

South West England: climate

The counties included in this area are Cornwall, Devon and Somerset together with the four administrative areas around Bristol (formerly Avon) and the Isles of Scilly.

Much of the landscape of Devon and Cornwall consists of plateaux at varying levels. The plateaux surfaces reach the sea in cliffs, for which the area is famous, but with a few areas of sand dunes as well. The plateaux are deeply incised by rivers and many of the lower river valleys have been submerged to form picturesque estuaries such as the Dart and Tamar. The highest areas coincide with the granite outcrops forming Dartmoor and Bodmin Moor and reach 621 metres on Dartmoor.



The high ground of Exmoor, made up from gritstones and slates, reaches 521 metres at its highest point. It lies in the counties of Devon and Somerset. To the east of Exmoor are the low lying Somerset Levels. This is an area similar to the Fens, which lies just above sea level and in the past was subject to flooding. To the south of Bristol lie the Mendip Hills, which is an area of limestone rocks. The porous nature of the limestone has led to a lack of surface streams with most drainage underground. Extensive underground caverns have been formed, perhaps the most famous being at Cheddar.

The Isles of Scilly, which lie 40 km to the west of Cornwall, total approximately 18 square km. St Mary's is the largest island and has a highest point of 51 metres.

Temperature

The south-west peninsula forms the most southerly part of the British Isles. The sea which surrounds the area on three sides has the highest annual mean temperature of any sea area near to the UK, close to 11 to 12 °C. With winds mainly blowing from the sea the annual mean temperatures are close to this in coastal areas of Cornwall and the Scillies. Compare this with the lowest UK annual mean temperature for low lying areas of about 7 °C in the Shetland Isles. The annual mean temperature tends to fall towards the north east where 10.5 °C would be more typical around Bristol.

The strong maritime control of temperature is best seen in the annual temperature range, or the difference between the mean temperature of the warmest and coldest months. In west Cornwall this is about 9 °C, which is similar to that found in western Ireland or the Outer Hebrides, but it increases to about 12 °C near Bristol and about 14 °C in the English Midlands.

Away from the coast, altitude is the main factor affecting temperature. The mean temperature decreases with height with, for example, Princetown at 414 metres on Dartmoor having an annual mean temperature of about 8.5 °C. Temperature shows both a seasonal and a diurnal variation, but due to the modifying effect of the sea the range is less than in most other parts of the UK.

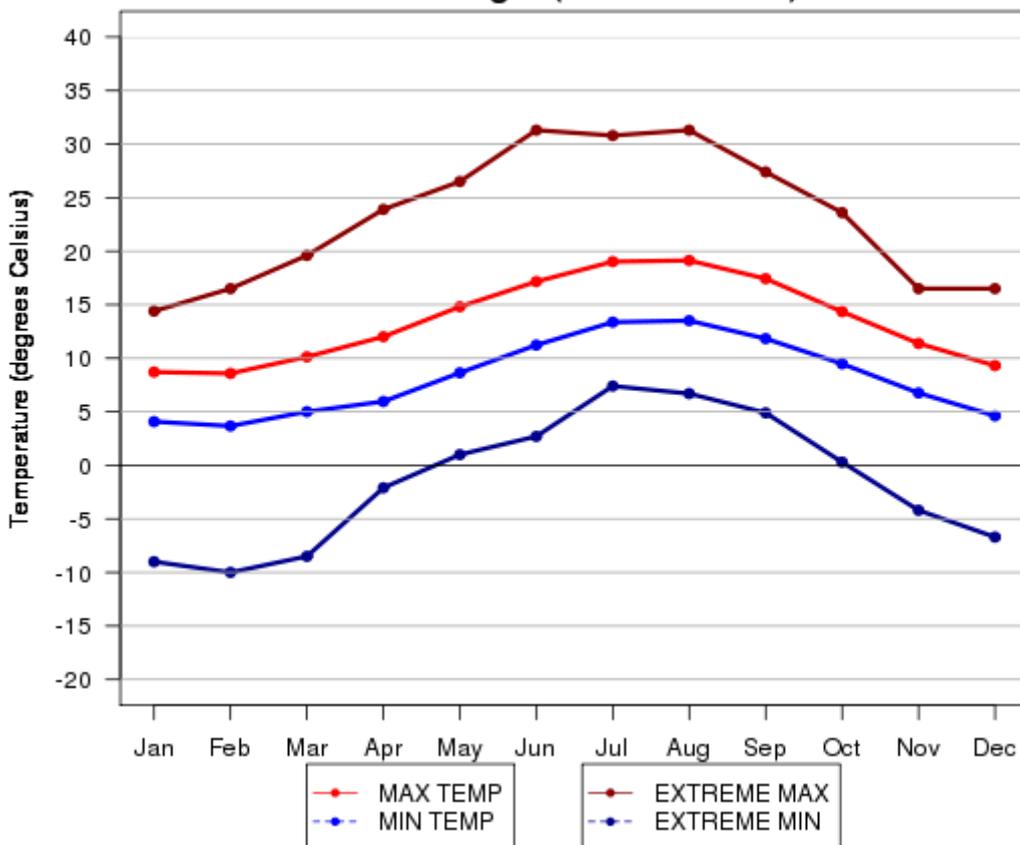
The sea reaches its lowest temperature in February or early March so that on average February is the coldest month in Cornwall and Devon. In this month the mean minimum temperature varies from rather more than 5 °C in the Scillies, to around 1.5 °C in inland Devon. Further north-east in Somerset and the Bristol area, where the influence of the sea is less, January is the coldest month with mean minimum temperatures between 1 and 2 °C.

The strong maritime influence normally prevents very low temperatures, but surprisingly low minima have been recorded occasionally. In coastal regions and in the islands the lowest temperatures are found when a strong, cold easterly wind ousts the normal south westerlies. Such an occasion was 13 January 1987, which was probably the coldest day of the 20th Century in the south west. For that day minima were recorded of $-9.0\text{ }^{\circ}\text{C}$ at St Mawgan (Cornwall) and even $-6.4\text{ }^{\circ}\text{C}$ on Scilly. Away from the coast, spells of frosty weather with clear and calm nights have produced records such as $-15.0\text{ }^{\circ}\text{C}$ at Exeter on 24 January 1958 and Bastreet (Cornwall) on 1 January 1979. Yeovilton (Somerset) reported $-16.1\text{ }^{\circ}\text{C}$ on 14 January 1982.

