

Wales: climate

Wales is a mainly mountainous country with much of the land being over 150 metres.

In the north, Snowdon is the highest mountain in England and Wales, at 1085 metres, and in the south the Brecon Beacons rise to 885 metres. The rivers drain radially from the upland areas, the Severn being the longest river in England and Wales. There are a number of hydro-electric schemes and reservoirs that supply water to major towns. The mountainous nature of the landscape means that large areas are only sparsely populated, with most of the settlements on or near the coast and in the southernmost counties, where almost half the population lives.



Wales has an essentially maritime climate, characterised by weather that is often cloudy, wet and windy but mild. However, the shape of the coastline and the central spine of high ground from Snowdonia southwards to the Brecon Beacons introduce localised differences. Whilst some upland areas can experience harsh weather, the coasts enjoy more favourable conditions and areas in east Wales are more sheltered and hence similar to neighbouring English counties.

Temperature

The mean annual temperature at low altitudes in Wales varies from about 9.5 °C to 11 °C, with the higher values occurring around or near to the coasts. The mean annual temperature decreases by approximately 0.5 °C for each 100 metres increase in height so that, for example, a location at 400 metres would have a mean annual temperature of about 7.5 °C. On this basis, Snowdon (at 1085 metres) would have an annual mean of about 5 °C. Over the UK, mean annual temperatures range from about 7 °C in the Shetlands to over 11 °C in Cornwall and the Channel Islands.

Temperature shows both a seasonal and a diurnal variation. In winter, temperatures are influenced to a very large extent by those of the surface of the surrounding sea, which reach their lowest values in late February or early March. Around the coasts February is therefore normally the coldest month, but inland there is little to choose between January and February. The January mean daily minimum temperatures vary from just above 0 °C in the higher parts of north and mid-Wales to 3 or 4 °C around the coast. The highest values occur in Pembrokeshire, due to the proximity of air from the relatively warm Atlantic.

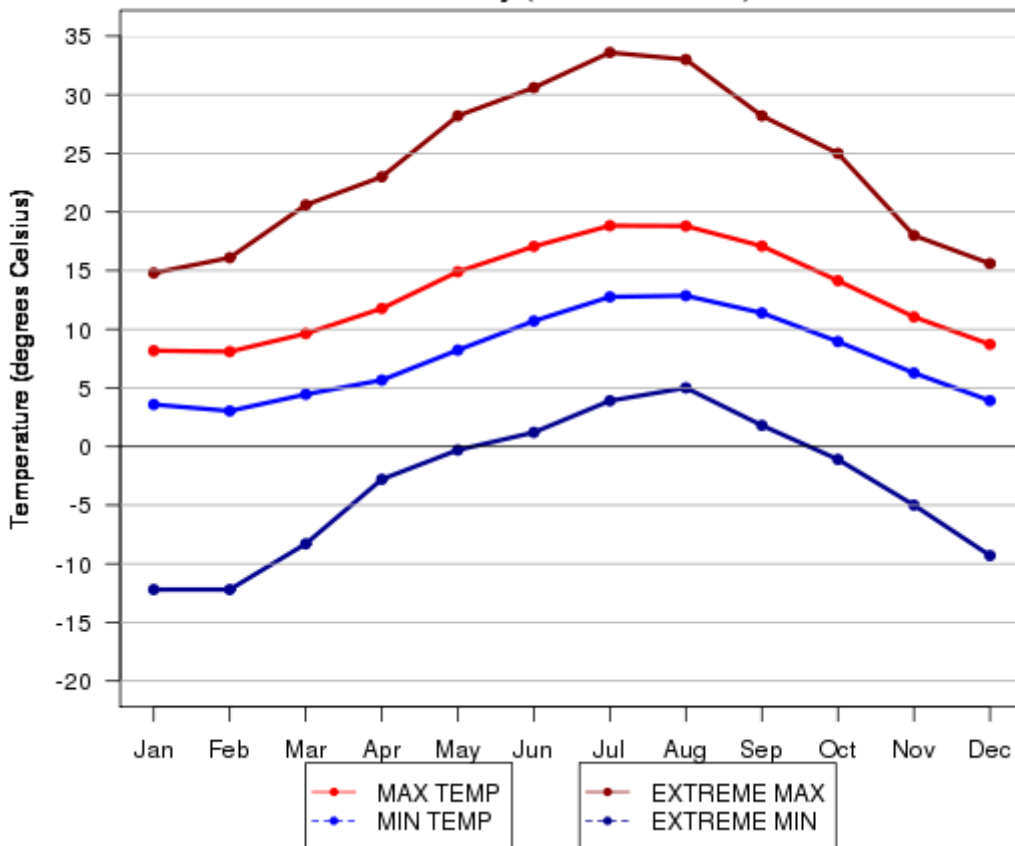
Minimum temperatures usually occur around sunrise with the coldest nights being those when there is little wind, skies are clear, and there is a covering of snow; the lowest temperatures occur away from the moderating influence of the sea, on the floors of inland valleys into which cold air can drain. It was under such conditions that the temperature fell to -23.3 °C, the lowest ever recorded in Wales, at Rhyader (Powys) on 21 January 1940. Coastal areas do not experience such cold nights; as an example, the lowest temperature ever recorded at Brawdy (Pembrokeshire) is -10.7 °C on 13 January 1987. In contrast, some of the highest winter temperatures in the UK have been recorded on the North Wales coast. These high winter temperatures (up to 18 °C on occasion) occur when a moist south to south-westerly airflow warms up downwind of Snowdonia after crossing the high ground, an effect known as a föhn after its more dramatic manifestations in the Alps.

