



Weather Logistics UK: Summer weather forecast – Regional outlook

Valid from: 1st June until 31st August 2011

Issued: 20th May, 2011(update due by 1st July)

Supporting evidence from the Blocking & Jet-Stream Interaction Model

Blocking Index: 7.3/10.0 (upper third on scale)

- Significant preference toward positive phase of the North-Atlantic Oscillation: Prominent high in close proximity to the UK for substantial periods, whilst longer rainy periods are also likely. Some major blocking patterns close to the British Isles may give rise to heat wave conditions for prolonged periods.

General Overview:

During the summer 2011 season, temperatures are expected to be well above average for much of the United Kingdom and Republic of Ireland with an anomaly of $+1.0 \pm 0.6^{\circ}\text{C}$ ($+1.8^{\circ}\text{F}$). As a result the energy required for cooling a household or work-place are likely to be around 40% greater in the southern counties of England than the long term climate average. For the northern counties of England, Scotland and Northern Ireland heat wave conditions will be much more frequent than usual. The HeatCast predictions indicate 125 to 180% more cooling in these regions. As a result of raised summer temperatures and a blocking - type domination in the weather, the rainfall totals are likely to be around $+4 \pm 21\%$ above the norm (rainy days -3% below the norm). Thundery showers are more likely to exhibit an above usual frequency, since the close proximity of blocking patterns will at times bring a southerly continental air stream into parts of England and Wales.

The jet-stream climatology and current indications of the Atlantic airflow predict that heavy rainfall events from Atlantic weather systems are more likely in the south early in the season, migrating northward during the summer. During June and July the rain is more likely for England and Wales, whilst during August the wetter conditions are likely to reside over Scotland and Northern Ireland. The Republic of Ireland is likely to experience changeable weather for much of the summer period. Due to the dry weather experienced throughout the spring, the risk of drought is expected to be higher than 2010 and more widespread in nature.

In summary: A drier summer than average for many parts of the UK and the Republic of Ireland. Heat waves are likely to be intermixed with much cooler and damper weather associated with Atlantic air-streams. The high variability in blocking patterns indicate that the seasonal weather will be one of striking contrasts, occasionally hot and dry and unusually cool and wet at other times.

Monthly update: Since last month's seasonal forecast there have been some minor adjustments. The overall positioning of the blocking high in the model is expected to be variable – with periods of high influence

and other times of much lower influence. As such, the blocking index has been reduced from 8.4 to 7.3. When high pressure resides closer to the British Isles, there will be a high impact on the general weather type and incidences of heat wave during these periods will be high. In addition, the North Atlantic Oscillation (NOA) is now expected to be much stronger than previous modelling would suggest at +0.8 rather than +0.2 in the previous forecast, indicating that at times the UK and Ireland may be rather wet – particularly earlier in the summer. In general, the season is now expected to be wetter than May’s forecast, whilst drier than the long term climate. Much of the rainfall totals will consist of showery-type rainfall from localised thunderstorms rather than synoptic systems. The risk of heavy rainfall events leading to flash-flooding are now higher than May or April’s outlook, as the UK temperatures are now prediction to be around +0.2 to +0.3°C higher. The overall precipitation anomaly is $+4 \pm 21\%$, with higher totals in the north and west in close check with the long term average. With the current pattern, Scotland and Northern Island are around 5% more likely to receive above average rainfall than parts of southern England.

Regional map with codes referred to in text and graphs ...

