop enough cloud to produce rain at sea level.

In other low pressure systems, the fronts may not be so distinct and a (non-frontal) trough may form at the boundary between the air masses instead.

Predicting wind strength

Wind strength increases as you approach the centre of the low pressure, but the strongest winds – and by far the most severe gusts – will be found at the cold front. Big breezes may also be found in the occasional showers that follow in the unstable air behind the front.

But low pressure systems are not the only source of gales. The squeezing effect on isobars when there's a low pressure system close to the south of a high pressure system can create sustained easterly gales.

This is often combined with bright sunshine, which can foster a false sense of security. It's also the mechanism that drives the Meltemi in the Aegean and Mistral in the South of France, both of which can produce winds of 40 knots for sustained periods.

In these cases a simplistic observation – one that ignores windspeed and focuses only on how clear the sky is – can lead us into trouble. On a day with the same wind strength but lashing rain, we would be much more wary of going afloat.

Another situation that can lull us into a false sense of security is when the skies sometimes clear ahead of a cold front. It may look pleasant for a short time, but it usually pays to wait for the cloud and rain to pass before leaving port.

Atmospheric pressure

In times gone by the barometer was often the only tangible source of weather prediction when at sea for more than 24 hours – those who ignored it were at very real risk of being caught out.

Today most smartphones and many VHF sets have barometers, so in theory it's easy to keep track of pressure changes. However, in practice it's easy to forget. One benefit of maintaining a written log is that it's easy to see changes in wind direction, strength, pressure and precipitation at a glance.

Rising, falling or constant pressure all give useful info, as does the rate of change. A rise or fall greater than 6.0mb in three hours indicates a gale will follow, while a change of 5.0mb in the same time period indicates a Force 7 is on the way.

On the other hand, constant pressure while a low moves across indicates you're in the warm sector and that the low is not deepening further.

Stable and unstable air

Clouds can tell us a lot about what the wind is likely to do in our vicinity, both in terms of the macro scale of the passage of a low pressure system and the local wind strength and direction underneath each one.

Clouds can be divided into two different types – those that form in a single layer of the atmosphere and those that transcend several layers.

Single-layer clouds are found in stable air such as that ahead of the warm front and in the warm sector of a low pressure system.

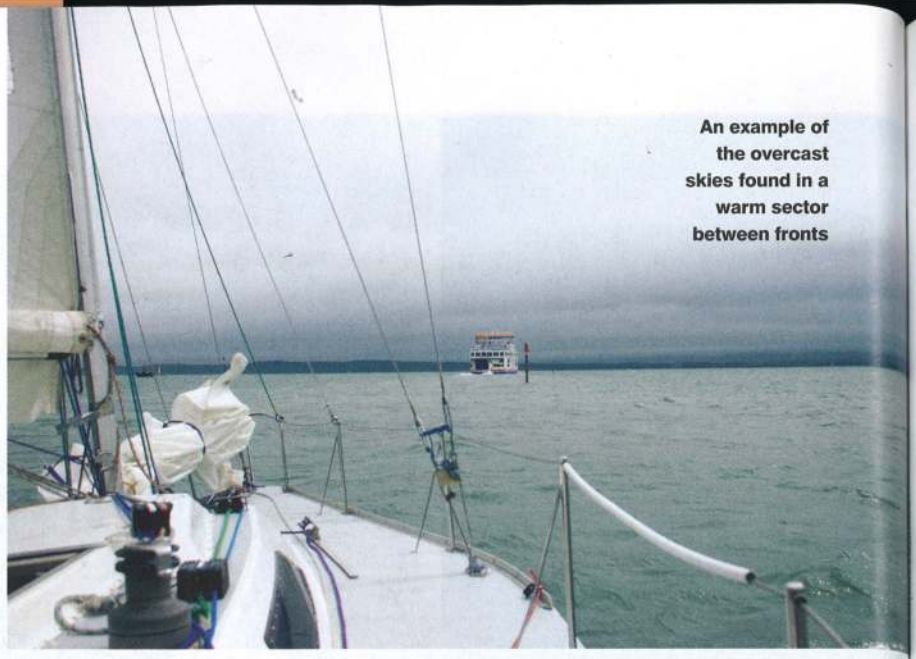
Stable air resists upward convection currents, with the result that clouds tend to form in horizontal layers or strata. Examples include cirrus, the wispy, high-level cloud that often heralds the approach of a low-pressure system. These are found at heights of around 5,000-15,000m and are formed mostly of ice crystals.

In the middle layer, around 2,000-6,000m above the earth, we get layers of altostratus, which are mostly composed of water.

Low cloud

Low-level clouds include stratus and fair-weather cumulus at any level up to around 2,000m. Nimbo as a prefix, or nimbus as a suffix, refers to rain-bearing clouds, so nimbostratus is a stratus cloud associated with rain.

All warm fronts are associated with thickening stratus clouds and a lowering cloud base, however, with a weak front there may be no rain. There are usually no local effects beneath stratus clouds.



An example of the overcast skies found in a warm sector between fronts

Unstable air is a very different situation, allowing updraughts to create a tall heap of cloud that may transcend several vertical layers of the atmosphere. This is particularly true if there's a trigger such as heating of the land, high ground, or a front that forces the air upwards.

Such clouds are referred to as cumulus and are characterised by their lumpy, cotton-wool like appearance. They range from the small fluffy 'fair weather' cumulus seen on sunny days to the towering anvil-shaped clouds of a vigorous cold front or isolated thunderstorm.

If the cloud is not rain bearing, rising air immediately below it will reduce the wind strength. This is also a feature of the cloud streets that may be experienced in the Tradewinds, where each band of cloud can stretch for hundreds of miles.