July is normally the warmest month, with mean daily maximum temperatures varying from about 17 °C in the higher inland locations, to 18 °C along the west coast and 21 °C in the east of Powys and Monmouthshire. In the UK, the highest July mean daily maxima occur in the London area (23.5 °C) whilst the lowest occur in the

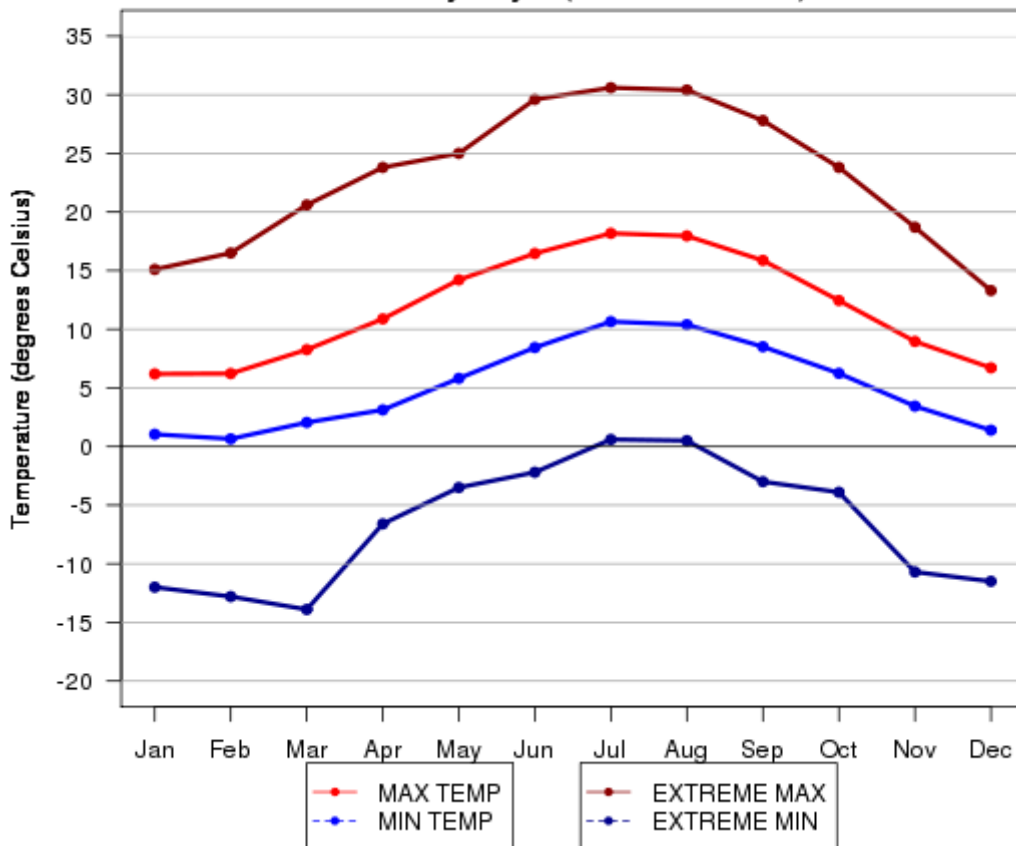
Shetlands (15 °C). Daily maximum temperatures usually occur 2 or 3 hours after midday, and extreme maximum temperatures are usually in July or August. The highest temperatures usually occur furthest away from the cooling influence of the Atlantic, the record in Wales being 35.2 °C at Hawarden Bridge (Flintshire) on 2 August 1990. However, when a hot airstream arrives from the east, maxima along the coasts can equal those inland, an example being the 31.8 °C achieved at Aberporth (Ceredigion) on 2 August 1995.

The variation of mean daily maximum and minimum temperatures month by month, together with the highest and lowest temperatures recorded, is shown for Valley and Cwmystwyth. Coastal locations such as Valley have the smallest range of mean temperature over the year, being relatively warm in winter but relatively cool in summer owing to the moderating influence of the sea. Places close to the English border and in SE Wales have colder winters and warmer summers.

**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1931-2014)
at Valley (10 metres amsl)**



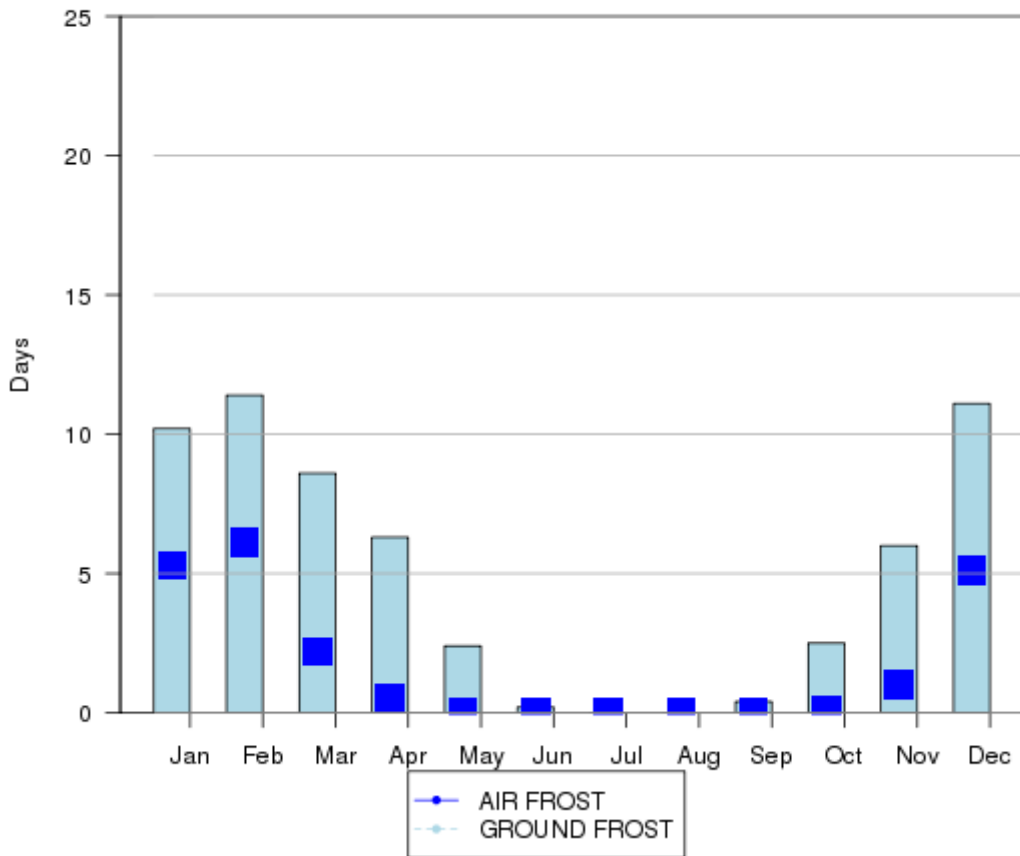
**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1959-2014)
at Cwmystwyth (301 metres amsl)**