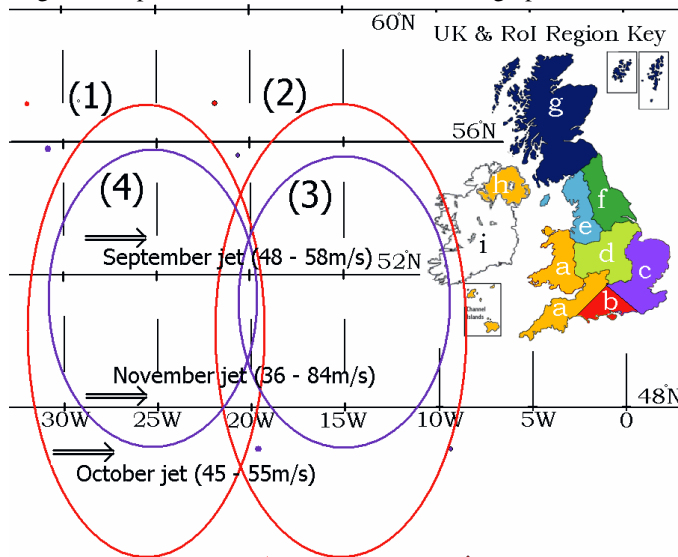


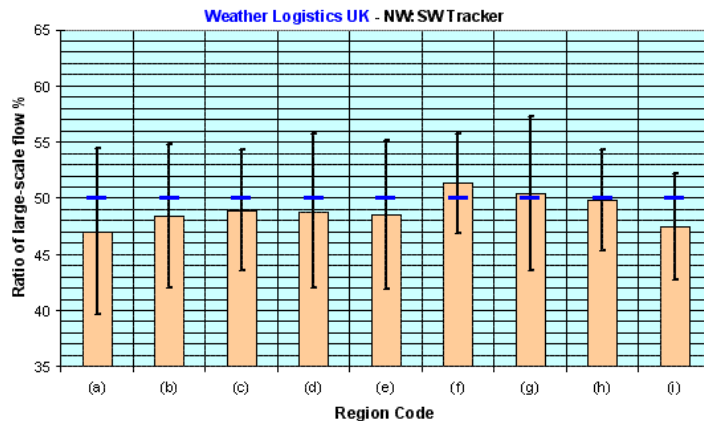
Figure showing the United Kingdom and Republic of Ireland with four different blocking patterns (labelled from (1) to (4) ordered from most to least influential based on the current seasonal weather outlook for summer 2011. The figure also indicates the climatology (from 2004 – 2009) of the jet stream latitude and average strength (intensity). This jet stream analysis was achieved by a examining the N-S gradients in upper air temperature around 5 km above the Earth’s surface. The analysis of the jet was undertaken at 15 to 25°W in the North Atlantic Ocean. The jet stream climatology and information on the position of “blocking” high pressure was fed into a computer model developed by Weather Logistics UK. Large circles indicate stronger blocking patterns than the small.

Summer prediction from the Weather Logistics UK in-house software:

(1) Jet-Stream Tracker (Percentage: NW to SW flow) UK Average 49% (43 – 55) – Fluctuating air streams around any blocking pattern residing within close proximity of the British Isles. A

continental south to south-easterly flow will bring warm and unstable air at times. At other times, a Polar or Arctic maritime air-flow will also bring much cooler than average conditions.

- (a) South-west England and Wales **47%** (40 - 54)
- (b) Central-southern England **48%** (42 - 55)
- (c) South-east England and East Anglia **49%** (44 - 54)
- (d) Midlands **49%** (42 - 56)
- (e) North-west England **48%** (42 - 55)
- (f) North-east England **51%** (47 - 56)
- (g) Scotland **50%** (44 - 57)
- (h) Northern-Ireland **50%** (45 - 54)
- (i) Republic of Ireland **48%** (43 - 52)

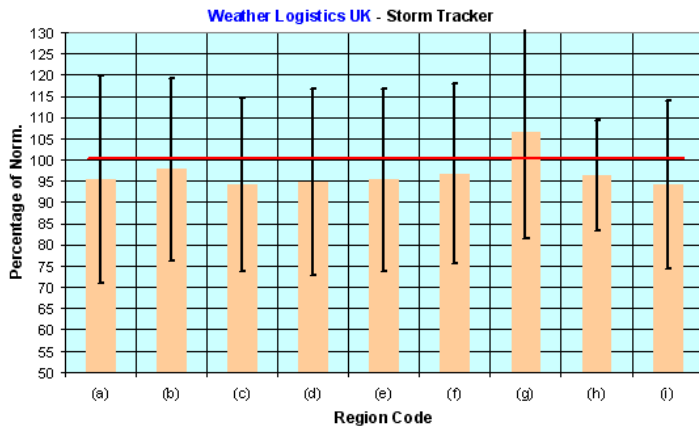


Bar chart showing the ratio of north-westerly to south-westerly flow trajectories (indicated by solid bars). The region codes correspond to those listed in the text above. The average flow is normalised to 50% when weighting each forecast outcome by its likelihood, as indicated by the horizontal grey markers. The range of likely flow ratios are indicated by the vertical black lines.

(2) Storm Tracker

UK Average Storm Anomaly ($97 \pm 21\%$) [100% is average] - Slightly below average storminess (likelihood of 55%) - below average synoptic rainfall events (transported by Atlantic systems) are expected in line with storm-tracker values. With significant blocking to the Atlantic lows, the general picture is one of irregular periods of rainfall with showery rainfall from thundery-type disturbances. These are more likely to give rise to sporadic and unpredictable flooding events on a local scale. Wetter weather than average is much more likely in Scotland.

