

The climate of Iceland, 1701—1784

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ABSTRACT

In this paper, variations in temperature in Iceland during the years 1701 to 1784 are discussed. For the period 1601 to 1780, a decadal winter-spring thermal index for the whole of Iceland, and also for the north, south and west has been constructed. A sea-ice index for these years is also presented. Discussion is centred on the eighteenth century; however, because of current interest in the Skaftáreldar (Laki) eruption of 1783, the weather during the years 1781 to 1784 is also considered in detail. The data used are taken from descriptions of the weather in contemporary historical documents, primarily annals and official letters. As continuous meteorological observations were not begun in Iceland until 1846, the information gathered is of great value, despite its qualitative nature. When data from the whole of Iceland are taken into account, the mildest decade of the period can be seen to be 1701 to 1710. The coldest decades are the 1740s and 1750s. Apart from this, the most noticeable features of the climate of Iceland during this time are its variability, both spatially and temporally (as during the present day), and its severity. With the exception of 1781, the years immediately before and after Skaftáreldar were also very cold.

INTRODUCTION

Continuous, systematic weather observations exist in Iceland from 1846 onwards (*Sigfúsdóttir*, 1969). Before this time, the climate of the historical past may be reconstructed by using documentary evidence: written accounts of what the weather was like at a particular place and time. A reconstruction of the climate of Iceland based on such evidence, and covering the period from medieval times to 1780, has recently been completed (*Ogilvie*, 1981, 1984). In addition to all previously used sources, this reconstruction also included material that had not been used by the pioneers of Icelandic historical climatology, *Thoroddsen* (1916/17), *Koch* (1945) and *Bergþórsson* (1969). All sources were carefully analysed for historical veracity,

and unreliable material that had crept into earlier works was eliminated.

Much of the new material presented in *Ogilvie* (1981) covers the eighteenth century; and it is this period, specifically 1701 to 1784, which is considered here. Because of the extremely cold weather which prevailed in Iceland (and in the rest of Europe) at this time, it is a particularly interesting period from a climatological viewpoint. It should, however, be noted that, although the eighteenth century as a whole may be considered typical of the so-called Little Ice Age, mild seasons and years did occur.

In the first part of this paper, decadal temperature and sea-ice variations from 1701 to 1780 are discussed. (Analysis of data for the period 1781 to 1800 is currently in progress.) In the second part, particular attention is paid to the years 1781 to 1784. In 1783, a major volcanic eruption occurred in Vestur-Skaftáreldar in the southeast of Iceland — Skaftáreldar. In the non-Icelandic literature, this eruption has generally been referred to as the “Laki” eruption. This is inappropriate, however, as, although the eruption occurred in the vicinity of Mount Laki, there were no fissures on Laki itself. The lava flows and, especially, the poisonous substances in the volcanic dust adversely affected vegetation, and thereby caused the deaths of numerous domestic animals. In the ensuing famine, which came to be known as “Móðuharðindin” or “The Famine of the Mist” from the volcanic dust haze, more than 9,000 people died (*Finnsson*, 1970). Because of current interest in the 200th anniversary of Skaftáreldar (see *Gunnlaugsson et al.*, 1984), it was decided to include a detailed discussion of the weather during the eruption year, plus the years immediately before and after it. A summary of conditions during these years is given in Table 3.

SOURCES

The data sources used for this study are contemporary historical documents. For the most part, these can only supply qualitative information, and therein lies

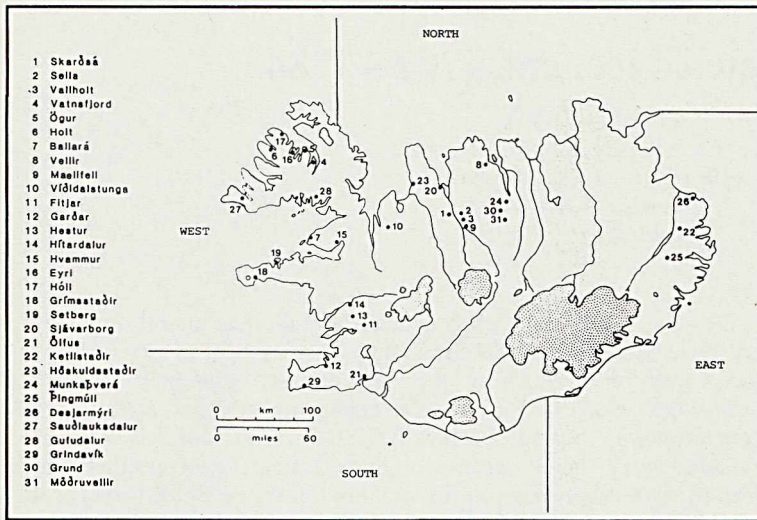


Fig. 1. Geographical divisions used in the analyses presented here. Also shown are the places of origin of the later Icelandic annals, plus Grund and Möðruvellir where Jón Jónsson lived. — *I. mynd. Staðarnöfn í greininni.*

their limitation. Nevertheless, given that other means of estimating climate variability in Iceland are not available for the time period covered, they are invaluable. Furthermore, because eighteenth-century documents containing climate information are copious, the disadvantages resulting from subjectivity on the part of the observer, and also on the part of the researcher in interpreting the data, are offset by the fact that, for any one weather event, there are usually a number of independent descriptions.

Major sources used include travellers' accounts, various government documents, early newspapers, weather diaries and private and official correspondence. By far the most important data sources, however, are the eighteenth-century annals (*Annálar 1400–1800*) and the unpublished reports sent annually to the Governor of Iceland (*Bréf til Stiftamanns*: abbreviated below to B.S.) by the *sýslumenn* or sheriffs in all the different districts of Iceland.