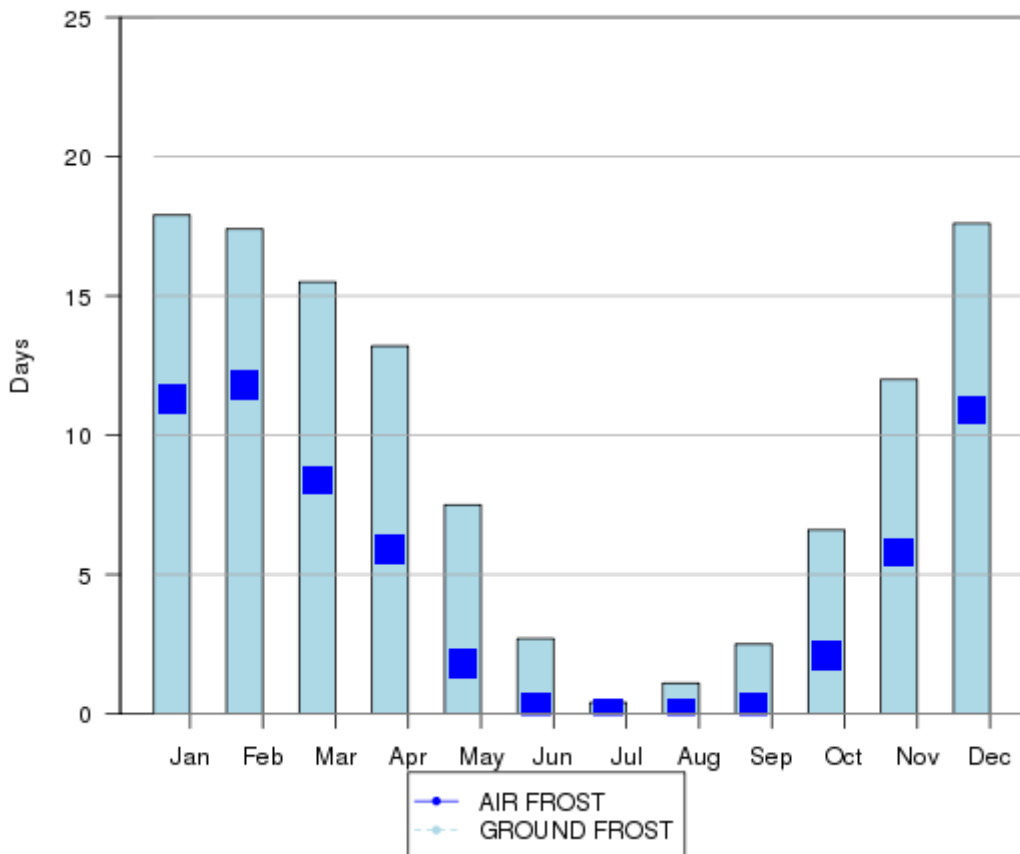
The average number of days with frost in Wales varies widely depending on the location. The main controls are distance from the sea and altitude, but the ability for cold air to drain into inland valleys is another important factor. An 'air frost' occurs when the temperature at 1.25 metres above the ground falls below 0°C, whereas incidence of a 'ground frost' refers to a temperature below 0 °C measured on a grass surface. Sites along the west coast typically have fewer than 25 days of air frost each year and inland the number ranges from 40 to 80 days, generally increasing with distance from the coast. Ground frost occurs on average on about 40 days each year on coasts and over 110 days well inland, with a similar distribution to air frost.

The graphs show the average frequency of air and ground frost at Valley and Cwmystwyth. Although the summer months are usually free of air frost, ground frost may occur at any time of the year, especially at sites well inland.

Average annual number of days of air and ground frost (1981-2010) at Valley (10 metres amsl)



Average annual number of days of air and ground frost (1981-2010) at Cwmystwyth (301 metres amsl)