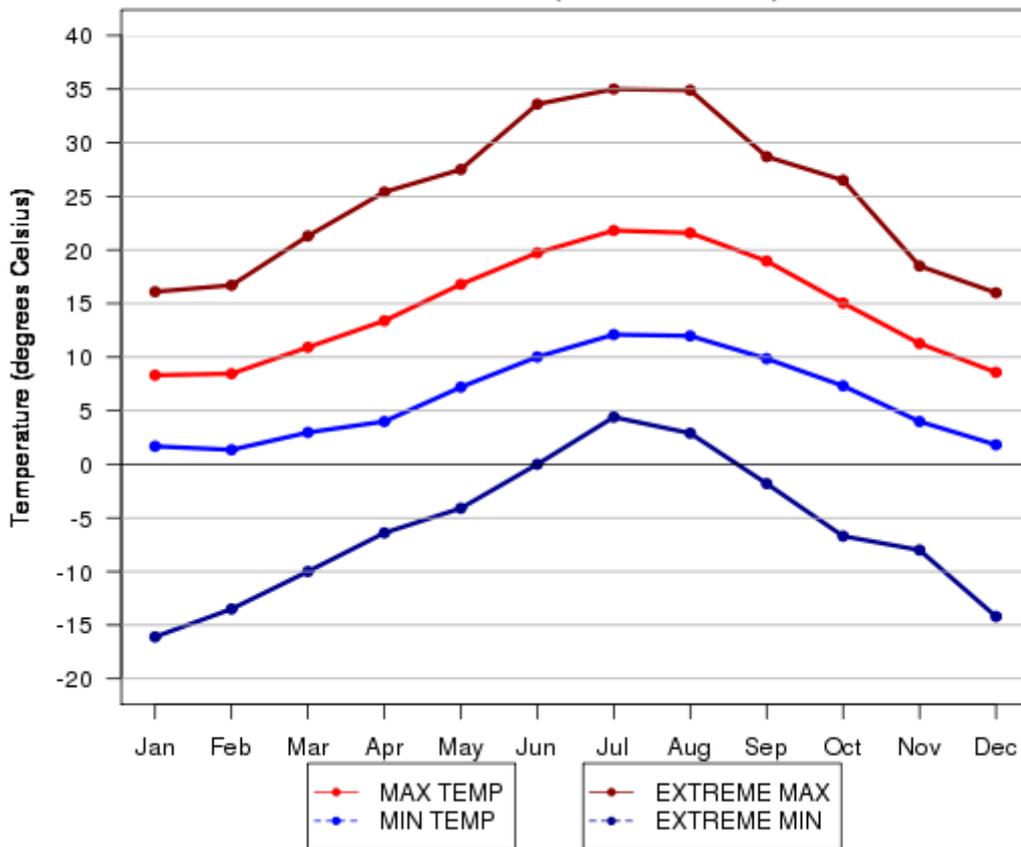
July and August are the warmest months in the region with mean daily maxima ranging from around $19\text{ }^{\circ}\text{C}$ in coastal Cornwall to $21.5\text{ }^{\circ}\text{C}$ in inland areas of Somerset and around Exeter. This is to be compared with $23.5\text{ }^{\circ}\text{C}$ that is typical of the area of highest UK temperature around London. Instances of extreme high temperatures are rare and are associated with hot air brought from mainland Europe on south easterly winds accompanied by strong sunshine. Records include $35.4\text{ }^{\circ}\text{C}$ at Saunton Sands, a site which is next to a large dune/heath area in north Devon, and $34.5\text{ }^{\circ}\text{C}$ at Yeovilton in Somerset, both on 3 August 1990. The highest UK temperature stands at $38.5\text{ }^{\circ}\text{C}$ at Faversham (Kent) on 10 August 2003.

The variation of mean daily maximum and minimum temperatures month by month, together with the highest and lowest temperatures recorded, is shown for St. Mawgan and Yeovilton. Yeovilton has the lower minimum temperature throughout the year because it is inland. It also has higher mean maximum temperatures except in mid winter when St Mawgan is slightly higher. St Mawgan has lower maximum temperatures in summer because of the cooling influence of the sea. The inland site at Yeovilton has higher extreme maximum and lower extreme minimum temperatures compared to St. Mawgan.

**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1956-2007)
at St.Mawgan (103 metres amsl)**



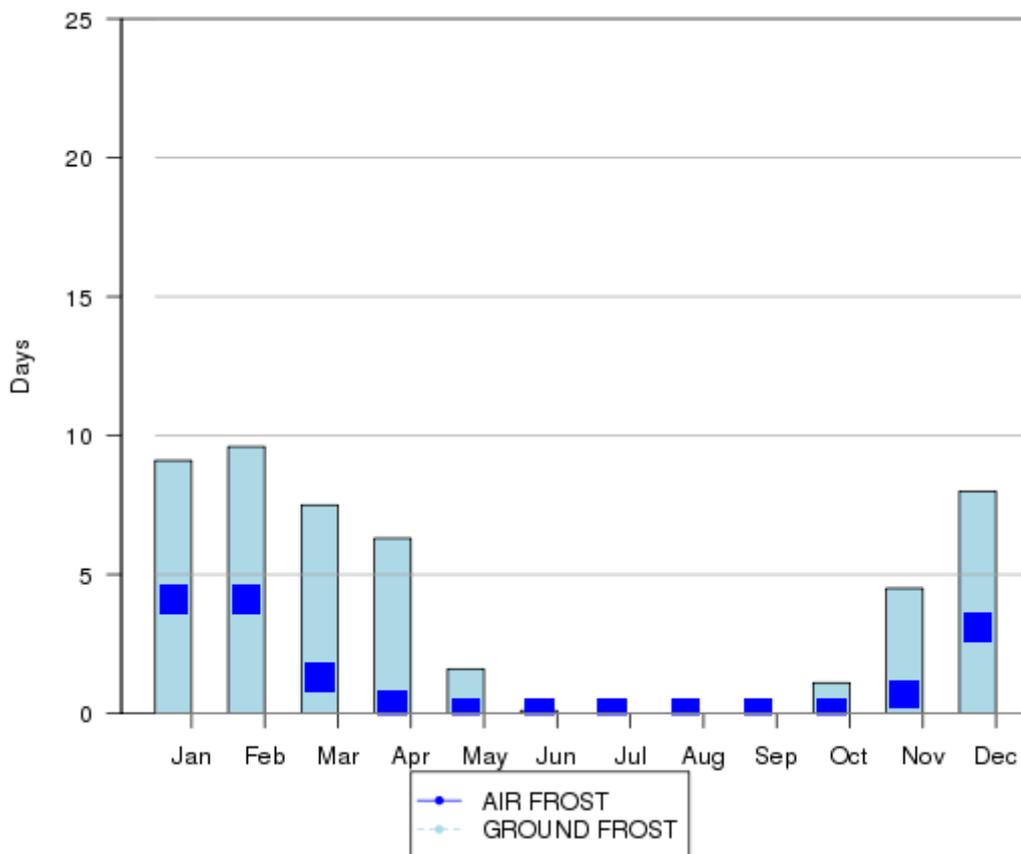
**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1964-2014)
at Yeovilton (20 metres amsl)**