The main sources used for the different regions are as follows: annals (in *Annálar 1400–1800*) from the north include *Mælifellsannáll*, *Vallaannáll*, *Annáll Páls Vídalins*, *Höskuldsstaðaannáll*, *Íslands Árbók* and *Espihólsannáll*. Sheriff's letters are from the northern districts of Þingeyjarsýsla, Húnavatnssýsla and Skagafjarðarsýsla. Another important source for the north of Iceland is the weather diary which was written by the Reverend Jón Jónsson between 1747 and 1794 (*Bergþórsson*, 1957; *Kington and Kristjánsdóttir*, 1978). Jón lived at various sites in Eyjafjörð district: from 1747 to 1758 at Möðruvellir in Hörgár-

dal and from 1759 to 1769 at Guðrúnarstaðir. From there, Jón moved to Grund, and then to Núpufell in 1785, where he lived until his death. Sources from the west of Iceland are: *Fitjaannáll*, the continuation of *Fitjaannáll*, *Hestsannáll*, *Hvammssannáll*, *Hítardalsannáll*, the continuation of *Hítardalsannáll* and *Grímsstaðaannáll*. Letters from the west are from Snæfellsnessýsla, Dalasýsla, and from the northwest from Ísafjarðarsýsla and Barðastrandarsýsla. There is only one eighteenth-century annal written in the south, *Ölfusvatnsannáll*, but there are two good series of sheriffs' letters, from Árnessýsla and Rangárvallasýsla. Eastern sources are *Þingmúlaannáll* and letters from Múlasýsla. A few letters from the southeast, from Austur-Skaftafellssýsla, have also been included in the analysis. For the years 1781 to 1784 the major sources used are the letters from the sheriffs and from the Governor of Iceland sent to the Danish exchequer (*Rentukammer*) and Jón Jónsson's weather diary. Because of the quantity of data in these sources, the annals are used very little for this time. The sites where the annals were written, plus two of the sites where Jón Jónsson lived, are shown in Figure 1.

METHOD

The first step in any climate reconstruction based on documentary evidence is to ensure, by careful evaluation of this evidence, that only reliable and accurate material is included. This will most frequently come from documents which have been written close in time and space to the events de-

scribed. Lack of space prevents further discussion of this issue here; suffice it to say that every effort has been made to ensure that only reliable information has been included in the analyses presented. For discussion explaining the need for source analysis, and detailing some of the techniques employed, see *Vilmundarson* (1969), *Bell and Ogilvie* (1978), *Ogilvie* (1981) and *Ingram et al.*, (1981).

After ensuring that the sources to be used were reliable, data on the individual years and seasons were extracted, compared and evaluated. In order to quantify the data, information was then summarized, with seasons categorized as "mild", "severe", "cold", "average" etc. (see Tables 1 and 2). The terms used were, as far as possible, those of the original observers. The seasons were divided into: winter (mid October of one year to mid April of the next); spring (mid April to early June); summer (June to August); and autumn (September to mid October). These seasonal divisions correspond most closely to the real seasons in Iceland, and also reflect the perception of contemporary observers who divided the year into two main seasons: summer (c. mid April to c. mid October), and winter (the rest of the year). Winters are dated according to the January, and all dates are New Style.

In order to compare regional differences in climatic variability, the data were grouped into four main areas: north, south, east, west. While it could be argued that certain regions, the Western Fjords, for example, have distinct weather patterns which should be analysed separately, it was felt that the geographical divisions used here (see Figure 1) give an adequate picture of regional variations in climate at a time when data are limited.

By summarizing the data they were greatly simplified, and interesting detail was lost, but it is always possible to refer back to the original sources if necessary. The great advantage of summarizing the data was that it was then possible to quantify them further and present them in tables and figures. By adding up the number of cold, mild and average seasons in a decade, it is possible to get an idea of which decades and years were colder, and which milder, during the period 1701 to 1784. The two coldest decades during these years are the 1740s and 1750s. The main characteristics of these seasons are shown in Tables 1 and 2.

The data were then quantified further by constructing winter-spring thermal indices for the whole of Iceland, and also for the north, south and west of Iceland, based on the summarized data described above. (Insufficient data made it impossible to do this for the

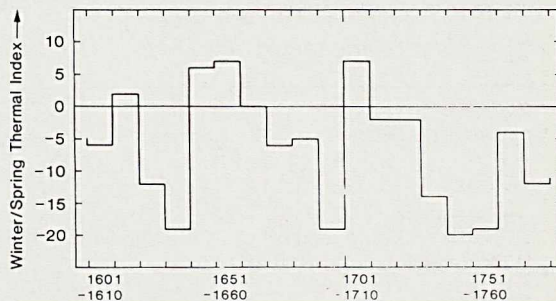


Fig. 2. Decadal winter/spring thermal index for Iceland 1601 to 1780. From Ogilvie (1981); see also Ogilvie (1984). — 2. mynd. Mælikvarði á hitastigveturs og vors á Íslandi frá 1601 til 1780.

east.) These indices (see Figures 2 and 3) are the number of mild seasons per decade minus the number of cold seasons (each weighted by the number of regions reporting mildness or severity), divided by the sum of these two weighted numbers. As stated, these indices only cover the winter and spring seasons. Fewer data were available for the summers and autumns and the indices were, therefore, not drawn up for these seasons.

As the indices are based only on qualitative information, they cannot be regarded as giving the same degree of accuracy as would be expected from quantitative observations, but, as these are lacking, the figures give a reasonable idea of variations in climate in Iceland as seen by contemporary observers.

A decadal sea-ice index was also constructed (Figure 4). This represents the number of seasons (winter, spring and summer) with sea ice present off the coast of Iceland per decade. As the ice only rarely appears in autumn, this season was not included in the index. Each number is weighted by the number of regions (north, south, east, west) which report ice. By comparing Figures 2 and 4, it may be seen that the relationship between sea-ice incidence and temperature is relatively strong. The correlation coefficient between the ice and temperature data is -0.57 (18 decades). This is similar to the annual correlation coefficients given by *Bergþórsson* (1969) of -0.68 for 1845 to 1919, and -0.39 for 1920 to 1969. Figures 2 to 4 cover the years 1601 to 1780.