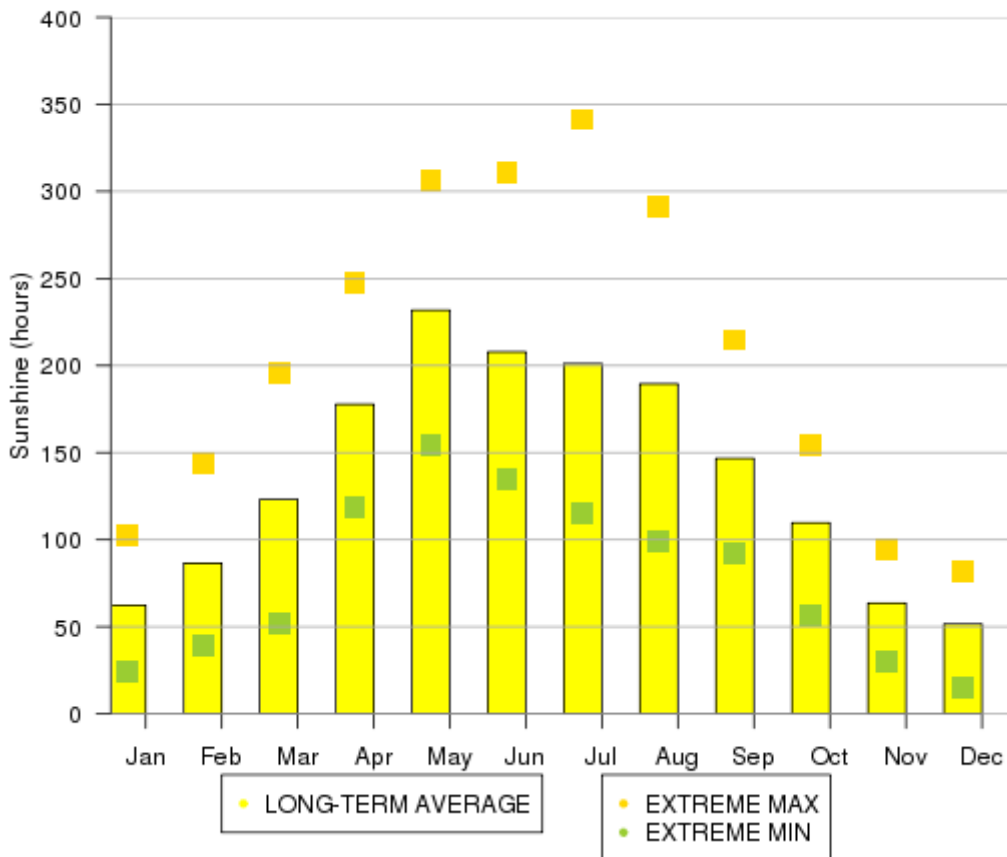
Sunshine

The hilly nature of the terrain in Wales and its proximity to the Atlantic tends to encourage cloud cover. Even so, the south-western coastal strip of Pembrokeshire manages an average annual sunshine total of over 1700 hours, which is comparable to the 1750 hours achieved by many places along the south coast of England. The duller parts of Wales are the mountainous areas, with average annual totals of less than 1200 hours. These figures compare with values of less than 1100 hours a year in the Shetland Islands to over 1900 hours in the Channel Islands.

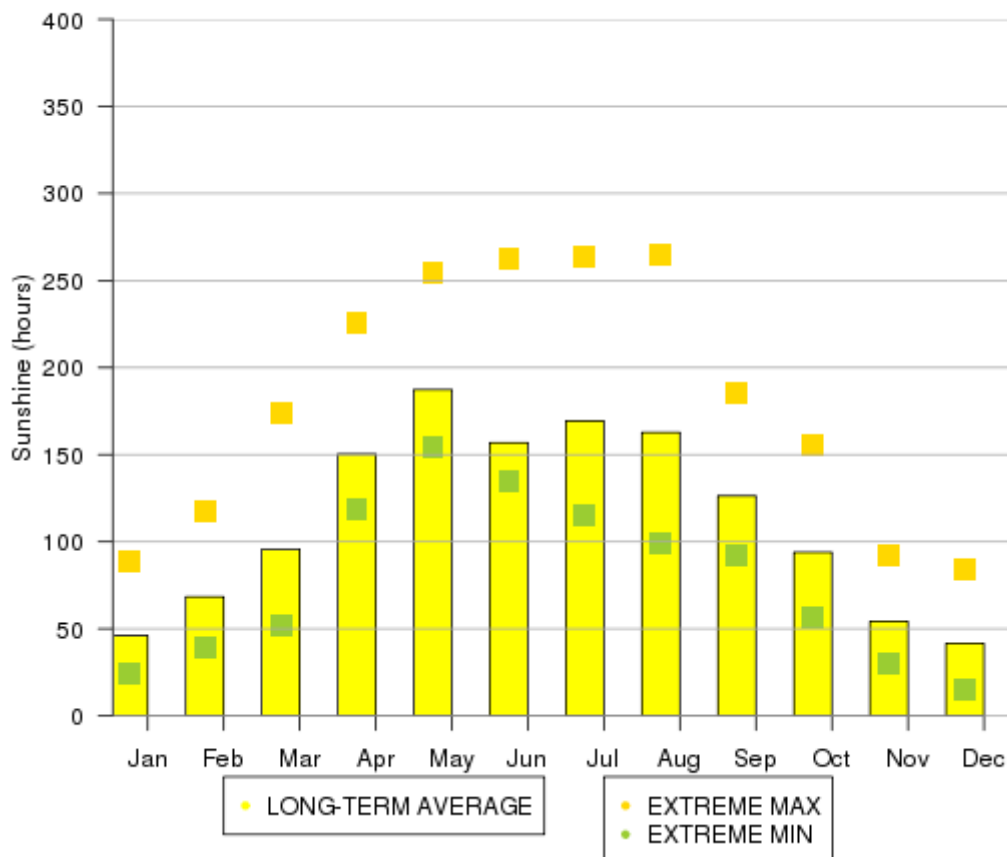
Mean monthly sunshine totals reach a maximum in May, and are at their lowest in December. The key factor is, of course, the variation in the length of the day through the year, but cloud cover plays a part too.

The graphs show the average monthly sunshine totals for Valley and Swyddffynnon , together with the highest and lowest totals recorded in the stated periods.

Mean monthly sunshine (1981-2010) and extremes (1931-2014) at Valley (10 metres asl)



Mean monthly sunshine (1981-2010) and extremes (1956-2014) at Swyddffymon (168 metres asl)



The highest known monthly sunshine total in Wales is 354.3 hours recorded at Dale Fort (Pembrokeshire) in July 1955. The highest UK monthly total is 383.9 hours at Eastbourne in July 1911. In the dullest winter months, less than 20 hours have been recorded - with none at all in December 1890 in central London.