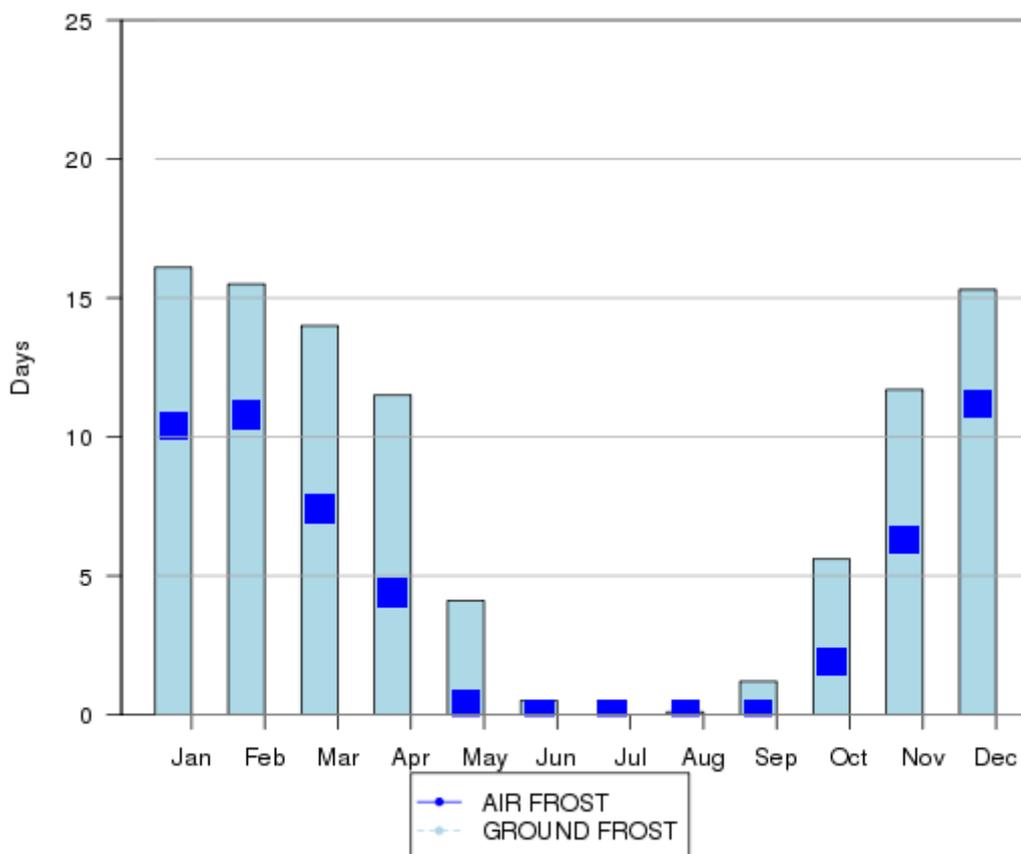
Frost frequency is highly variable across the region and despite its reputation for mildness can be relatively high in some places. An 'air frost' occurs when the temperature at 1.25 metres above the ground falls below 0 °C, whereas incidence of a 'ground frost' refers to a temperature below 0 °C measured on a grass surface. The Scilly Isles will experience an air frost only very occasionally, usually when cold continental air arrives on an easterly wind. Here the mean frequency of air frost is less than 2 per year. It rises to 15-20 in coastal areas of Cornwall and Devon. Frequencies exceed 50 per year in inland low-lying spots in Somerset. The first air frost of autumn can be expected about mid October inland in Somerset. The continuing warmth of the sea usually prevents coastal autumn frosts. Air frost in April is common and even in May is not unknown. Ground frosts follow a similar pattern to air frost. Most coastal locations have between 35 and 60 days per year, but in some eastern inland districts this rises to over 100 days per year.

The graphs show the average frequency of air and ground frost at St. Mawgan and Yeovilton. Although the summer months are usually free of air frost, ground frost may occur at any time of the year, especially at sites in inland valleys.

Average annual number of days of air and ground frost (1981-2010) at St. Mawgan (103 metres amsl)



Average annual number of days of air and ground frost (1981-2010) at Yeovilton (20 metres amsl)



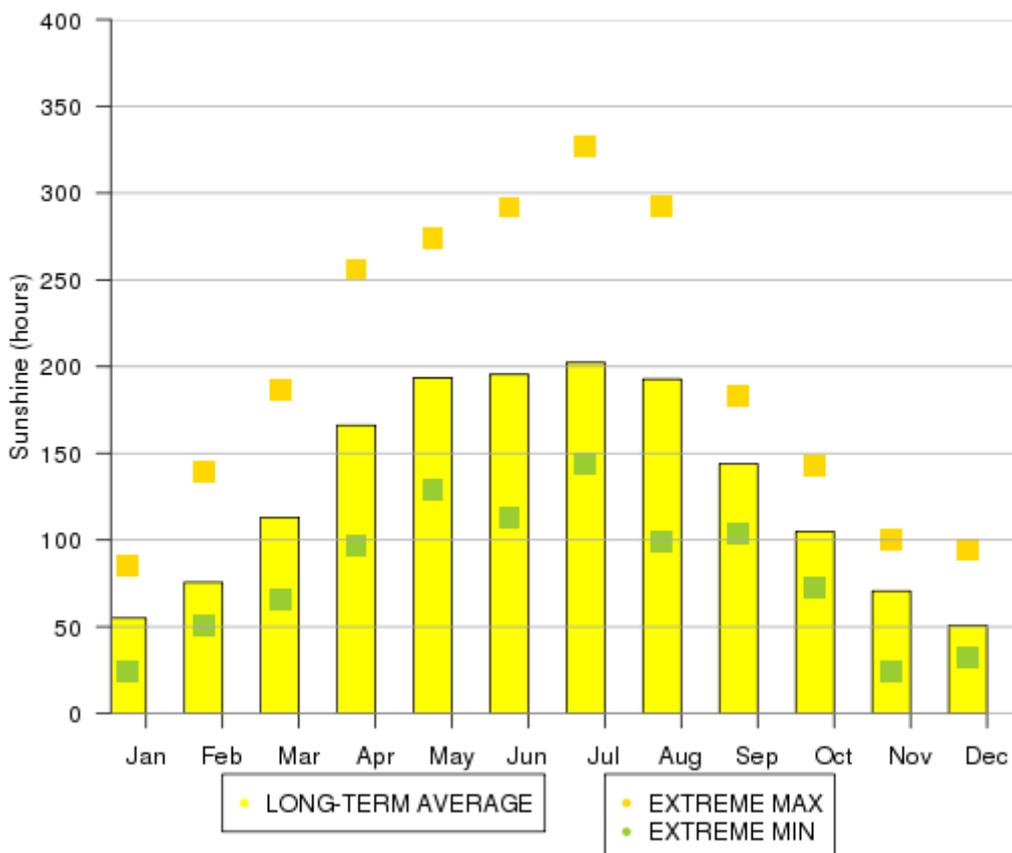
Sunshine

The number of hours of bright sunshine is controlled by the length of day and by cloudiness. The day is shortest in December and longest in June and so in general December is the duller month and June the sunniest. The south west of England has a favoured location with respect to the Azores high pressure when it extends its influence north eastwards towards the UK particularly in summer. Subsidence associated with high pressure reduces cloud cover and in spring and summer when the sea is cool relative to the air there is little convective cloud over the sea. Coastal areas are then favoured by high sunshine amounts. Inland and especially near hills, convective cloud often forms and acts to reduce sunshine amounts.