THE CLIMATE OF ICELAND 1701 TO 1780

The most striking aspect of Figures 2 and 3 is the dominance of cold decades over mild ones. Although

TABLE 1. Seasonal summary 1741–1750
 Tafla 1. Megineinkenni árstíða 1741–1750

| Year | District | Winter | Spring | Summer | Autumn | Sea ice | | | |
|------|--------------|-------------------|------------------|------------------|-------------------------|---------|----|----|---|
| | | | | | | W | SP | SM | A |
| 1741 | North | Quite good | Cold May | Some cold & rain | | | X | | |
| | South | | | Dry | | | | | |
| | East West | Harsh from Feb | | Very dry | | | | X | |
| 1742 | North | Quite harsh | | | | X | X | X | |
| | South | Very severe | | | | | | | |
| | East West | Severe, icy | Wet, cold, windy | Wet | Wet | | | | |
| 1743 | North | Reasonable | | | | | X | X | |
| | South | | | Wet | | | | | |
| | East West | Very severe | Severe, dry | Fairly good | Very wet, stormy | | | | |
| 1744 | North | Good then harder | Often cold | Quite good | Frosty | | | | |
| | South | Good, wet | | | | | | | |
| | East West | Good then severe | Cold, frosty | Cold then dry | Dry then cold | | | | |
| 1745 | North | Good then severe | Very severe | | | X | X | X | |
| | South | Severe frost | Very cold | Wet | | | X | | |
| | East West | Very severe | Very severe | Very cold | Ice in ground Stormy | X | X | | |
| 1746 | North | Good on whole | | Average | | | | | |
| | South | Average-good | Cold & windy | Good | Good | | | | |
| | East West | Mainly severe | Cold & frosty | Cold & dry | Rain, storms | | | | |
| 1747 | North | Quite severe | Cold | Stormy | Good | | | | |
| | South | Good | Wet & cold | Wet | Wet | | | | |
| | East West | Severe, frosty | Variable | Dry then wet | Very wet | | | | |
| 1748 | North | Good & mild | Severe | Wet, cold | Changeable | | X | | |
| | South | Mainly good | Average to cold | Very wet | Wet then snows | | | | |
| | East West | Very good | Cold & stormy | Very wet | Very wet | | | | |
| 1749 | North | Harsh then better | Good | Mild & dry | Variable | X | | | |
| | South | Mild | Cold, wet, windy | Very good | Stormy & wet | | | | |
| | East West | Harsh then better | Tolerable | June dry | | | | | |
| 1750 | North | Good then severe | Cold | Cold, dry | Reasonable | X | X | X | |
| | South | Mild then severe | Cold & windy | Good | Wet, windy | | | | |
| | East West | Good at Xmas | | Very dry | | X | X | X | X |

TABLE 1. Seasonal summary 1741–1750. This table shows the main characteristics of the seasons in the north, south, east and west of Iceland during 1741 to 1760. The terminology used is that of the contemporary observers. In the sea ice column an 'X' denotes the presence of ice in the winter (W), spring (SP), summer (SM) or autumn (A). For the sea ice column only, "west" should be taken as meaning "northwest" as sea ice rarely penetrates south of Látrabjarg in the western fjords. The figures below give totals of mild, cold and other seasons for this decade. The total number of possible seasonal description as 160. Of these, the total number of cold winters and springs is 26. There were 9 mild winters and springs, and 10 were partly cold and partly mild. There were 5 other types of descriptions ("average", "tolerable" etc), and for 30 seasons there were no data (mainly in the east). The total number of cold summers and autumns was 4. There were 7 mild summers and autumns. 14 of these seasons were characterised as wet, and 3 as dry. 2 cold and wet summers and autumns occurred, and 2 cold and dry ones. 1 such season was mild and dry, 7 were variable, 4 had other types of descriptions, and for 36 seasons there were no data.

no attempt has, as yet, been made to calibrate the data used here with modern data, there can be little doubt from contemporary descriptions that the climate of eighteenth-century Iceland was far colder than that of the present century, for example. From Figure 3 it may be seen that there is a broad agreement between longterm cooling and warming trends in all regions. Nevertheless, Figure 3 also shows considerable regional variability, indicating that the greatest frequency of severe seasons was experienced by the north, and the least by the south. Another noticeable feature of Figures 2 and 3 is the variability of the climate from one decade to the next. Annual and regional variability is also considerable, as may be seen from Tables 1 and 2. In the section which follows, the individual decades are discussed in more detail.

1701–1710

In the winter-spring thermal index for the whole of Iceland (Figure 2) and the regional index for the west of Iceland (Figure 3), the decade 1701 to 1710 shows up as the mildest in the period 1700 to 1780. It is also one of the two mildest in the south and north (Figure

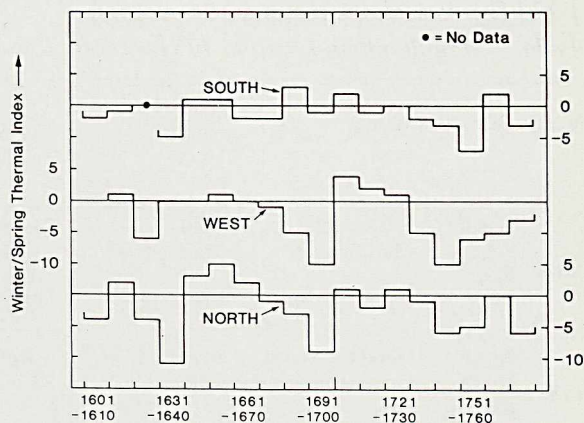


Fig. 3. Regional thermal indices for Iceland. From Ogilvie (1981); see also Ogilvie (1984). — 3. mynd. *Malikvarði á hitastig veturs og vors á Suður-, Vestur- og Norðurlandi.*

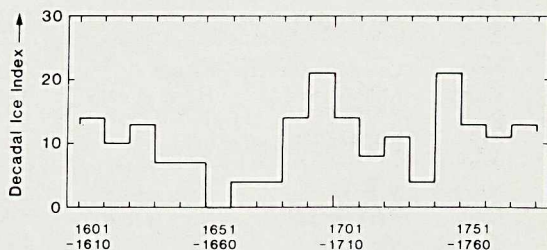


Fig. 4. Decadal sea-ice index for Iceland. From Ogilvie (1981); see also Ogilvie (1984). — 4. mynd. *Fjöldi árstíða á áratug, þegar hafís lá við strendur Íslands.*

3). Although some individual winters and springs are recorded as severe for this decade, many seasons were mild or favourable, more so than in any other decade. There was also a high proportion of dry and mild summers. Autumns were also quite frequently characterized as good.