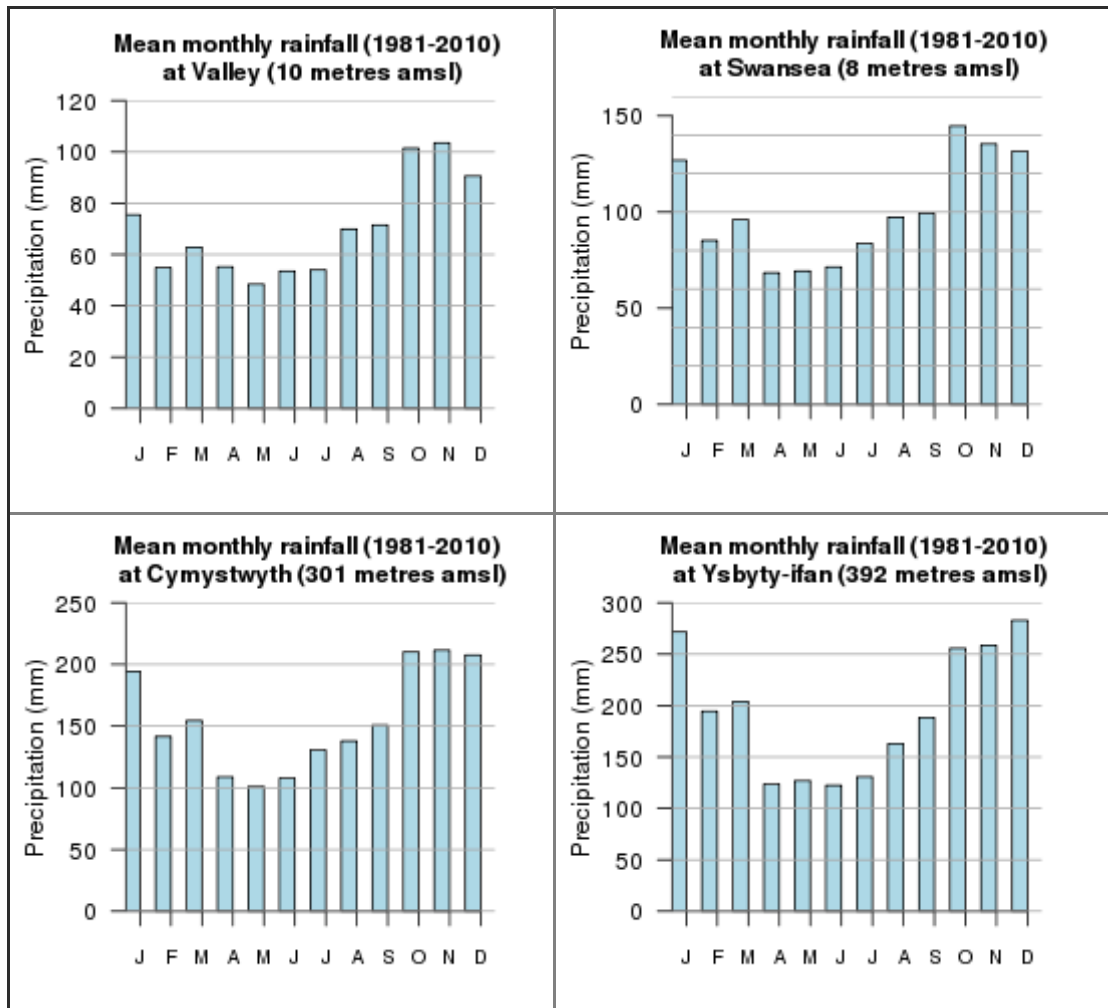
Rainfall

Rainfall is caused by the condensation of the water in air that is being lifted and cooled to its dew point. Rainfall tends to be associated with Atlantic depressions or with convection. The Atlantic Lows are more vigorous in autumn and winter and bring most of the rain that falls in these seasons. In summer, convection caused by solar surface heating sometimes forms shower clouds and a large proportion of rainfall is from showers and thunderstorms then. A further factor that greatly affects the rainfall distribution is altitude. Moist air that is forced to ascend hills may be cooled to the dew point, to produce cloud and rain. A map of average annual rainfall therefore looks similar to a topographic map.

Rainfall in Wales varies widely, with the highest average annual totals being recorded in the central upland spine from Snowdonia to the Brecon Beacons. Snowdonia is the wettest area with average annual totals exceeding 3000 mm, comparable to those in the English Lake District or the western Highlands of Scotland. In contrast, places along the coast and, particularly, close to the border with England, are drier, receiving less than 1000 mm a year.

Throughout Wales, the months from October to January are significantly wetter than those between February and September, unlike places in eastern England where July and August are often the wettest months of the year. This seasonal pattern is a reflection of the high frequency of winter Atlantic depressions and the relatively low frequency of summer thunderstorms. For example, at Cardiff, thunder occurs on an average of 11 days a year, compared with 15 to 20 days at many places in England. In west and north-west Wales the frequency drops to around 8 days per year.

The course of mean monthly rainfall for 1981 - 2010 for 4 sites is shown below. The pattern of rainfall is similar at each, with the months October to January the wettest and the late spring and early summer months the driest.



Over much of Wales, the number of days with a rainfall total of 1 mm or more ('wet days') tends to follow a pattern similar to the monthly rainfall totals. In the higher parts, over 50 days is the norm in winter (December-February) and over 35 days in summer (June-August). In the driest areas of the east and south, about 40 days in winter and about 25 days in summer are typical.

The combination of close proximity to active weather systems arriving from the Atlantic and the extensive areas of upland can lead to notable daily and monthly falls. Daily totals exceeding 50 mm occur every other year, on average, in most parts of Wales. Periods of prolonged rainfall can lead to widespread flooding. A notable example was 17-18 October 1987, when up to 36 hours of rain resulted in totals of over 100 mm and severe flooding in west and north Wales. There was transport disruption, damage to property and 4 people drowned. Following an exceptionally wet autumn with over twice the normal rainfall, late October and early November 2000 also saw severe flooding, with the River Dee in north Wales particularly badly affected. Flooding and landslides also occurred in early February 2004, the area around Llanwrst in the Conwy valley of north Wales being hit hard. Preceding this, there was prolonged heavy rainfall across Snowdonia, with over 300 mm of rain falling at Capel Curig in 6 days.

