

## THE WEATHER OF 2000

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### Introduction

2000 was yet another warm year, with the monthly mean maximum air temperature at the University Climate Station (Parkhead) being above average for eleven of the twelve months. The first three months were particularly warm, especially March which was 2°C warmer than average. With the warmth came plenty of rain, which was well above average in January and February. April was a cold and wet interlude, with some late snow, before the summer made an early start in May. Although the months May to July were drier than average, the overall picture was one of changeability, although there were some lengthy spells of very warm weather. August was very warm at times but thunderstorms, which are relatively rare in the Forth valley, made this a wet month. The remaining months, from September onwards, were generally warm and very wet until snow arrived late in December.

*(The rainfall and temperature values in the following refer to the University (Parkhead) or Bridge of Allan climate stations)*

### January Mild. Sunny at times

Over the first eleven days the predominantly westerly wind reached gale force at times and rain fell on every day. The wind was exceptionally strong in the far north of Scotland on the 3rd. The 4th, 5th and 7th were blustery days, with heavy rain and sleet falling in a stormy south-westerly wind. By the 13th the skies had cleared, heralding a spell of dry weather which lasted until the 27th. However, the absence of a cloud cover resulted in moderate night frosts. Visibility was excellent in the cold Polar air. By the 27th a westerly wind had reasserted its influence on the weather and the remaining days of the month were generally wet and, at times, very windy. The 48 hr rainfall total for the 30th and 31st was 34.4 mm.

### February Very mild but with frequent rain

The month started on a wet note with the Allan in flood following the late January rain. The unsettled weather, with occasionally strong winds and heavy rain, continued for almost the whole of the month and a daily rainfall of 1.0 mm or more was registered on 22 occasions. The wind remained strong south-westerly, almost without break, from the afternoon of the 6th through to the 11th. Sleet fell on the 8th, and by the 11th heavy snow was falling, which continued to fall throughout the 12th. The snow melted very quickly on the 14th in steady drizzle. Over the following four days there were occasional bright spells but snow or sleet fell again on the 15th and 17th. There were two bright and sunny days after the 19th, but more rain arrived from the west on

the 20th. Mild air arrived on the 21st and by the 23rd the daytime temperature had reached 11.3°C (10.9°C Bridge of Allan). The very changeable pattern persisted until the end of the month, with further snow on the 24th and 28th. Over the three days 26-28th, 32.1 mm of rain was registered. The 28th was an exceptionally stormy day with hail, sleet and snow accompanied by thunder and lightning.

### **March** Warm and dry

The weather remained changeable for the first three days and further snow fell on the 3rd. The 4th was bright after a moderate frost, but the following eight days were very mild in a fresh to strong south-westerly or westerly wind. Rain was recorded on most days but there were also some lengthy spells of bright and clear weather. The temperature reached 14.6°C on the 8th, and the daffodils in Bridge of Allan had been coaxed into bloom by the 12th. The wind went round to a colder direction and hail showers fell on the 14th, but the weather remained bright and sunny until the 21st when cloud returned. Rain fell on the 23rd and 24th which was heavy at times, but the following days were calm and dry with increasing amounts of bright sunshine. Low cloud returned on the 29th and the last three days of the month were mostly dull and damp with a few sunny spells.

### **April** Cold and wet

The month started in a cold north-easterly airflow. The maximum of 10.9°C on the 1st contrasted with only 4.6°C on the 2nd. Snow began to fall, which arrived in Scotland late on the 1st. Snow and sleet showers fell throughout the day on the 2nd and 3rd. The snow eventually cleared, and the 5th to the 8th were bright sunny spring days, although night temperatures fell sharply. The grass minimum temperature fell to -7.2°C in Bridge of Allan in the early hours of the 5th. Clouds returned on the 9th bringing an end to the frosts. The weather was unsettled between the 14th and 18th and hail fell in isolated showers. From the 19th the weather became warm with some longer spells of rain, and thunder was heard on the 24th. The 26th was an exceptionally wet and windy day. There was a remarkable east-west gradient of rainfall, with heavy falls and floods in Edinburgh but only 6.2 mm on Flanders Moss. Warm Tropical air arrived from the south on the 27th resulting in a sharp rise in temperature, which reached 20.9°C (21.7°C Bridge of Allan) on the 30th.

### **May** Warm and dry at the beginning, but becoming cool and unsettled

The first fourteen days were dry and occasionally very warm but there were intermittent dull spells of weather with low cloud in the early morning, which had usually been cleared by the sun before mid-day. The warmest days were the 9th and 14th, the latter reaching 23.4°C (25.8°C Bridge of Allan). A sharp change in the weather arrived on the 15th as rain began to fall in a freshening south-westerly wind. The drop in daytime temperature was dramatic, struggling to only 13.4°C on the 17th, 10°C cooler than three days earlier.

Unsettled weather continued for much of the remainder of the month but rainfall amounts were relatively small, and there were some lengthy sunny spells. The daytime temperatures, however, hovered around a cool 15°C.