Sea ice was present in 1701, 1703, 1705, 1706 and 1708. In 1701, it came to the north during the "Moving Days" (beginning of June) and "lay for a long time after" (*Fitjaannáll*). The ice is also mentioned by *Eyrarannáll*, which says that whales were killed "in the ice around the country". In 1703, *Vallaannáll*

TABLE 2. Seasonal summary 1751—1760
Tafla 2. Megineinkenni árstíða 1751—1760

| Year | District | Winter | Spring | Summer | Autumn | Sea ice | | | |
|------|----------|------------------|----------------|---------------------|-------------------|---------|----|----|---|
| | | | | | | W | SP | SM | A |
| 1751 | North | Reasonable | Cold | Good on whole | Variable | X | X | | |
| | South | Mainly mild | Mainly good | Good & dry | | | | | |
| | East | | | Wet | | | | | |
| | West | Mainly severe | Very cold | Dry | Quite good | | | | |
| 1752 | North | Good then hard | Severe | Wet, cold | Fairly mild | | | | |
| | South | Good then severe | Cold | Cold & wet | Quite good | | | | |
| | East | | | | | | | | |
| | West | Good then severe | Severe | Mainly wet | Snows | | | | |
| 1753 | North | Quite good, calm | Sometimes cold | Mainly good | Rain, snow, sleet | | | | |
| | South | Fairly hard | Often windy | Good then wet | | | | | |
| | East | | | | | | | | |
| | West | Quite hard | | Wet | Very severe | | | | |
| 1754 | North | Extremely severe | Cold & dry | Cold | Wet & stormy | | | | |
| | South | Very severe | Hard & cold | Very cold | Wet & windy | | | | |
| | East | | | | | | | | |
| | West | Very severe | | Continual rain | | | | | |
| 1755 | North | Good then severe | Severe | Very wet | Wet then good | | | | |
| | South | Mainly mild | Harsh & cold | Good | Cold, frost, snow | | | | |
| | East | | | | | | | | |
| | West | Good then harsh | Severe | | | | | | |
| 1756 | North | Very severe | Very severe | Very cold | Cloudy, wet, cold | | X | X | |
| | South | Very severe | Very severe | Cold, dry then wet | Wet | | | X | |
| | East | Very severe | | | | | | X | |
| | West | Very severe | | Severe & wet | | | | | |
| 1757 | North | Severe | Severe | Good then wet, cold | Quite good | | X | X | |
| | South | Severe | Harsh | Cold & wet | Mainly wet | | | | |
| | East | | | | | | | | |
| | West | Severe | | | | | | | |
| 1758 | North | Mild then hard | Good & calm | Variable | Quite good | | | | |
| | South | Mainly good | Mild, wet | Very good | Good but wet | | | | |
| | East | | | | | | | | |
| | West | Mainly good | Very good | Mainly good, dry | Reasonable | | | | |
| 1759 | North | Mild then hard | Severe | Very cold | Tolerable | | X | X | |
| | South | Mainly good | Cold-variable | Good | Wet | | | X | |
| | East | | | | | | | | |
| | West | Cold & dry | | | Reasonable | | | | |
| 1760 | North | Mainly good | Mainly good | Good, dry | Often severe | | X | | |
| | South | Mild | Good | Good | Good | | | | |
| | East | | | | | | | | |
| | West | Mainly good | | Dry then wet | | | | | |

TABLE 2. Seasonal summary 1751–1760. (Construction as for Table 1.) Total number of possible seasonal descriptions: 160; total number of cold winters and springs: 30; mild winters and springs: 15; partly mild, partly cold winters and springs: 7; others: 3; no data: 25. Total number of cold summers and autumns: 8; mild summers and autumns: 13; wet summers and autumns: 10; dry summers and autumns: 1; cold and wet summers and autumns: 6; cold and dry summers and autumns: —; mild and dry summers and autumns: 3; mild and wet summers and autumns: 1; variable summers and autumns: 7; others: 2; no data: 29.

records: “Drift ice off the eastern and western fjords but no ice in the north.” This is unusual. 1705 was a severe ice year, with ice reaching the south coast. This was also a cold and wet summer. In 1706, sea ice came to the north “at the time of the beginning of summer” (22 April) “but it was not land-fast for long and it did not stay far into the summer” (*Vallaannáll*). There was also sea ice in the east according to *Fitjaannáll*. In 1708, the ice was first seen in the north around 8 February. It continued to drift in and out for some time although it was never land-fast. On 5 May, the ice did come right into the coast “everywhere in the north” (*Vallaannáll*).

1711–1720

The next decade, 1711 to 1720, was slightly colder than the previous one, but was relatively mild compared to other decades (see Figure 2). There were no exceptionally severe winters, although 1718 and 1720

TABLE 3. A Summary of the Seasons 1781–1784
Tafla 3. Megineinkenni árstíða 1781–1784

| Year | District | Winter | Spring | Summer | Autumn | Sea ice duration |
|-------|----------|---------------|------------|--------------|-------------|-------------------------|
| 1781 | North | Mild | Variable | Good | Variable | April to early June |
| | South | Mild | Reasonable | Mild | | |
| | East | Mild | Reasonable | Good | Variable | |
| | West | Mild | Reasonable | Good | Wet | |
| 1782 | North | Severe at end | Severe | Cold and dry | Very cold | Mid March — late August |
| | South | Severe | Severe | Cold and dry | cold | May — June — August |
| | East | Severe | Very cold | Very cold | Very cold | Early Feb. — Sep. |
| | West | Severe | Very cold | Very cold | Mainly cold | End March — late August |
| 1783* | North | Severe | Variable | Variable | Cold | 9 March — August |
| | South | Reasonable | Mild | Cold | Cold | |
| | East | Severe | Cold | Cold | Cold | May — end August |
| | West | Cold | Reasonable | Cold | Cold | June — August |
| 1784 | North | Severe | Very cold | Cold | Reasonable | January — July |
| | South | Severe | Very cold | Cold | Reasonable | |
| | East | Severe | Very cold | Reasonable | Reasonable | March — June |
| | West | Severe | Very cold | Cold | Reasonable | January — June |