Coastal areas in the south west have average annual sunshine totals above 1600 hours, the south (English Channel) coast being more favoured than the north (Bristol Channel) coast. The Channel Islands are the sunniest part of the UK with some places exceeding 1900 hours per year. This may be compared with the 1100 hours per year recorded on the Shetland Islands. Inland the annual sunshine totals are mainly between 1450 and 1600 hours.

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

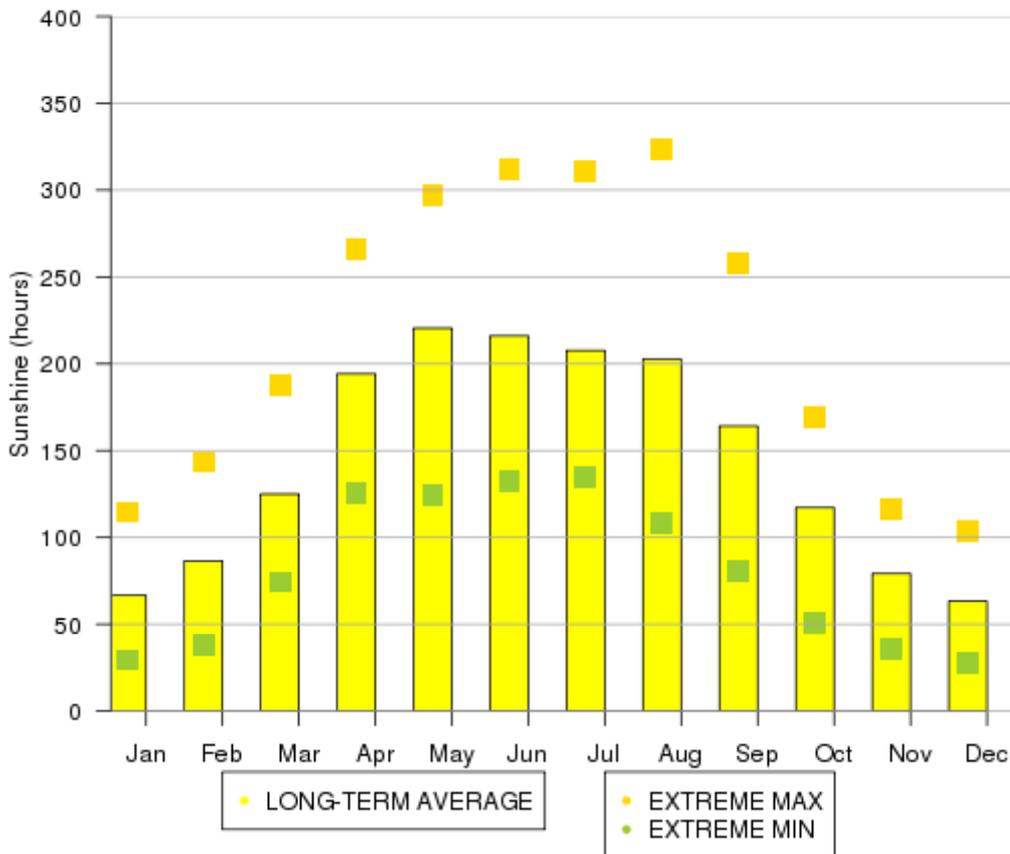
Mean monthly sunshine (1981-2010) and extremes (1983-2014) at Yeovilton (20 metres asl)



The highest known monthly sunshine totals in the area are for June 1925 when 334.8 hours were recorded at Long Ashton and 381.7 at Pendennis Point in Cornwall. The highest UK monthly total is 383.9 hours for July 1911 at Eastbourne, only a few hours above the Cornish record. In the duller winter months less than 20 hours have been recorded on occasion.

Rainfall

Mean monthly sunshine (1981-2010) and extremes (1956-2007) at St.Mawgan (103 metres asl)



Rainfall is caused by the condensation of the water in air that is being lifted and cooled below its dew point. Rainfall tends to be associated with Atlantic depressions or with convection. The Atlantic depressions are more vigorous in autumn and winter and most of the rain which falls in those seasons in the south west is from this source. In summer, convection caused by solar surface heating sometimes forms shower clouds and a large proportion of rainfall falls from showers and thunderstorms at this time of year.

The air humidity is an important factor determining rainfall and the sea temperature largely controls this. The sea temperature off SW England is at its maximum in late summer and autumn and is coolest in late winter and spring and as a result rainfall tends to be most in autumn and least in spring.

A final factor which greatly affects the rainfall distribution is altitude. Moist air which is forced to ascend hills may be cooled below the dewpoint to produce cloud and rain. A map of rainfall looks very like a topographic map.