The wind tends to be lighter and more backed in direction under the cloud, and stronger and more veered between the lines of cloud.

Cumulonimbus

Cumulus can develop into a tall and vigorous formation that produces rain, whether as isolated showers, or as part of a cold front or trough.

As it falls, rain cools the air at the edge of the cloud, resulting in potentially strong downdraughts of air that fan out across the surface of the sea as gusts. Eventually the rain will stop new air being drawn upwards into the cloud, which will then start to dissipate.

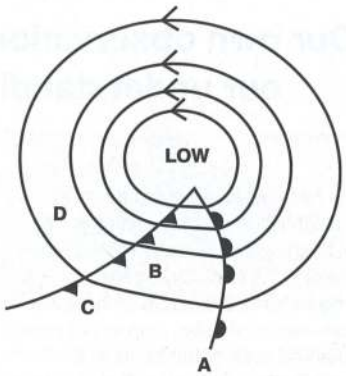
Characteristics of a low pressure system

A. The warm front can be up to around 100 miles across and may take several hours to pass.

B. The warm sector is characterised by warm, damp and humid weather.

C. The cold front is rarely more than 20-30 miles wide and moves faster than the warm front. It passes in a much shorter time — minutes rather than hours. It is the part of the low with the strongest winds and heaviest rain.

D. The cold front is followed by cold, dry polar air, so although the sun typically returns temperatures can remain low.



	WARM FRONT APPROACHING	AT WARM FRONT	WARM SECTOR	COLD FRONT APPROACHING	AT COLD FRONT	AFTER COLD FRONT
Wind direction	south or south-east	veers (to SW)	south-west	steady or briefly backing	marked veer (to NW)	usually north-west
Wind strength	increasing	steady	steady	increases close to front	big increase	strong, gusty and shifty
Temperature	rising	steady	warm, humid	steady	rapid cooling	cold, fresh
Cloud	high, wispy; then thicker layers	layer of rain cloud	mainly overcast	sky may briefly clear	line of towering cumulus	mainly clear, some cumulus
Rain	starts as the front approaches	moderate	possible drizzle	heavy, sudden, close to front	sudden, heavy (hail)	occasional heavy showers
Visibility	reducing as front approaches	stops falling	moderate/poor	moderate/poor	poor in rain	excellent (except in showers)
Pressure	falling	stops falling	steady	falls temporarily	rises quickly	rising

Ian Grainger/Alamy

These wispy cirrus clouds typically herald the approach of a low pressure system

Alex Fieldhouse/Alamy

As the warm front approaches the clouds become lower and thicker...

EyeEm/Alamy

... eventually reaching the point at which it rains

Lukasz Szczepanski/Alamy

Fair weather cumulus have lighter winds, and a big wind shift, under the cloud as a result of air being drawn upwards into the cloud

B.A.E. Inc/Alamy

A cold front is associated with a more sudden transition to a line of tall cloud that spans several atmospheric layers

David Lyons/Alamy

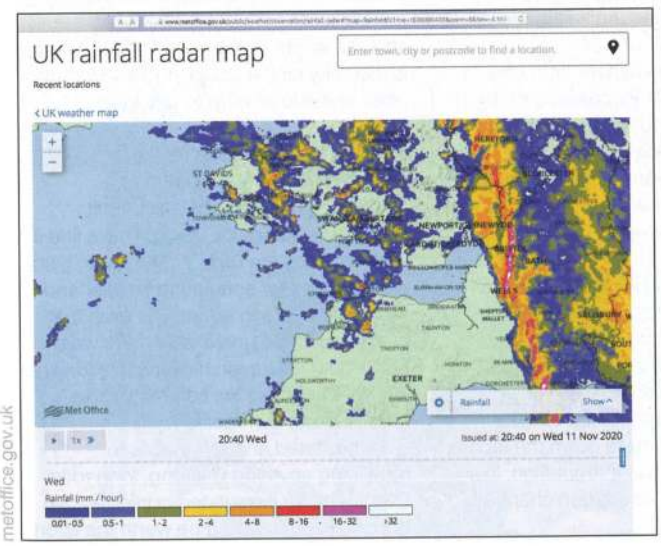
Heavy showers and big gusts can be experienced in the unstable air behind a cold front

The strongest gusts tend to be found in the middle stage of the lifecycle of such a cloud – if you experience an increase in wind strength before the rain, a further sharp increase can be expected when the precipitation hits.

The trailing edge of a cloud formation in this stage of development is often still being fed by rising air, in which case the wind will drop to less than that experienced before the cloud as it moves away from your location.

Many such clouds pass over or die out in around 20 minutes and it's rare for them to produce heavy rain for more than an hour.

An exception is a stationary front – usually associated with an ageing low pressure system – which may remain in almost the same position for several hours, where showers often form and move along the front.



metoffice.gov.uk

LEFT The MetOffice rainfall radar showing shower activity in the Bristol Channel behind a vigorous cold front

The rapid increase in wind at a textbook cold front has plenty of potential to catch out the unwary.

Providing there's plenty of sea room this may not be an issue for a well-found offshore cruiser with efficient reefing systems, especially as the strongest winds are likely to pass relatively quickly.

However, smaller craft may struggle, especially in the initial downdraughts – for these craft a vigorous front is worth avoiding at all costs.

When does it become safe for these boats to venture out?

Again your own observations are usually the best guide here – as soon as the rain stops and the sun comes out the strongest wind will usually be over.

However, if you have internet access it always pays to look at the rainfall radar to check whether there are any big showers behind the front that are coming your way.

This will also confirm that you're not lured out by the clearing of the sky that may happen just before a cold front looms over the horizon. PBO