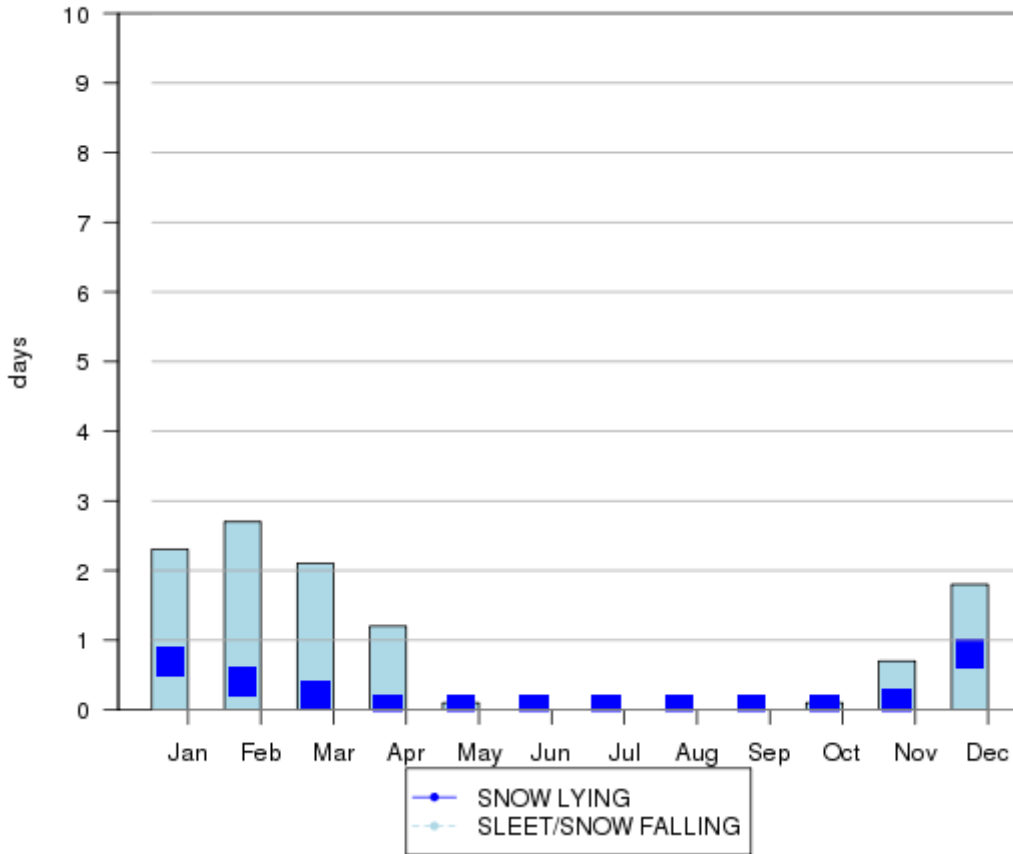
Snowfall

The occurrence of snow is linked closely with temperature, with falls rarely occurring if the temperature is higher than 4 °C. The numbers of days with snow falling and snow lying increase with latitude and altitude, so values reflect topography. Snow is comparatively rare near sea level in Wales, but much more frequent over the hills. The average number of days each year when sleet or snow falls varies from 10 or less in south-western

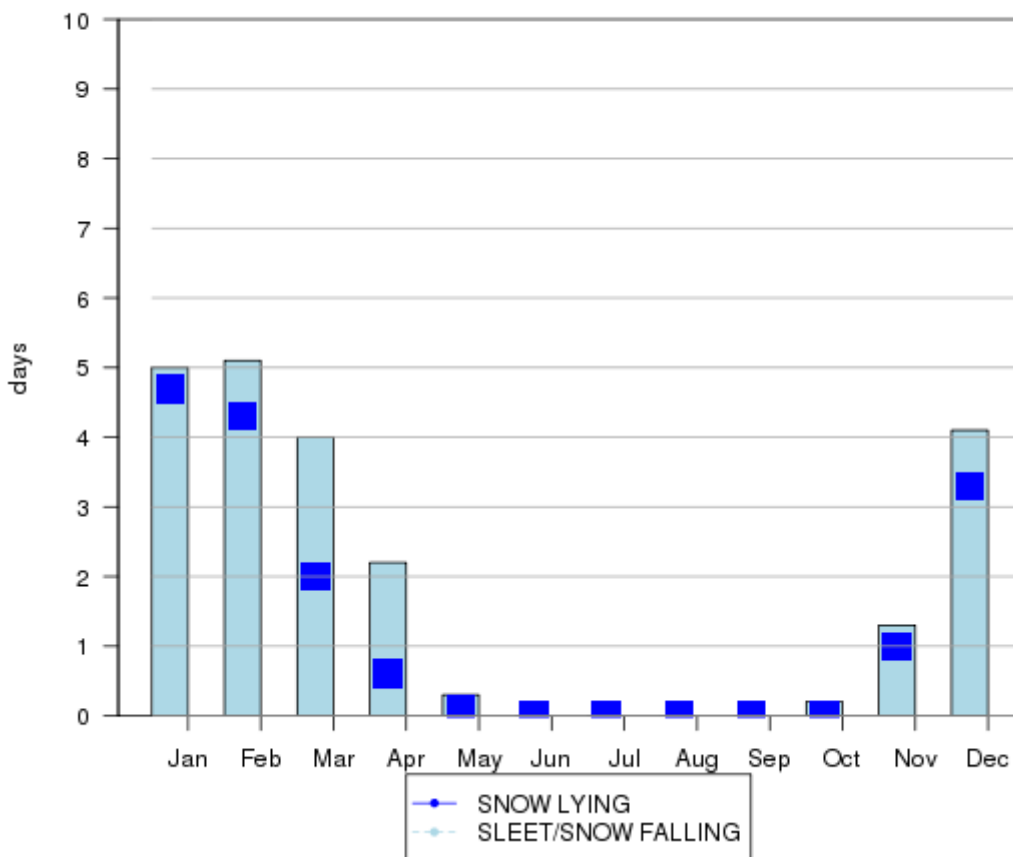
coastal areas to over 30 in Snowdonia. Snow rarely lies on the ground at sea level before December or after March, and the average number of days with snow lying in Wales varies from 5 or less around the coasts to over 20 in Snowdonia. These averages can be compared with parts of the Scottish Highlands, which have about 60 days with snow lying on average and with the coasts of SW England, with less than 3 days per year.