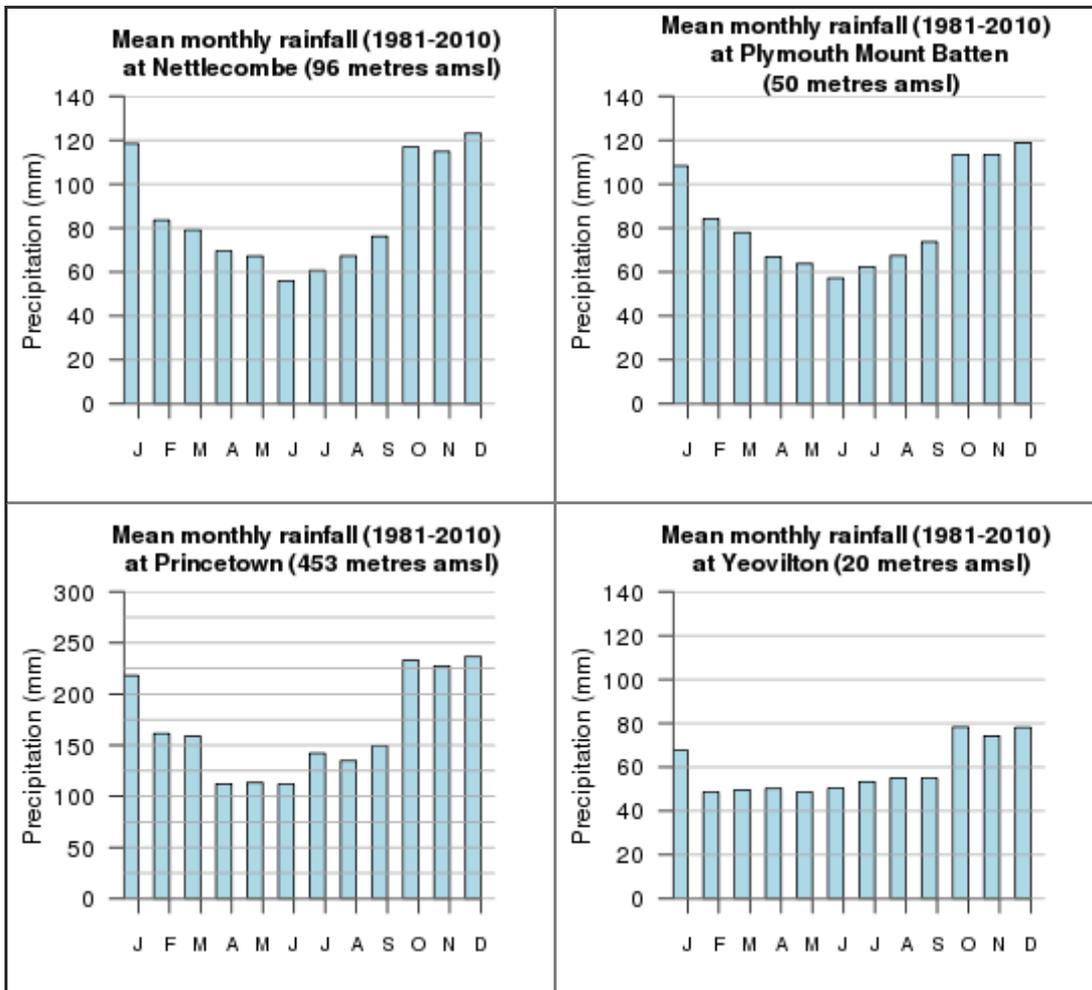
Annual rainfall totals are about 850-900 mm in the Scilly Isles. Most coastal areas of Cornwall and Devon have 900-1000 mm, but up to double this amount falls on upland such as Dartmoor, Bodmin Moor and Exmoor. Areas to the lee of high ground have lower totals e.g. 800 mm near Exeter and even 700 mm in the low-lying parts of central Somerset. Further east the Mendip Hills have annual totals exceeding 1100 mm, while the Bath-Bristol area has totals around 800-900 mm. These figures can be compared to annual totals around 500 mm typical of the driest parts of Eastern England and over 4000 mm in the western Scottish mountains.

The course of mean monthly rainfall for 1981 - 2010 for 4 sites is shown below. The highest rainfall is in December and January when the sea is relatively warm still and the Atlantic depressions are most vigorous. The months from April to July are the driest when the sea is relatively cool and the Azores high pressure

system exerts more influence. August shows an increase of rainfall over July and starts the inexorable rise in rainfall into the autumn and early winter.

The effect of altitude is seen by comparing the records for Plymouth and Princetown which are about 23 km apart, but differ by 403 metres in altitude. The Princetown rainfall is twice the Plymouth rain on average.

Monthly rainfall is also very variable. Most months of the year have recorded totals below 20 mm in coastal districts and many below 10 mm. Even at Princetown one May recorded only 7 mm. The highest monthly totals tend to be in the autumn and winter months. At Plymouth for example every month in the year has had more than 100 mm, but totals in excess of 200 mm have only been recorded from December to February.



The numbers of days with rainfall totals of 1 mm or more ('wet days') tend to follow a similar pattern to the monthly rainfall totals. In coastal areas in winter about 15 or 16 days is the norm, but this decreases to 9 or 10 in late spring and summer. In Somerset and the Bristol area there are fewer days having 1 mm or more throughout the year. In winter about 12 or 13 days is normal with about 7 to 9 in summer. The numbers of days increase with altitude and at Princetown for example there are over 18 days in the winter months and 12 to 13 days in summer.

The south west peninsula is prone to rare, but very heavy rainfall events lasting from about 5 to 15 hours. The famous storm which devastated Lynmouth in north Devon on 15 August 1952 was one of these, when one place on Exmoor had 228 mm in 12 hours. Other similar events are the 200 mm at Otterham near Boscastle in Cornwall on 16 August 2004, 203 mm at Camelford in Cornwall on 8 June 1957 and 243 mm in 13 hours at Bruton in Somerset in June 1917. The highest recorded daily rainfall total in UK was at Martinstown in Dorset when 279 mm was recorded on 18 July 1955.

Snowfall

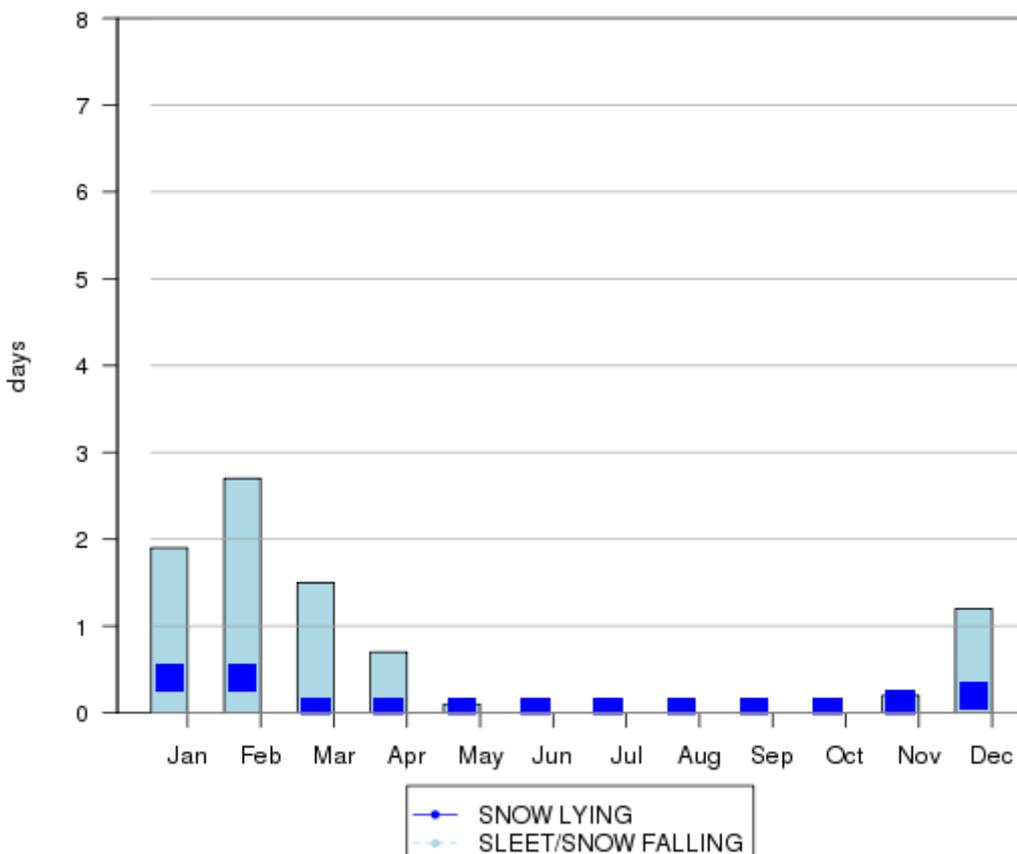
The occurrence of snowfall is linked closely with temperature with falls rarely occurring if the temperature is higher than 4 °C. For snow to lie for any length of time then the temperature normally has to be lower than this. In the south west snowfall is normally confined to the months from November to April, though upland areas may have brief falls in October and May. Snow rarely lies outside of the period from December to March.