- (a) South-west England and Wales (**$95 \pm 25\%$**)
- (b) Central-southern England (**$98 \pm 22\%$**)
- (c) South-east England and East Anglia (**$94 \pm 20\%$**)
- (d) Midlands (**$95 \pm 22\%$**)
- (e) North-west England (**$95 \pm 22\%$**)
- (f) North-east England (**$97 \pm 21\%$**)
- (g) Scotland (**$106 \pm 25\%$**)
- (h) Northern-Ireland (**$96 \pm 13\%$**)
- (i) Republic of Ireland (**$94 \pm 20\%$**)



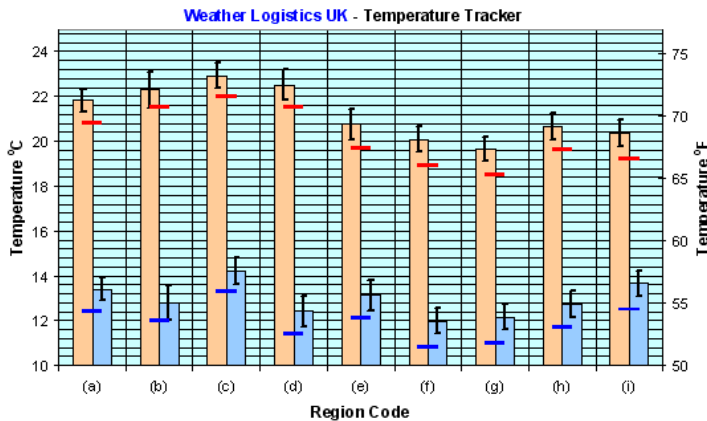
Bar chart showing the frequency of North Atlantic storms passing over regions of the UK and RoI (indicated by solid bars). The region codes correspond to those listed in the text above. The average storm-track frequency is normalised to 100% for each region when weighting each forecast outcome by its likelihood, as indicated by the horizontal baseline. The range of likely flow ratios are indicated by the vertical black lines.

(3) Temperature Tracker

UK Average Temperature Deviation from 1961-1990 Climate averages ($1.0 \pm 0.6^{\circ}\text{C}$) [$21.2^{\circ}\text{C} / 13.0^{\circ}\text{C}$] – Significantly above average temperatures (likelihood of > 95%). Temperature anomaly is likely to be evenly distributed over UK and Ireland, as a large scale Atlantic blocking system will dominate the weather conditions.

- (a) South-west England and Wales ($1.0 \pm 0.5^{\circ}\text{C}$) [$21.8^{\circ}\text{C} / 13.4^{\circ}\text{C}$]
- (b) Central-southern England ($0.8 \pm 0.8^{\circ}\text{C}$) [$22.3^{\circ}\text{C} / 12.8^{\circ}\text{C}$]
- (c) South-east England and East Anglia ($0.9 \pm 0.6^{\circ}\text{C}$) [$22.9^{\circ}\text{C} / 14.2^{\circ}\text{C}$]
- (d) Midlands ($1.0 \pm 0.7^{\circ}\text{C}$) [$22.5^{\circ}\text{C} / 12.4^{\circ}\text{C}$]
- (e) North-west England ($1.1 \pm 0.7^{\circ}\text{C}$) [$20.8^{\circ}\text{C} / 13.2^{\circ}\text{C}$]
- (f) North-east England ($1.2 \pm 0.6^{\circ}\text{C}$) [$20.1^{\circ}\text{C} / 12.0^{\circ}\text{C}$]
- (g) Scotland ($1.2 \pm 0.6^{\circ}\text{C}$) [$19.7^{\circ}\text{C} / 12.2^{\circ}\text{C}$]
- (h) Northern-Ireland ($1.1 \pm 0.6^{\circ}\text{C}$) [$20.7^{\circ}\text{C} / 12.8^{\circ}\text{C}$]
- (i) Republic of Ireland ($1.2 \pm 0.6^{\circ}\text{C}$) [$20.4^{\circ}\text{C} / 13.7^{\circ}\text{C}$]

*Note that [$T_{\text{max}}/T_{\text{min}}$] correspond to the predicted mean day and night temperatures in deg Celsius for the summer season (and are only for guide purposes)



Bar chart showing the temperatures in degrees Celsius for regions of the UK and RoI. The average maximum temperatures are indicated by

the upper solid bars, whilst the average minimums are indicated by lower solid bars. The region codes correspond to those listed in the text above. The average minimum and maximum temperatures are indicated for each region, by the lower and upper horizontal markers respectively. The likely range of temperatures is indicated by the vertical black lines.