The monthly averages of days with sleet/snow falling and lying at Valley and Loggerheads are shown below (a day of lying snow is counted if the ground is more than 50 % covered at 0900).

Average number of days per year of sleet/snow falling and snow lying (1981-2010) at Valley (10 metres amsl)



Average number of days per year of sleet/snow falling and snow lying (1981-2010) at Loggerheads (201 metres amsl)



The number of days of snowfall and snow cover varies enormously from year to year. At many places in the last 50 years it has ranged from none at all in several winters to in excess of 30 days during the very severe winter of 1962/63. Even places near the coast experienced prolonged snow cover during this winter.

On rare occasions, in heavy snowfalls there can be quite extensive drifting of the snow in strong winds, especially over higher ground, resulting in severe dislocation to transport and power supplies. A notable example was the snowstorm in South Wales on 8-10 January 1982, when depths of 30 cm were commonplace even at low levels, with severe drifting in the strong to gale force easterly winds. This resulted in power lines being brought down and some roofs collapsing due to the weight of snow.

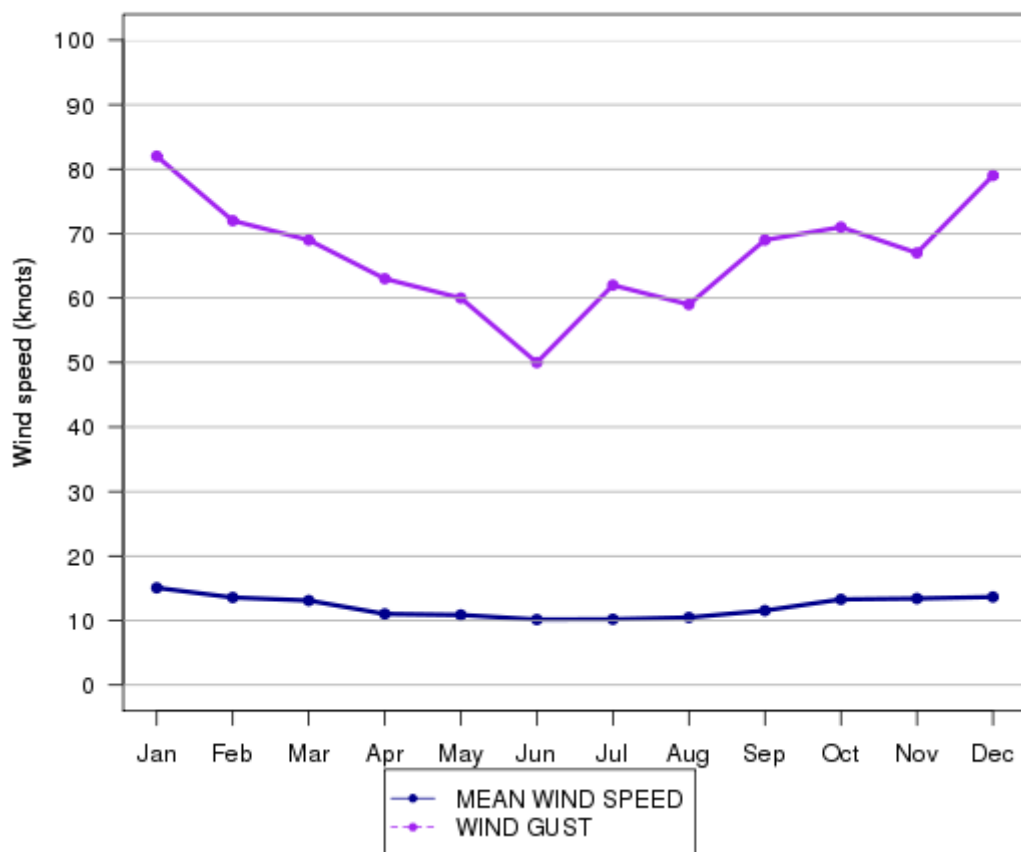
Wind

Wales is one of the windier parts of the UK, with the windiest areas being over the highest ground and along the coasts, particularly those facing directions between north-west and south.

The strongest winds are associated with the passage of deep areas of low pressure close to or across the UK. The frequency and strength of these depressions is greatest in the winter half of the year, especially from November to February, and this is when mean speeds and gusts (short duration peak values) are strongest.

The variation in monthly mean speeds (average of a continuous record) and highest gusts ('instantaneous' speed averaged over about 3 seconds) at Valley is shown below.

Monthly mean wind speed (1981-2010) and maximum gust (1953-2014) at Valley (10 metres amsl)



Another measure of wind exposure is the number of days when gale force is reached. If the wind reaches a mean speed of 34 knots or more over any 10 consecutive minutes, then that day is classed as having a gale. At low altitudes in Wales, gales occur most frequently in the south-west of Pembrokeshire with about 30 days of gale on average. Other coastal areas average 15 days or more of gale each year with the number of days decreasing inland to 5 days or fewer. Wind speed is sensitive to local topographic effects and land use - places sheltered by hills or in urban areas will have lower wind speeds and fewer days of gale.