On average, the number of days with snow falling is less than 10 per winter in the islands and coastal districts of Devon and Cornwall, though slightly higher near to the upper Severn Estuary. About 8-15 days is typical of inland areas with the higher figure in the north east near to the border with Wiltshire. In upland areas such as Exmoor and Dartmoor more than 25 days per year are possible. A rough average increase of about 5 days of snow falling per year per 100 metres increase in elevation has been found typical in the south west.

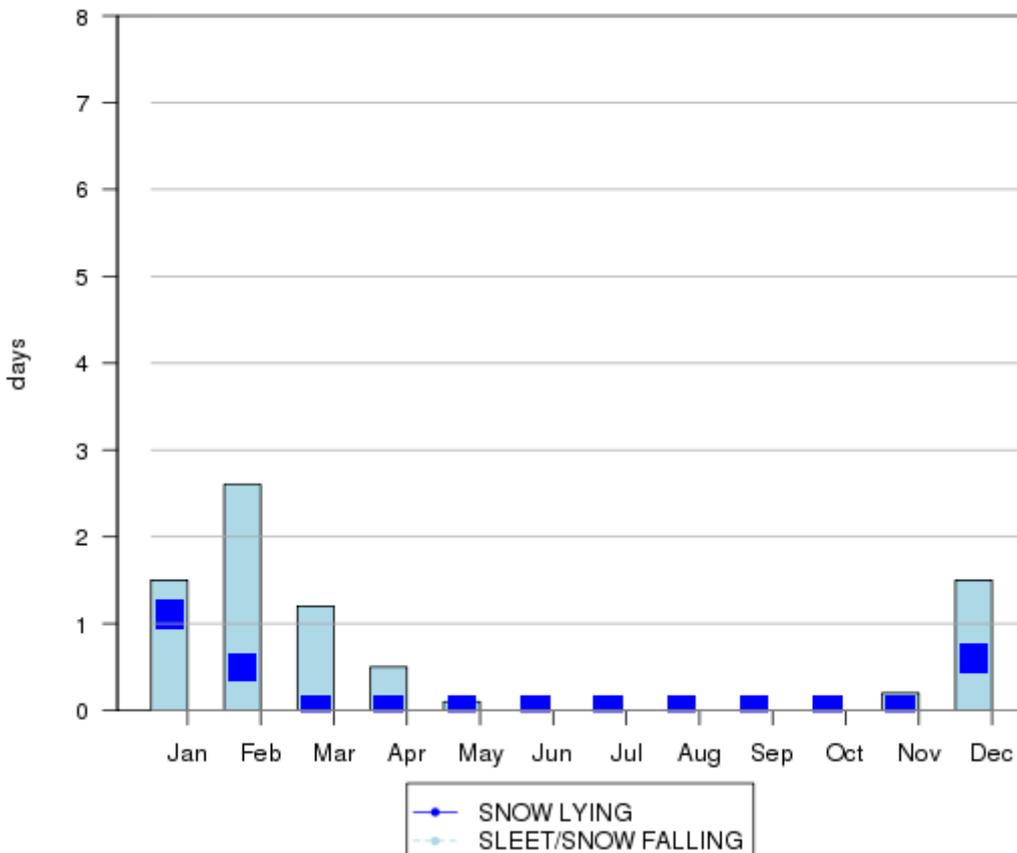
Lying snow is not a frequent occurrence in the south west, and in lowland areas about a third of years do not record any snow lying. In the Scillies and coastal Cornwall and Devon less than 3 days per year is a typical average. This increases to 5-10 days per year inland with the higher figure applying to north eastern areas. Altitude is significant and a rough guide is an increase of about 5 days per year with snow lying per 100 metres increase in elevation. Dartmoor and Exmoor have more than 20 days per year. Compare this with Balmoral, Grampian which has about 60 days with snow lying on average.

The monthly averages of days with sleet/snow falling and lying at St. Mawgan and Yeovilton 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 St.Mawgan (103 metres amsl)



Average number of days per year of sleet/snow falling and snow lying (1981-2010) at Yeovilton (20 metres amsl)



The graphs show that the coastal site at St Mawgan has a similar incidence of falling snow to Yeovilton which is inland and considerably further east. This demonstrates the effect of altitude since St Mawgan is the higher site.