**June** Rather changeable but becoming warm and dry mid-month

The unsettled weather pattern continued for much of the first two weeks with a conveyor-belt of cloud coming in from the west, but amounts of rain were mostly rather small. Although there were long sunny spells, some days were very dull and cold. The temperature had risen sharply by the morning of the 12th, reaching 20.4°C by the early afternoon despite a strong south-westerly wind and occasional rain. While much of northern Scotland remained cloudy and wet, the southern half shared with the rest of the British Isles in a spell of very warm weather between the 17th and 19th, the temperature reaching 27.3°C (28.8°C Bridge of Allan) on the 18th. Heavy rain fell on the morning of the 21st (10.8 mm Bridge of Allan) but the weather was cloudy, cooler and generally quite dry, from the 24th.

**July** Rather changeable again, but very dry

The first five days were warm and cloudy, but cooler Polar air arrived on 6th. The daytime temperatures were well below average, reaching only 15.2°C on the 9th, which was also an exceptionally wet day. There was torrential rain during the early afternoon of the 9th and the local rainfall totals were 28.9 mm (Parkhead) and 33.3 mm (Bridge of Allan). By St Swithin's Day (15th) the weather had become sunny, dry and warm. Accordingly, the following nine days were glorious high summer with the daytime temperature exceeding 20.0°C on almost every day. Although the temperature remained high, conditions became very muggy and at times unpleasantly humid from the 25th. Thunder was heard on the 28th and 29th and an otherwise mostly dry month finished with a very wet finale.

**August** Unsettled and rather wet

The 1st and 2nd were dull with rain but occasional sunny spells gradually began to develop. The cloud cover had cleared on the 6th in time for the Strathallan Games, which took place on a warm sunny day with a light westerly breeze. The settled weather began to break on the 8th and the 9th was a dull and very wet day with low cloud obscuring the hills after the warmest night of the year at 15.7°C. The weather remained unsettled with a mixture of rain and sun. Thunderstorms began late on the 18th, which continued intermittently until the 21st. These were associated with some exceptionally heavy precipitation which fell as hail on the 19th and 21st. The hailstones on the 19th were reported to be as large as 15 mm in diameter. The weather became more settled from the 21st and there was morning fog on the 23rd and 25th. The fog cleared quickly and days were sunny and very warm, reaching 24.5°C on the 25th. More rain arrived from the west late on the 25th, and the 26th was a dull and very wet day with a heavy thunderstorm in the evening.

The weather continued changeable and a little cool for the remainder of the month with a mixture of rain and lengthy sunny spells.

### **September** Warm and very wet

After a dull start, the weather freshened on the 2nd as a light northerly breeze set in. There were two calm and sunny days on the 3rd and 4th, although night temperatures fell to 5.2°C. Rain came in from the west late on the 4th and the weather became rather changeable in a fresh south-westerly wind. By the 9th the weather had become very dull, and heavy continuous rain fell on the 11th, resulting in flooding on the Allan. The 48 h rainfall on the 10th/11th amounted to 39.8 mm in Bridge of Allan. There was further rain on the 17th and 18th and the weather remained very unsettled until the end of the month, with lengthy spells of heavy continuous rain, most notably on the 21st, 26th and 27th.

### **October** Mild and rather wet

Unsettled weather prevailed for most of the month, which proved to be the wettest October in England and Wales since 1903. The first of many stormy spells arrived late on the 3rd (8.5 mm) which was also the last really warm day of the year (maximum 20.7°C). A bright day followed on the 5th in the wake of the storm, before more rain arrived on the 6th. Exceptionally heavy rain fell on the 9th (30.0 mm. 33.7 mm Bridge of Allan) and by the end of the day the Allan was in flood. There was a bright interlude on the 13th and the weather remained quite dry in a light south-westerly breeze on the 14th and 15th. This pattern of rain and wind followed by sunshine and showers arrived with almost mathematical regularity until the end of the month. On the 28th more heavy rain fell during the evening and overnight (28.7 mm Bridge of Allan) and by the 29th the Allan was in flood again.

### **November** Very variable. At times very cold and generally cloudy and wet

There was a spell of bright weather over the first four days during which the visibility was excellent. However, under clear skies night temperatures began to fall and the first air frost of the winter was recorded in Bridge of Allan on the morning of the 2nd, and at Parkhead by the 5th. The 6th was a very wet day in a strong north-easterly wind and registered a rainfall of 39.0 mm, the wettest day of the year (38.7 mm Bridge of Allan). There was further rain between the 10th and 13th. As the cloud cover cleared on the 13th, the air temperature fell below freezing and there were two crisp winter days before rain returned on the 15th. Although the weather chart had an unsettled look to it, conditions remained relatively dry between the 16th and 20th. Wet weather arrived from the south-west on the 21st and the remainder of the month was generally rather dull and damp with only occasional glimpses of the sun. The persistent cloud cover did, however, keep night frosts away.

