Typical characteristics of the six major air masses which affect the British Isles

	Tropical maritime (Tm)		Polar Maritime (Pm)	Arctic Maritime (Am)	Returning Polar Maritime (rPm)
	Exposed	Sheltered			
Temp	Near sea temperature	Warm	Rather cold	Cold (colder than Pm)	Warm (warmer than Pm)
Humidity	Very moist	Moist	Moist	Fairly moist (not as moist as Pm)	Fairly moist (not as moist as Pm)
Change of lapse rate	Cooled from below	Warmed in summer	Heated from below	Heated from below	Heated from below
Stability	Stable	Stable aloft	Unstable	Unstable	Unstable
Weather	Low cloud, drizzle	Broken cloud, dry	Variable cloud, showers	Showers (mainly coastal)	Showers (mainly coastal)
Visibility	Often poor with coastal fog	Moderate	Good	Very good	Very good

	Tropical continental (Tc)		Polar continental (Pc)	
	Summer	Winter	Long sea track	Short sea track
Temp	Very warm or hot	Average	Cold	Very cold
Humidity	Relatively dry	Rather moist	Moist in lowest layers	Very dry
Change of lapse rate	Little change	Cooled from below	Heated from below	Little change
Stability	Generally stable	Stable	Unstable	Stable
Weather	Clear, occasional thundery showers	Clear	Rain or snow showers	Clear
Visibility	Moderate or poor	Moderate of poor	Good	Moderate or poor

Summary By Type

Arctic Maritime (mAc)

Arctic air rarely occurs outside winter and is colder and drier than polar maritime although it picks up sufficient moisture to produce showers, usually of sleet or snow, on north-facing coasts and hills. As a rule, these showers don't travel far inland and many places will be fine and sunny, if rather cold. Occasionally, they may become organised into lines of heavy showers and, rarely, into small depressions known as Polar Lows, which can produce quite heavy falls of snow. If accompanied by strong winds, blizzard conditions may develop, usually over the Scottish Highlands.

Polar Maritime (mPc)

Polar maritime air is the most common type of air mass affecting the British Isles. The air has its source in the Canadian Arctic or the Greenland area. It reaches the British Isles from the west or north-west after having swung around the western side of a depression. As the cold air travels over the relatively warm sea, it is warmed from below and becomes unstable. Unstable airstreams tend to produce convection, and so cumulus clouds, cumulonimbus clouds and showers are likely in polar maritime air. Other characteristics of the air are that it is cool (especially in summer), fairly moist and associated with good visibility.

In winter, most of the convection is initiated over the Atlantic, and showers hit the coasts, spreading inland if the winds are strong.

In spring and summer, convection clouds tend to be set off inland by daytime heating. Now, the shelter of the western mountains is less important, and showers or short-lived thunderstorms can occur almost anywhere. At night the clouds disperse.

Tropical Maritime (mTw)

Tropical maritime air usually approaches the British Isles from the south-west. Its source region is the subtropical Atlantic Ocean, typically the Azores area, although occasionally it may come almost directly from the Tropics. During its passage across the Atlantic, the air is cooled from below as it passes over a progressively cooler ocean, and so it becomes more stable. While it cools down, little of its moisture is lost. It therefore reaches south-west England or western Ireland almost saturated, giving dull, warm, overcast weather.

On the coasts, sea fog is common in these tropical maritime south-westerlies. However, if the cloud base of the stratus or stratocumulus is several hundred feet, sea-level sites may be saved from the fog, but on rising ground and hills there may be fog and drizzle.

Further inland, in the summer half of the year at least, the low stratus may be burnt off by the sun and it could turn out to be quite warm, though still humid. In the lee of hills or mountain ranges, the clouds sometimes break up and there is a lot of sunshine.

Returning Polar Maritime (mPw)

Returning polar maritime air, like polar maritime air, originates in polar regions, but travels southwards before turning north towards the British Isles. The classic returning polar maritime airstream occurs when a large depression is situated somewhere to the north-west of the British Isles. Normally, once the associated weather fronts have passed through, the British Isles are left in a north-westerly polar maritime airstream. However, if the air reaching the British Isles has travelled around the southern edge of the depression and the winds are between south and south-west, the air is designated as returning polar maritime.

The air is originally cold, but as it takes a long sea track southwards across the Atlantic, the lower layers become warmer, more moist and more unstable. However, as it returns northwards, the lower layers are cooled and become more stable. This mixture of a stable layer near the surface and an unstable layer aloft can lead to a wide variety of weather. On exposed coasts and hills, the combination of high moisture content and low-level stability can lead to stratus clouds and hill fog.

Sometimes, however, the unstable layer leads to the formation of altocumulus castellanus followed by cumulonimbus clouds and showers (and occasionally thunderstorms). Further inland a mixture of weather can occur – stratus lifts and disperses, allowing heavy showers to form.

Moisture contents are quite high, especially near southern coasts, but the clean air usually means good visibility.

Only if the wind becomes very light can inland fog form, where evening showers have moistened the ground.

Tropical Continental (cTw)

Tropical continental air usually comes with south-easterly or southerly airstreams. It originates in north Africa and often travels over the Mediterranean Sea, Spain and France before reaching the British Isles. In summer, even easterly winds from central Europe or the Ukraine could be included in this category, as the continent becomes so hot at this time of year. The air picks up some moisture over the Mediterranean (and perhaps the Bay of Biscay), but overall the air tends to be quite dry and the skies are typically cloudless.

An air mass cooled from below on its northward journey should be stable Sometimes, however, moisture may have found its way to medium levels in the atmosphere. Then, if there is a layer of unstable air and a trigger to set off convection, altocumulus castellanus clouds can develop, looking like turrets. These are often the forerunner to tremendous thunderstorms, which can occur by day or night. The majority of tropical continental airstreams give a heatwave in summer. The lack of moisture usually causes the visibility to be good. However, there may be desert dust, fine soil or pollution particles in the air, which can lead to moderate visibility (often described as ‘heat haze’). Also, the cloudless sky sometimes looks milky because of pollutants.

Polar continental (cPc)

A polar continental air mass originates in Scandinavia or Russia, and reaches the British Isles when north-easterly or easterly winds become established. This tends to occur when there is a high pressure area somewhere to the north of the British Isles, often over Scandinavia itself. Polar continental air masses mainly affect the British Isles during the winter half of the year.

Temperatures in polar continental air masses are below average in winter, except perhaps to the lee of mountains. In summer, however, the temperatures tend to be above average.

The moisture content is low in these air masses, especially when they take a short sea track. This leads to clouds being generally well broken, and so the weather is fine and sunny.

Air that has crossed the North Sea between Denmark and Scotland is said to have taken a long sea track. It therefore collects more moisture and clouds tend to form during its journey over the sea. Consequently, it is cloudy in eastern districts (with perhaps drizzle or snow flurries), but further inland there tends to be a mixture of cloud and sunshine.

Visibility varies, generally being very good when air comes from Scandinavia, but less good when the air originates in the industrialised regions of central or eastern Europe.