(4) Cooling Degree Days (CDD) / Percentage Change from 1961-1990 average

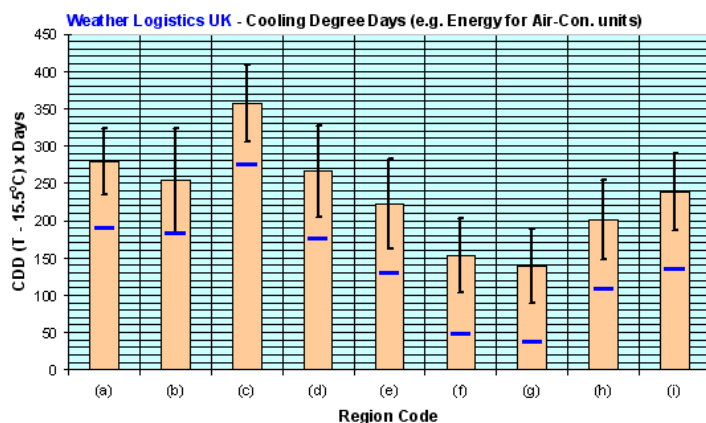
UK-wide average (179 - 289) +26% to +103% - Significantly above the long-term mean. It is very likely (more than 95%) that you will need more energy to cool your house or office to a comfortable room temperature than average. The British Isles average cooling degree range is 234 ± 19.

For the long-term climate averages for the 1961 – 1990 period, please view the Weather Logistics UK climatology for your local town or city. This can be found at: weatherlogistics.com/EXPECTEMPT/11.html

Cooling degree day (CDD) are quantitative indices designed to reflect the demand for energy needed to cool a home or business. For historical reasons CDD are often made available with base temperatures of 18°C (65°F), or 15.5°C (60°F). The calculations below use a base temperature of 15.5°C. Weather Logistics UK recommends that air-conditioning is only used where it is essential for personal or public health.

- (a) South-west England and Wales (236 - 324) +25% to +72%
- (b) Central-southern England (184 - 324) +1% to +77%
- (c) South-east England and East Anglia (305 - 409) +11% to +49%
- (d) Midlands (205 - 327) 17% to +86%
- (e) North-west England (162 - 283) +25% to +120%
- (f) North-east England (104 - 203) N/a*
- (g) Scotland (90 – 190) N/a*
- (h) Northern-Ireland (148 - 254) +38% to +137%
- (i) Republic of Ireland (179 - 289) +39% to +115%

*No significant cooling is usually required in these regions



Bar chart showing the Heating Degrees Day (HDD) for regions of the UK and RoI. The average HDD is indicated by solid bars, where **HDD = 15.5°C - (T_{max} + T_{min})/2.0 x total days**. The HDD is a total of all days in the three month seasonal period from June to August. The average HDD is indicated by horizontal markers for regions with the corresponding codes listed in the text above. The likely range of HDD is indicated by the vertical black lines.

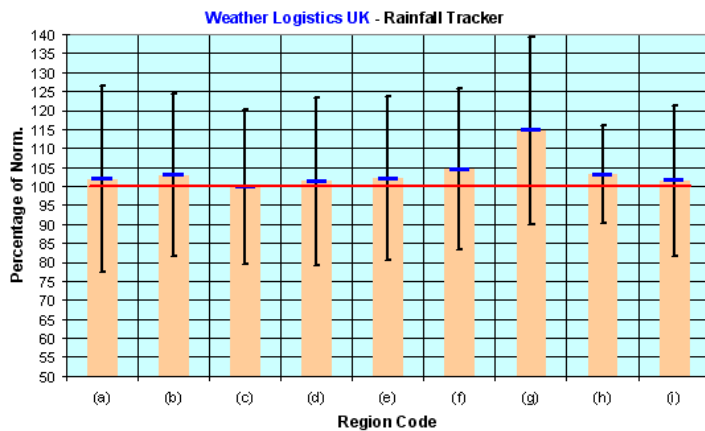
You can check the heating degree days for your local area at the Environmental Change Institute (ECI), Oxford University:
<http://www.eci.ox.ac.uk/research/energy/degreedays-weekly-monthly.php>

For more information on heating or cooling degree days and how to estimate your winter fuel bills, please see the WeatherMedia pages, which can be found at:
http://www.weatherlogistics.com/WeatherMedia/index.php?title=Heating_degree_days

(5) Rainfall Anomaly / Percentage Change from 1961-1990 averages

UK-wide average +104% ± 21% - Slightly above the long-term mean. It is likely (more than 58% - odds ~3:2) that seasonal rainfall totals will be above the long-term average. Please check the long-term averages if you would like to know the absolute rainfall totals for your region. Note that around 7% of the rainfall totals are due to above average temperatures expected, which act to amplify the signal reported by the model.