TABLE 3. This table shows the main characteristics of the seasons during 1781 to 1784. The terminology used is that of the contemporary observers. The duration of sea ice off the coasts is also given (New Style dates). For the sea ice column only “west” should be taken as meaning “northwest”. In 1782, sea ice is said to have returned to the southern coast (*Rangárvallasýsla*) on 14 August, but it is not stated how long it remained. It was, however, lying just off the Westman Islands in late August (see the discussion of 1782 in the text).

were mainly hard, especially 1720. However, there were several very cold springs: 1712 (in the north, east and west); 1713 (in the north); 1714 (in the north, south and west); 1715 (in the north, east and west); 1717 (in the north, south and west); 1718 (in the north and east but "good" in the west) and 1720 (in the north and east). The summers this decade appear to have been very variable regionally. For example, 1711 was good in some regions, such as the north, but cold and snowy in the east. 1714 started out warm and wet in the north, and then became dry and favourable. In the east it was cold, and elsewhere it was wet. 1713, 1718 and 1719 were generally good summers. The autumns were changeable with few extreme seasons, except for 1712 which, although "excellent" in the north (*Mælifellsannáll*) was "unusually wet and sleety" in the east (*Pingmúlaannáll*). Autumn 1718 was generally good like the summer, but there was a violent storm at the end of October which caused shipwrecks in the west (*Fitjaannáll* continuation) and the author of *Vallaannáll* remarked on the widespread damage done to hay and buildings as well as the roof of the church at Vellir which was attached to the farm where he lived in Svarfaðardalur.

Sea ice was recorded in 1711, 1714, 1717 and 1718 but only one of these years, 1714, was a severe ice year. In 1711, the only source to mention the ice is *Fitjaannáll*, which states: "Sea ice off the northern coast, seals caught on it." As *Fitjaannáll* was written in the west, and northern sources, such as *Vallaannáll* and *Mælifellsannáll*, do not mention the ice, it is likely that this is an error.

1721—1730

The comparatively mild weather of the 1710s continued into the 1720s and, as can be seen from Figure 2, the winter and spring seasons were similar in both decades. The data suggest that summer conditions were also similar. The regional variation is interesting, however. There were four severe winters in the north: 1722, 1724, 1728 and 1730. 1723 was mainly cold. In the west, 1722, 1724 and 1728 were recorded as severe. In the east, 1721, 1722, 1724, 1725 and 1728 were all severe. 1729 was severe to begin with. In the south, only 1722 was recorded as severe (but this may be partly due to lack of data for the south for this period). The worst winters (in all districts) occurred in 1722, 1724 and 1728. 1722 was a severe spring in all districts except in the south. 1724 was good in most places, 1725 and 1728 were severe in most places, and 1729 was cold everywhere except in the south. During these severe winters and springs, sea

ice was only present during 1728 and 1729. In 1728, *Sjávarborgarannáll* records that: "Sea ice was first seen on 3 April but came in earnest on 24 April. Much sea fog. Ice lay all around the northern coast until 20 July." The ice came again in 1729, or never moved far away. There was also ice off the northwestern coasts during these years. Sea ice was recorded in only one other year this decade, 1726, (in the north and northwest) when a good winter and spring occurred.

There were several good summers this decade, especially in the early part. In 1722, 1723, 1724, 1725, 1726 and 1729, good summers were recorded in at least two districts out of four. In 1721, the summer was good in the east, in 1727 in the north, and in 1728 in the west. The summer of 1730 was the only summer that was very wet in most areas and it was also cold: "continual rain and bad weather during the greater part of the summer" (*B.S. Þingeyjarsýsla*). In the east, it was "very cold with snow and sleet" (*B.S. Múlasýsla*). Sheriff Markús Bergþórsson, writing from Ögur in Ísafjörður, said it was: "Hard with continual rain and snow" (*B.S. Ísafjarðarsýsla*). Autumns during 1721 to 1730 were on the whole unremarkable. There was an eruption of Katla in 1721 and of Krafla in 1724. There was also an earthquake in Árnes district in 1724. In 1725, there was an eruption near Hekla and in 1728 in Mývatn. In 1727, a jökulhlaup (glacier burst) occurred in Örefajökull to the east of Síða.

1731—1740

Over the whole of Iceland, the winter-spring seasons during 1731 to 1740 appear to have been far colder than during the previous two decades (see Figure 2). There was also some regional variability, however, (see Figure 3). The 1730s appear to have been colder in the west than they were in the north and south but, in the north, these years were slightly milder than the 1710s. Winters that were mainly severe in all regions were: 1737, 1738 and 1739 (although both 1738 and 1739 started off as good in the east). 1734 was severe everywhere except for the east, and 1735 was harsh in the north and west. Mild winters were: 1731, 1733, 1736 (although the latter part of this winter was severe in the east) and 1740. 1732 was good everywhere except for the east. Severe springs were: 1731, 1734, 1735 and 1737. In 1732, there was a severe spring in the east. Unfortunately, there are no data for the north and south for this year, and western sources give different accounts. *Hvammssannáll*, written in Dalasýsla, records a harsh spring, while *Hitardalsannáll*, from Mýrasýsla, says it was good and dry. Only 1733 was an unqualified good spring in all districts, and

most of this year was very good. There were four summers that were good in most places: 1731, 1733 (see below), 1736 and 1739, and three cold ones: 1737, 1738 and 1740. 1732 was cold in the north but pleasant in the west. Several autumn seasons were characterized as "good", otherwise they were mostly wet.

Sea ice occurred in only two years of this decade: in 1732 and 1733. In the first year, a northern source states: "Drift ice came in the spring and lay close into land until the end of August when it was seen last" (*B.S. Skagafjarðarsýsla*). Western sources do not mention the ice. In 1733 also, the ice is only mentioned in the north: "Cold near the sea because of drift ice which lay off the coast all summer" (*B.S. Skagafjarðarsýsla*). In spite of the presence of the ice, the summer of 1733 is mainly described as good by the sources, or at least, "good at the beginning" (*B.S. Skagafjarðarsýsla*). No sea ice is recorded during the most severe years of the decade, 1737 and 1738. These were severe for most of the time in all districts. In 1737, *Ölfusvatnsannáll*, written in the south, suggested that this was the worst winter since the "white winter" of 1632 to 1633.