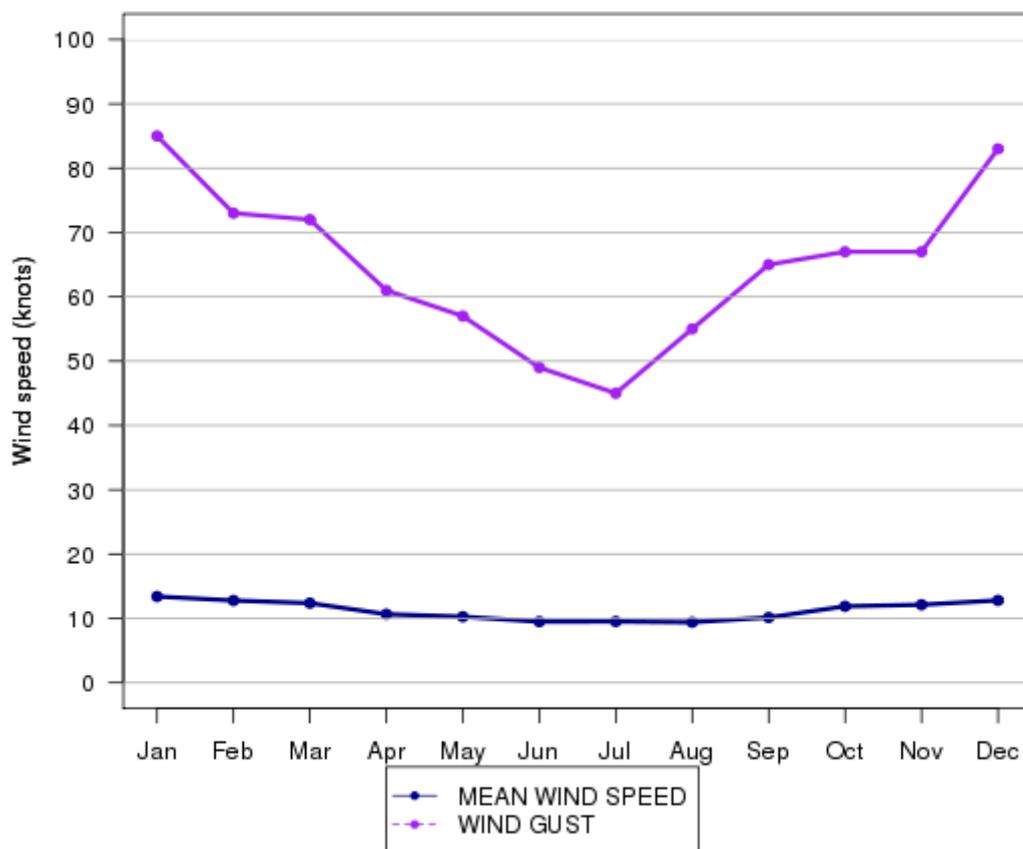
Despite being the mildest region of the British Isles, the south west peninsula has experienced some of the most severe blizzards to affect the country. This is because of a set of circumstances that affect the UK only rarely. If bitterly cold easterly winds from Europe meet a slow moving Atlantic depression situated off south west England then a prolonged snowstorm accompanied by high winds is possible. An example is 18/19 February 1978 when fine snow accompanied by 25 knot easterly winds at temperatures as low as -2°C deposited around 50 cm of snow in inland Devon. On 8/9 January 1982 conditions were especially severe in the Bristol area where drifts were locally 1 m deep. Another event, this time from convective showers, on 12 January 1987 produced snow depths of 35 cm (Falmouth), 39 cm (Penzance) and even 23 cm on the Scillies. Also, persistent bands of heavy showers across Cornwall and west Devon from northerly winds occasionally produce substantial snowfalls, such as on 25 November 2005, which resulted in traffic disruption on the A30 across Bodmin Moor.

Wind

South-west England is one of the more exposed areas of the UK, with wind speeds on average only greater in western Scotland. The strongest winds are associated with the passage of deep depressions close to or across the British Isles. The frequency and strength of depressions is greatest in the winter half of the year and this is when mean speeds and gusts are strongest. The graph shows a typical variation of the monthly mean speed and highest gust.

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

Monthly mean wind speed (1981-2010) and maximum gust (1956-2007) at St.Mawgan (103 metres amsl)



The graph shows that the months from November to March have the highest mean speeds with June to August having the lightest winds. The peak gust follows a similar pattern and in the past 30 years both December and January have both had gusts to over 80 knots.

Other coastal areas are similar to St. Mawgan, though mean speeds generally decline towards to the north east. Inland areas have lower speeds which also decrease to the north east. At Yeovilton in lowland Somerset, for example, the mean speeds are about two thirds those at St. Mawgan. Wind speeds also tend to increase with increasing altitude. The highest parts of Exmoor and Dartmoor are likely to have speeds similar to those on the coast.

There have been several noteworthy strong wind events in the south-west. On 15 December 1979 severe gales in Cornwall and the Scillies produced gusts of 91 knots at Lizard, 99 knots at St. Mary's (Scilly) and 103 knots at Gwennap Head. The gust at Gwennap Head is the highest recorded at a low-level site in England. The notorious storm on 15 October 1987 was not very severe from Cornwall to Avon, but the Channel Islands reported 85 knots that day. The Burn's Day storm (25 January 1990) caused considerable damage to buildings and overturned vehicles as high winds were widespread. Some stations had gusts which were the highest in the period from 1971 to 2000 and included 84 and 85 knots at Plymouth and St Mawgan respectively. Other reports were of 79 knots at Bristol (on top of a building), 68 knots at Yeovilton and 74 knots at Exeter airport. The maximum hourly mean speed was 60 knots at Plymouth and 45 knots at Yeovilton.

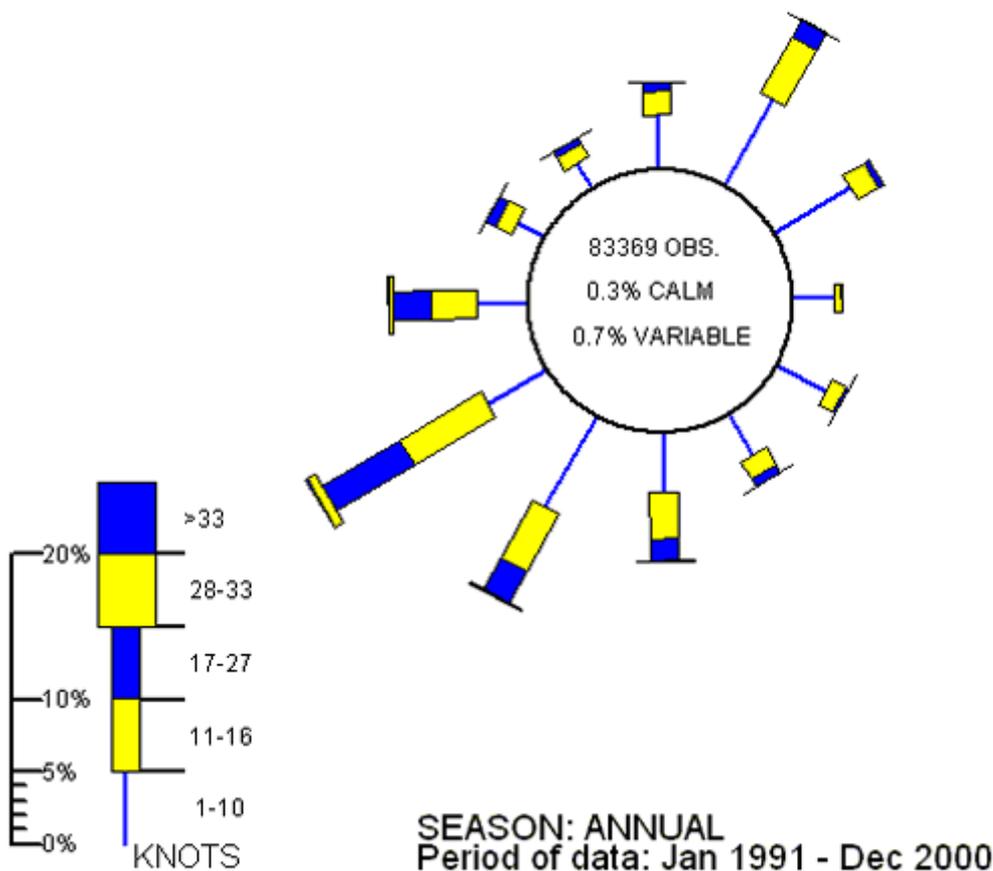
Another measure of wind exposure is the number of days when gale force was reached. If the wind reaches a mean speed of 34 knots or more over any ten consecutive minutes then that day is classed as having a gale. Exposed headlands and islands have the greatest frequency of days with gale. In the Scillies the average is around 24 days per year, with a similar figure for exposed places in coastal Cornwall. The frequency is rather less to the north east especially inland. Plymouth (on the coast) has about 16 days per year, but Yeovilton in Somerset has 7 and Long Ashton near Bristol only 4. Wind speed is sensitive to local topographic effects and land use. Places sheltered by hills, or which are in extensively wooded or urban areas will have lower wind speeds and fewer days of gale.