- (a) South-west England and Wales (**102 ± 25%**)
- (b) Central-southern England (**103 ± 22%**)
- (c) South-east England and East Anglia (**100 ± 20%**)
- (d) Midlands (**101 ± 22%**)
- (e) North-west England (**102 ± 22%**)
- (f) North-east England (**105 ± 21%**)
- (g) Scotland (**115 ± 25%**)
- (h) Northern-Ireland (**103 ± 13%**)
- (i) Republic of Ireland (**101 ± 20%**)

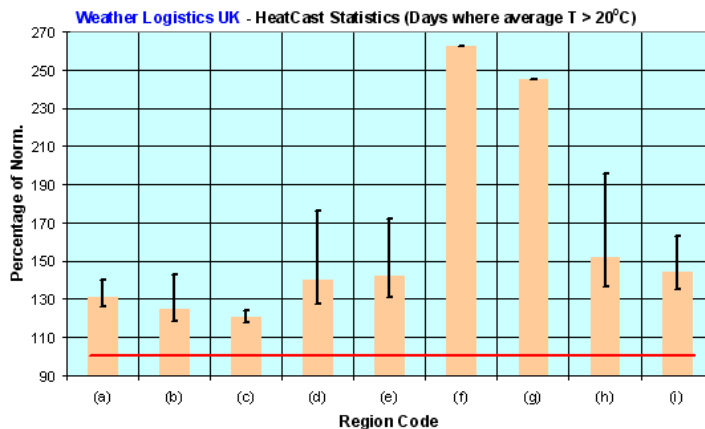


Bar chart showing the rainfall anomaly as a percentage of the climate average from 1961 – 1990 (indicated by the solid bars). The rainfall perturbation is estimated from Atlantic air-streams only, carried by storm systems rather than convective rain. The region codes correspond to those listed in the text above. The average precipitation is normalised to 100% for each region when weighting each forecast outcome by its likelihood, as indicated by the horizontal baseline. The range of likely flow ratios are indicated by the vertical black lines. The horizontal markers indicate the likely rainfall anomaly when considering only natural factors in the large-scale circulation, the solid bar indicates the overall affect attributed to both higher temperatures (high absolute humidity) and increased likelihood of heavier rainfall events.

(6) HeatCast Predictions / Percentage Change from 1961-1990 averages

UK-wide average +136% ± 16% - Significantly above the long-term mean. It is very likely (more than 95%) that the frequency of heat wave conditions will exceed the long-term average. Note that more than 90% of this increase is related to a long-term warming of the climate system incorporated into the model).

- (a) South-west England and Wales **126%** (**121% to 131%**)
- (b) Central-southern England **128%** (**121% to 147%**)
- (c) South-east England and East Anglia **118%** (**116% to 121%**)
- (d) Midlands **136%** (**125% to 165%**)
- (e) North-west England **136%** (**127% to 160%**)
- (f) North-east England **221%** (**n/a**)
- (g) Scotland **212%** (**n/a**)
- (h) Northern-Ireland **144%** (**131% to 179%**)
- (i) Republic of Ireland **133%** (**126% to 148%**)



Bar chart showing the probability of “heat-wave conditions” as a percentage of the climate average from 1961 – 1990 (indicated by the bars). The values indicate the likelihood of days where temperatures exceed 20°C. For example around 25% more heat-wave days are expected in southern England and Wales in comparison to the regional climate average. The region codes correspond to those listed in the text above. The average summer is normalised to 100% for each region when weighting each forecast outcome by its likelihood, as indicated by the horizontal baseline. The range of predictions are indicated by the vertical black lines. The solid bar indicates the percentage of heat-waves likely for each region.

Please note that any additional enquiries or assistance will be dealt with by email upon request. Monthly updates will be provided that may supersede the forecasts issued above. These may be issued as additional portable documents via email. Thank-you for your support in the future of long-range (seasonal) weather forecasts at Weather Logistics UK.

*Any comments and feedback on these forecasts would be much appreciated, so that we can make any future improvements. Please complete my online survey on seasonal weather forecasts.

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