1741—1750

The most obvious features of the 1740s were the cold weather and severe sea ice (see Figures 2 and 4). During 1741 to 1750, there were seven years when sea ice was present (1741, 1742, 1743, 1745, 1748, 1749, 1750). The most severe ice-year was 1745, when ice came early to the north and west and also reached the eastern and southern coasts. There were three winters which appear to have been severe in all regions: 1742, 1745 and 1750. As may be seen from Table 1, nine winters during this decade were severe in at least one region for part of the winter. The only winter that was reported good in all available sources was 1748. Most of the springs during this decade were severe. The summers were frequently unfavourable, either dry or wet. In no year is a good summer reported in all regions (see Table 1). The autumns were often wet and stormy.

1745 stands out in this decade as having been an unusually severe year all over the country. The distinctive feature of the winter seems to have been the intensity of the frost and the lack of snow. In the south there was: "No snow until 21 March but great frost. Frost in the ground was two ells deep" (*Ölfusvatnsannáll*). In the west and northwest it was recorded as "The severest frost winter that people remember in recent times" (*Grimsstaðaannáll*, *B.S.*

Ísafjarðarsýsla). The lack of snow is also reported in the northwest: "Severe with heavy frosts from the beginning although in some places there was not so much snow" (*B.S. Barðastrandarsýsla*). The spring in the northwest was "almost as harsh as the winter with cold, frost and snow" (*B.S. Barðastrandarsýsla*). In the north it was "extremely severe" (*Höskuldsstaðannáll*). The summer this year was "rather wet" in the south (*Ölfusvatnsannáll*) and in the north the weather improved at the end of June. In the east and west it remained severe, with frost in the ground past the end of August in the west (*Grimsstaðaannáll*). The autumn weather seems to have improved somewhat elsewhere, but in the east, "In September, in Fljótsdal in Múla district, there was ice one and a half ells deep in the ground" (*B.S. Múlasýsla*).

1751—1760

Another decade of very cold weather followed in the 1750s, with cold years occurring one after the other from 1751 to 1757 (see Table 2). The last three years of the decade, 1758, 1759 and 1760, were reasonably good and mild. According to the sources used here, sea ice was present in 1751, 1756, 1757, 1759 and 1760. From 1751 to 1757, almost all springs and winters were severe, at least in part, in most regions.

The coldest year this decade (and one of the coldest in the eighteenth century) was 1756. Jón Jónsson recorded "severe weather with snow and lack of pasture all winter". The winter in the south was "very severe with frost and snow" (*B.S. Árnessýsla*) and there was "a harsher spring than anyone could remember" (*B.S. Árnessýsla*). In the west and east the winter was also severe. Jón Jónsson records that by the "ninth week of summer" (c. 15 June) the snow had begun to melt but that there was still snow on the ground three weeks later. The situation was very similar in other parts of Iceland. In the south, "the cold and frost were so severe right up to 6 August that small ponds and streams froze almost every night, although they thawed out during the day" (*B.S. Árnessýsla*). In the west, one source commented: "The worst thing of all is this summer's severity" (*B.S. Dalasýsla*). Sea ice surrounded the country this year. It first came to the north in March, and then spread along the eastern and southern coasts. One southern source recorded: "Drift ice came to the south on 24 June and began to break up on 6 July" (*B.S. Árnessýsla*). All the northern sources agree that the ice remained off the north coast until the end of August. In coastal districts there was also wet weather associated with the ice: "There was

continual fog, sleet and rainy weather caused by the ice" (*B.S. Húnavatnssýsla*). Another severe year followed in 1757, but in 1758 the run of severe years which had lasted through the decade came to an end with a winter and spring that were much milder than previous seasons. The summer this year was mainly good everywhere and the autumn average to good.

The 1740s and 1750s may well have been the coldest decades of the century. Of equal severity (see Figure 2) were the 1690s and 1630s. Previous works (for example, Koch, 1945; Bergþórsson, 1969) have suggested that the 1750s were more severe than the 1740s and, certainly in terms of human suffering, this would seem to be so (*Vilmundarson*, 1969; *Ogilvie*, 1981). In the index for the whole of Iceland presented here, however, the 1740s appear to have been slightly colder (see Figure 2). This is because, although more seasons were described as very cold in the 1750s, more seasons were described as good as well. The regional indices for the north and west of Iceland (Figure 3) follow this pattern; indeed, in the west, the 1740s appear far colder than the 1750s, but in the south, it is the 1750s which are the coldest decade in the period 1601 to 1780.

1761—1770

The following decade, 1761 to 1770, was undoubtedly milder than the previous two in the north, south and west. During the 1760s, only two winters were recorded as severe in most districts: 1761 and 1770. However, western sources also give 1764 and 1766 as very cold winters. 1767 was said by Jón Jónsson to have been severe in the east, although it was mild and calm in the north. A high proportion of winters were judged to be mild this decade. In the north: 1762, 1763, 1767, 1768, 1769; in the south: 1762, 1763, 1765, 1768, 1769; in the west: 1763 and 1768. Spring was severe in the south and west in 1761, but good this year in the north. The spring of 1764 was cold in the north and west, as was 1766. In the latter year, a western source stated: "The winter weather lasted until 5 June with continual frost and keen northerly winds" (*B.S. Dalasýsla*). 1769 was very cold in the south and west, but tolerable in the north. 1770 was recorded as cold in the north. 1763 was a mild spring in the north and west and 1768 in the north and south.

The summers this decade were mainly variable, although some stand out as interesting. 1761 was cold in the north, south and west, and 1766 in the east and elsewhere. In this latter year "few people in the north and in Múla district went to the Alþing because of the

severity" (*Íslands Árbók*). Later on, the weather became better, at least in the north. Dry summers were: 1762 (north, south, west), 1763 and 1768 (west), 1769 (south). 1762 was also regarded as being good in the south and west. 1767 and 1768 were good in the north. 1768 was very wet in the south, and 1764 in the west. There is very little information on the autumns this decade but four could be described as good or favourable in the north (1761, 1762, 1763 and 1768). 1762 was also good in the south and west. 1764 and 1766 were very cold in the north.