The direction of the wind is defined as the direction from which the wind is blowing. As Atlantic depressions pass by 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 this range of directions. The wind roses illustrate the typical frequency of speeds and directions during the year and confirm the predominant SW direction. At Avonmouth, the relatively high frequency of NE winds (and lack of SE and NW winds) reflects its situation on the Bristol Channel, aligned NE-SW. East or north east winds can also be strong if depressions pass along the English Channel. Spring time also tends to have a maximum of winds from the north east. Periods of very light or calm winds with no preferred direction are usually below 6% of the time in the islands and coastal districts. This increases to about 15% of the total time in inland areas to the north east and can be compared with a typical inland station in central England that would have light winds for around 25% of the time.

WIND ROSE FOR AVONMOUTH

N.G.R: 3503E 1787N

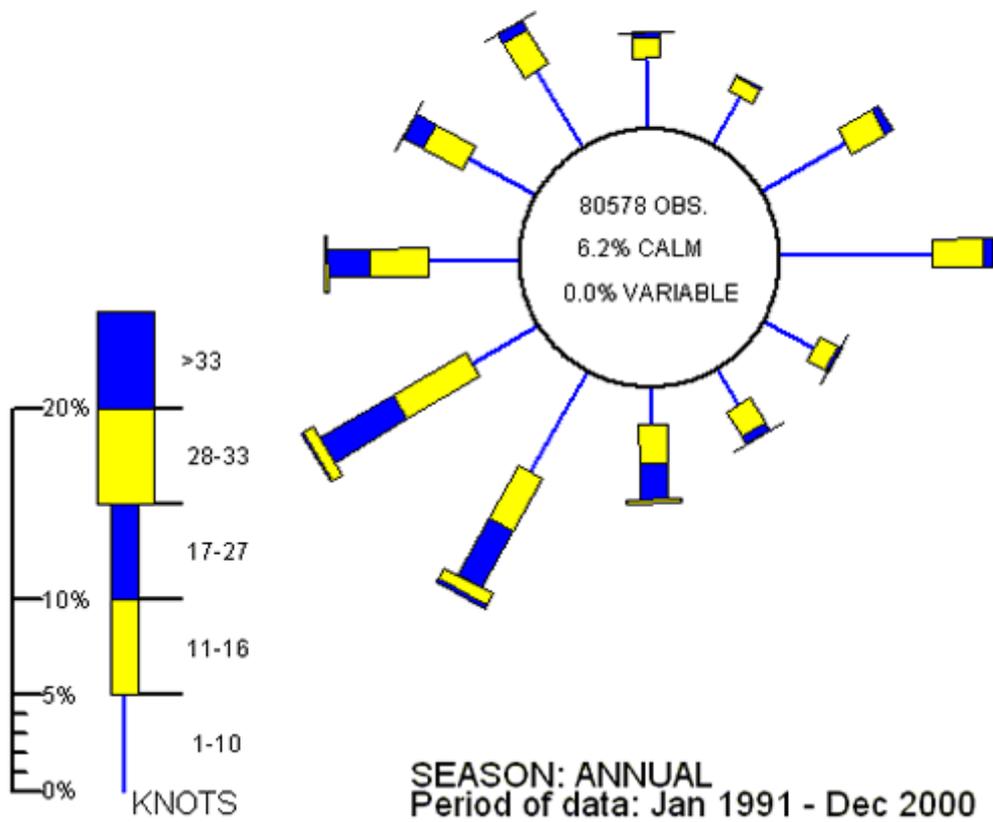
ALTITUDE: 9 metres a.m.s.l.



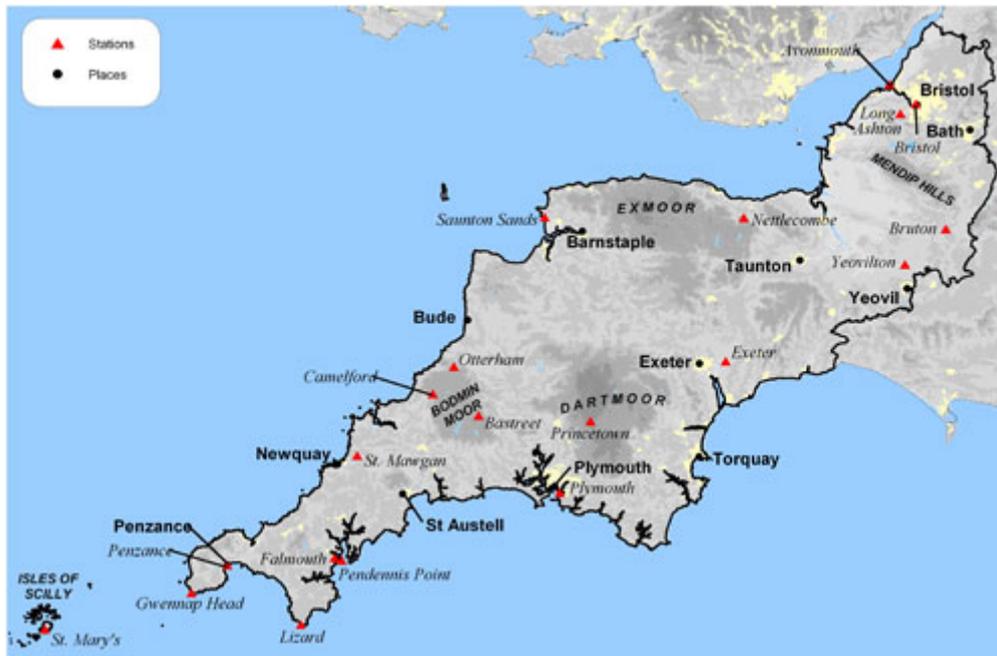
WIND ROSE FOR PLYMOUTH MOUNT BATTEN

N.G.R: 2492E 527N

ALTITUDE: 50 metres a.m.s.l.



Location map



Last updated: 11 October 2016