**December** Wet again; becoming much colder

The weather patterns remained unchanged from November but the air was mild. The rainfall total for the first five days came to 29.1 mm (40.8 mm Bridge of Allan) and the water table was at the surface across the carse lands. After a brief dry interlude on the 6th, rain and strong winds returned on the 7th and a further 35.2 mm (44.7 mm Bridge of Allan) fell over six days. A cold northerly wind developed late on the 13th and by the morning of the 15th the air temperature had fallen to  $-2.2^{\circ}\text{C}$  ( $-4.1^{\circ}\text{C}$  Bridge of Allan) in the cold Arctic air. The daytime temperature reached only  $1.4^{\circ}\text{C}$  and  $1.3^{\circ}\text{C}$  in Bridge of Allan on the 16th and 17th. There was heavy rain on the 19th (18.8 mm) after which there were three very dull and damp days on the 20th, 21st and 22nd. From the 23rd the air temperature fell sharply in a cold easterly airflow and there were light snow showers on Christmas Day. Dense freezing fog formed during the 26th and the daytime temperature failed to rise above  $-0.5^{\circ}\text{C}$ . The fog persisted all day on the 27th and the temperature in Bridge of Allan reached only  $-4.0^{\circ}\text{C}$  by mid-day. Heavy snow began to fall during the evening of the 27th and by the morning of the 28th this had caused widespread disruption across the UK. The clouds cleared away by the 29th and the night minimum temperature fell to  $-8.7^{\circ}\text{C}$  in Bridge of Allan (ground minimum  $-11.1^{\circ}\text{C}$ ), freezing the remaining snow cover. Calm weather continued into the 30th but heavy snow began to fall during the afternoon of the 31st

**Noteworthy weather events in Scotland during 2000**

In terms of exceptional weather, Scotland escaped relatively lightly during 2000, with most of the drama happening south of the border in England and Wales

- January 3rd: severe gales hit Northern and Western Scotland. Thousands of homes were without power in Northern Scotland and all ferries to the Northern Isles were cancelled. Winds were exceptionally strong in the Western Isles and there were blizzards on Cairngorm.
- January 29/30th: gales with gusts exceeding 90 kts affected Northern Scotland again.
- April 26th: exceptionally heavy rain in Eastern Scotland resulted in flooding in parts of Edinburgh, and heavy falls also occurred around Stirling. However, only a little distance to the west, very little rain fell at Flanders Moss.
- June 12th/13th: a record-breaking low pressure (centre 966 mb) resulted in strong winds across Scotland. There were gusts in excess of 70 kts in western Scotland. Falling trees blocked roads and brought down power lines.
- Between the 18th and 21st August there were widespread thunderstorms which were accompanied by heavy rain and hail.
- September 11th: heavy rain in Scotland caused flash flooding and some road and rail closures.
- October 9th: deep depression over southern Scotland resulted in very heavy rain and some flooding.

- October 29th/30th: Heavy rain over much of Scotland which fell as snow in some areas.
- December 27th: Heavy snowfall which closed some airports. 20 cm of snow lying in Glasgow.

### **Bridge of Allan Flood Diary 2000**

The Allan overtopped its banks near Bridge of Allan on the following dates: 1st February, 27th February, 11th September, 9th October, 29th October.

### **Scottish Snowfall Changes Project**

Maps have been produced which estimate the number of days with snow lying which may be expected in the 2020s, 2050s and the 2080s. These have been based on climatic analogues. The final report on the research, which was commissioned by the Scottish Executive, was published in May 2001.

Changes in the number of days on which snow is lying on the ground during the winter months as a result of large scale change in climate has implications for both the economy and the environment of Scotland. The greatest effects will be felt in the winter tourism sector where opportunities for skiing and ice climbing are likely to be greatly reduced. There are further knock-on effects for related activities such as accommodation, catering, retailing and local employment. However, with some adaptation it is likely that Scotland can continue to offer opportunities to engage in these activities. The clearing of snow from the roads should become less of a problem, but the variable nature of the Scottish climate will always make it necessary to remain prepared for the occasionally heavy snowfall. Greater access to the land during the winter will mean that operations such as logging could continue but there will be a temptation for greater numbers of walkers to get into the hills. This may cause more trampling damage and could also disturb wildlife. Floods may become more frequent during the winter months but less frequent in spring, which will affect water-resource management, hydro-electric power generation and river habitats.

### **Reference**

Harrison S.J., Winterbottom S.J. and Johnson R.C. (2001) *Climate Change and Changing Snowfall Patterns in Scotland* Scottish Executive Environment Group Research Findings No.14. Edinburgh. The Stationery Office.

*This report is based on the Annual Climatological Bulletin of the University of Stirling, copies of which may be obtained from the author, S.J. Harrison, at the Department of Environmental Science, University of Stirling, Stirling FK9 4LA.*