During 1761 to 1770, there was sea ice present in 1764, 1766, 1767, 1769 and 1770. 1766 was a fairly heavy ice year, but the ice seems not to have penetrated beyond the northern and northwestern coasts. The outstanding environmental event of the decade was the Hekla eruption which began in 1766 and lasted for two years. Jón Jónsson described the effects of the ash cloud from the eruption which was first seen by him on 5 April. The cloud "took away the colour of snow in the mountains" and the fall of ash had adverse effects on grass and livestock.

1771—1780

The thermal index for the whole of Iceland (Figure 2) suggests that the 1770s were colder than the 1760s. Nevertheless, on a regional scale there were large areas where the climate was probably milder in the 1770s than it had been at any time since the 1730s. The overall situation is reflected in the south and north, but in the west the 1770s were milder than the 1760s.

Seven winters were described as severe, at least in part, in one or more districts in the 1770s. These were: 1772 (north), 1773 (north and east), 1775 (south), 1777 (west), 1778 (north), 1779 (south, west), 1780 (north, east, west). Southern sources say the winter of 1780 was mild to around mid to late February, when severe weather with frost and snow set in. Four winters were mild: 1775 (north and west), 1776 (north and west), 1777 (north), and 1779 (north and east). It can thus be seen that 1775, 1777 and 1779 were years with marked spatial contrasts in the severity of their winters. Only one spring was described as mild in this decade: 1776, in the north. However, this may well reflect lack of data for these years rather than the true picture. (As early meteorological observations exist for some years from the 1770s onwards, it may eventually be possible to fill in gaps in the historical data.) Five springs were described as severe: 1773 (north), 1774 (west), 1775 (north), 1777 (north, west), 1779 (north), 1780 (every-

where) and many more as "cold": 1771, 1772, 1774, and 1778 (all in the north). The coldest winter—spring seasons this decade thus included 1773, 1775, 1777 and 1780. Jón Jónsson wrote that the spring of 1780 was similar to the "hard" spring of 1728. The only spring recorded as mild was 1776 and this was also a mild winter. Sea ice was present off the northern coast every year this decade except for 1779 and 1780. It is also recorded in the northwest in 1774, 1775 and 1776.

There do not appear to have been any particularly unusual seasons among the summers and autumns of this decade. Only the last two years, 1779 and 1780, will be described in detail. The summer and autumn of 1779 were very wet in the south and west. In the north and east, there was a reasonable balance between wet and dry weather. In 1780, the summer (particularly the latter part) and the autumn were very wet in all southern and western districts. Thodal, the Governor at Bessastaðir in the south, wrote that, since he first came to Iceland (in 1770) his visit to the Alþing, a journey of some 70 kilometres, had never been so wet and uncomfortable. "I left there in the rain on the 29th July . . . and should have returned home on the 31st. As a result of the rain and bad weather, we did not get there until the 4th of August". In the east, the early part of the summer was cold, then the weather became mild and better than average. Similar summer weather was recorded by Jón Jónsson, but September was very wet and unfavourable for the hay harvest.

THE WEATHER DURING 1781 TO 1784

In the following section, the weather during 1781 to 1784 will be discussed year by year. Particular attention is paid to 1783, the year of Skaftáreldar. A summary of the characteristics of these years may also be found in Table 3.

1781

Almost all sources state that the winter of 1780 to 1781 was a reasonably mild one. Typical accounts are from the Sheriffs of Austur-Skaftafellssýsla ("a good winter") and Rangárvallasýsla ("mild and reasonable as regards frost and snow"). In the south and west, the spring was also reasonable. The Sheriff in Rangárvallasýsla noted that frost and ice in the ground melted unusually early. In Gullbringusýsla, the spring was said to have been damp and cold with rain to June. From Barðastrandarsýsla, the report is of pleasant spring weather from 27 April. A snowstorm

occurred on 10 to 12 May, but from then on the weather was average. In the north, Jón Jónsson recorded that, up to 31 May, spring had been changeable with continual night frosts which slowed grass growth. Sea ice occurred off the north coast in April, and stayed at least to early June. The ice hindered seal-fishing in the east, but apart from that, conditions there were said to be better than in previous years (B.S. Múlasýsla).

The summer of 1781 was favourable in most districts, and most sources refer to a good crop of grass. The account from Gullbringusýsla is typical of many: "This year's grass and hay the best". Instrumental temperature observations are also included in the latter account: "From June on, temperature often twelve to fifteen degrees above freezing." As we have no information about the instrument used nor its location, it is difficult to assess these values; but they certainly support the qualitative information. The Sheriff of Dalasýsla recorded "a mild and grass-rich summer, even though the Greenland drift ice lay off Strandasýsla into July." From Jón Jónsson's account, it is clear that, in the north, the summer was reasonably mild from early June to the end of August.

Some western sources refer to a rainy autumn, and this meant that the harvest was not quite as good as hoped. The Sheriff of Hnappadalssýsla wrote that there had not been so much rain for such a long time during the past seventy years. In Dalasýsla, the autumn was said to be tolerable. Jón Jónsson wrote that there was cold weather with snow from late August to late September, but October was good. In the south, the autumn was mild.

1782

In contrast to the relatively mild year of 1781, 1782 seems to have been unusually cold all over Iceland for much of the year. It was also a heavy ice year. Most-northern sources state that the ice first came to the north coast in mid March, but the Sheriff of Norður-Múlasýsla wrote that the ice lay off the eastern coast from early February to well into September. The Sheriff of Dalasýsla recorded that the sea ice came to the northwest around the end of March and beginning of April and remained up to the time that he was writing (19 August). The sea in Breiðafjord was also frozen this year (B.S. Barðastrandarsýsla). Most sources say the ice left the northern coast in August, but it may have remained in the vicinity of Iceland at least to the end of August or later. For the week 18 to 24 August, Jón Jónsson recorded that there were said to be nineteen Dutch ships anchored off Hrísey in