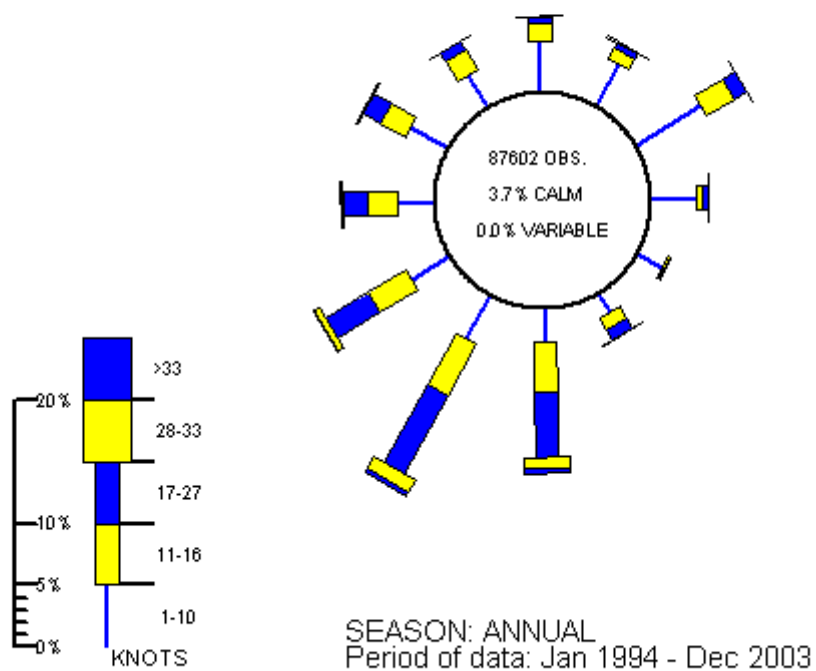
There have been several noteworthy gales affecting Wales, accompanied by property damage and disruption to travel and power supplies. Examples include the 'Burns Day storm' of 25 January 1990, when gusts of 60-70 knots were recorded widely and one of 93 knots occurred at Aberporth, and 27 October 2002 which again saw gusts of around 60 knots with 84 knots recorded at Mumbles, near Swansea. The highest gust recorded at a low-level site in Wales is 108 knots at Rhoose (Vale of Glamorgan) on 28 October 1989.

Wind direction is defined as the direction from which the wind is blowing. As Atlantic depressions pass the UK the wind typically starts to blow from the south or south west, but later comes from the west or north-west as the depression moves away. The range of directions between south and north-west accounts for the majority of occasions and the strongest winds nearly always blow from these directions.

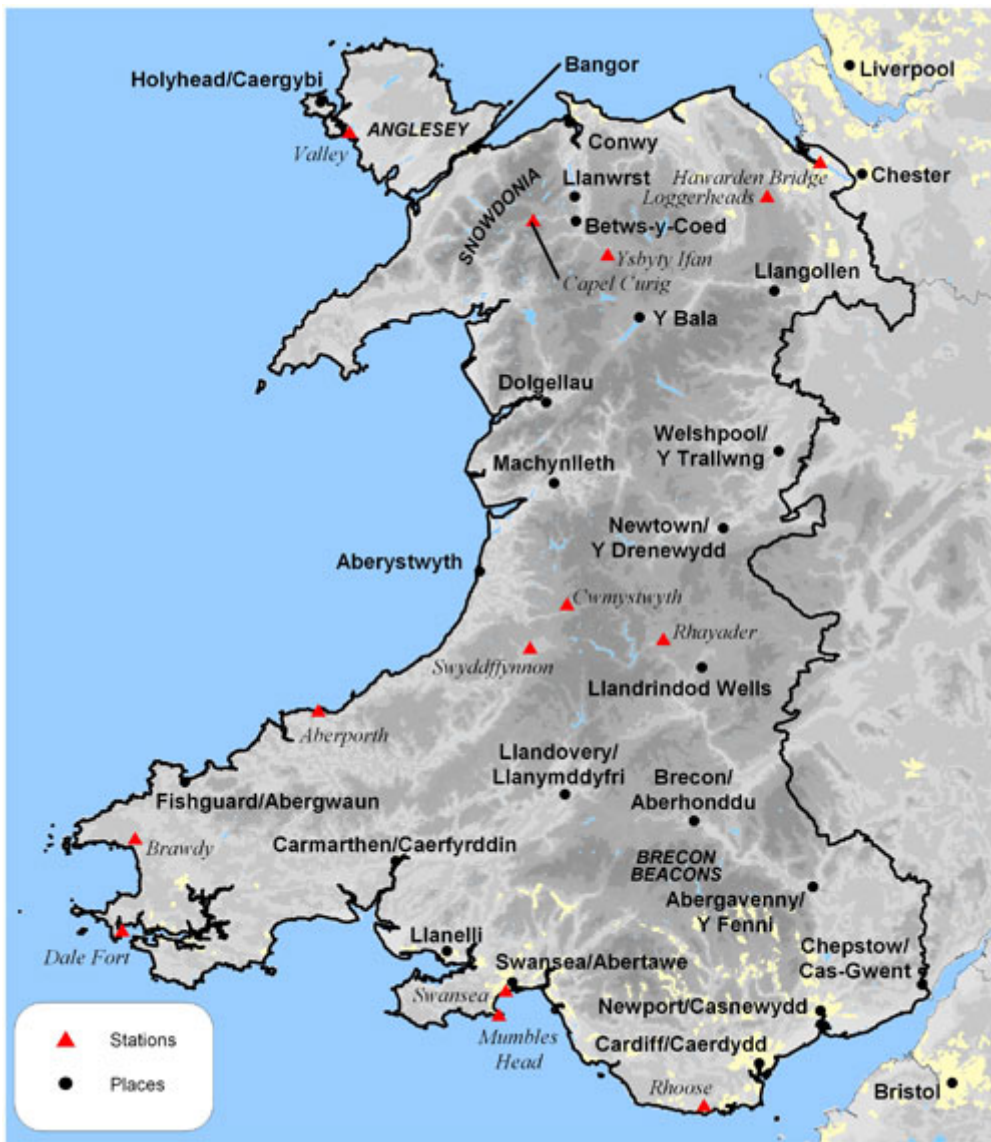
The annual wind rose for Valley on Anglesey is typical of coastal locations in Wales, with a prevailing south-westerly wind direction through the year. However, there is a high frequency of north to north-east winds in spring.

WIND ROSE FOR VALLEY
N.G.R: 2308E 3758N

ALTITUDE: 10 metres a.m.s.l.



Location map



Last updated: 10 October 2016