Eyjafjord, afraid to leave because of the ice still lying off the northeast coast. The sea ice also reached the southeastern and southern coasts. The Sheriff from Vestur-Skaftafellssýsla stated that the ice first occurred there at Whitsun (19 May) and did not leave until 23 August. In the report from Rangárvalla district it was said that, shortly after 13 May, the sea "was quite covered with sea ice which came from the east". This stayed for about three weeks. On 14 August more ice came, "no less than before". Skúli Magnússon, who sailed to Copenhagen in late August, wrote that the ice stayed in the north to August, and that it then drifted away past the eastern fjords to the south and lay just off the Westman Islands. The ship he travelled in had to change course, from southeast to southwest, in order to avoid it. For this year, the Sheriff of Norður-Múlasýsla wrote: "No one can remember that the ice has ever stayed so long here . . ." Such remarks should be treated with caution, as people's memories of natural events are short, but other evidence suggests that the ice had not lasted for quite such a long time since the 1750s. Furthermore, Jón Jónsson, writing in early April, stated that the amount of ice off the northern coast at that time was the greatest he remembered. Jón, then aged sixty-three, was an accurate and reliable witness, and his statement should be taken seriously. From all these accounts, 1782 appears to have been one of the most severe sea-ice years of the eighteenth century.

The winter of 1781 to 1782 was unusually severe in most districts. Accounts from the east, south and west are remarkably similar in their descriptions of this season. Some northern sources record that it was mainly the latter part of winter which was very severe there. Although, according to Jón Jónsson, all of November (1781) was harsh. From the end of November to the end of February, only one week was characterized by him as severe. Seven weeks were "good" (mainly because there was sufficient pasture for livestock) and three were "reasonable". However, March was undoubtedly very severe, and there was great frost and cold to mid April. In Suður-Múlasýsla, it was said that the winter began in November 1781 with snow, storms and bitter frost. This lasted to mid December when it became milder for fourteen days. Right after the New Year this changed to continual northeasterly storms with snow and terrible frost, and became increasingly worse to mid April. The Sheriff of Vestur-Skaftafellssýsla wrote that the winter began in October with snow, and that, except for short times in December and February, there was the severest frost that people could remember, and this lasted the whole

winter. Governor Thodal at Bessastaðir said that the winter was fairly mild to 6 January when a severe frost and heavy snowfall occurred. He also wrote that he had not experienced such a winter since he first came to Iceland (in 1770) and that the Icelanders he spoke to said they could not remember a similar one, either. Skúli Magnússon, writing from Viðey off Reykjavík stated that, from 3 January to 15 April, there was often severe frost except for the 9 to 20 February when the snow melted somewhat during a period of rain and southerly winds. The Sheriff of Dalasýsla wrote that this was one of the severest winters in people's memories, and also noted that around the end of March and beginning of April, there was such severe frost that people who were outside were frost-bitten on the hands and face.

The very cold weather continued into the spring in all districts. A typical account is that from Dalasýsla: ". . . the spring was very cold and dry with continual night frosts". As might be expected, however, there is some regional variation. In Suður-Múlasýsla, the weather continued severe to mid April, when it became milder, but it was cold with frost and snow right up to the beginning of June "on account of the sea-ice". In Vestur-Skaftafellssýsla, the spring was said to be very severe to the end of May when it became milder. The Sheriff of Rangárvallasýsla wrote that there was severe weather during the spring which became milder just before Easter (31 March). There were some days of thaw, but then the frost and bitter cold began again immediately afterwards. Jón Jónsson recorded severe weather right through spring. Only two weeks at the beginning (14 to 27 April) were described as fine and with thaws.

The summer of 1782 was undoubtedly unusually cold. Writing on 6 July, the Sheriff of Suður-Múlasýsla stated that the homefields were still "bald". In other words, there was still snow-cover with no grass growth. At this time, mountain roads and paths in the district were still virtually impassable due to snow and ice. In the north and south, it was also dry for much of the time. Jón Jónsson recorded cold and dry weather in June and July. It was also cold in August in the north, although there were periods of rain too. The Sheriff in Rangárvallasýsla wrote that it was a very dry summer with frequent night frosts. At Bessastaðir, Thodal also recorded a dry summer. The Sheriff's report for Austur-Skaftafellssýsla stated that, there, it was cold with continual drought. However, the report for Vestur-Skaftafellssýsla says that the sea ice, which lay off that part of the coast from 19 May to 23 August, sometimes brought rain, and the

weather was often foggy. In Dalasýsla, there were night frosts throughout the summer, up to the time when the Sheriff wrote his report (19 August). Heavy snow fell at the beginning of July. In the mornings, around the end of July, the earth was often white with rime-frost. On 10 August there was severe night frost and on 16 August much snow fell. In the northwest the summer was fairly wet. In Barðastrandarsýsla, for example, although very little rain fell from the end of October 1781 to 15 June 1782, from that time there was much rain and bad weather from the southwest.

The autumn season was mainly rather cold, but it was different in different districts. Jón Jónsson recorded a very cold September, and said that all hope of a harvest ceased on 18 September, there being few parallels to the present severe season. It was also mainly cold and frosty in October. In Norður-Múlasýsla the weather was said to have been harsh through to November. The Sheriff's report for Snæfellsnessýsla stated that, at the beginning of September, there occurred rain with southerly winds which lasted to 20 September. This stopped the hay harvest. Later there was frost and snow with a little rain in between which changed to ice. This lasted to 2 October. After that there were southerly winds with occasional rain. From mid October the weather changed to northerly winds with frost and snow. In Kjósarsýsla the frost was said to have been felt early, even before 22 September, but the weather was dry so there was a good harvest. This dry frost lasted to 2 October when there was heavy rain for four or five days. After that there was frost and snow so the livestock had to be housed. The autumn weather in Mýrasýsla was also said to have been cold and dry.

1783

The eruption year, 1783, was also a year of difficult climate. In the north, there was a severe winter from New Year to the end of March. Jón Jónsson wrote that it was considered severe because of snow, and also because there was no pasture for the livestock due to frozen ground. Some sea ice came to Eyjafjord in the week of 9 to 15 March. In the eastern districts, large amounts of snow were reported. The Sheriff of Suður-Múlasýsla wrote:

Last November and to mid December the weather was very pleasant so the livestock did not need to be fed, but from 20 December to the end of March, that is, about fourteen weeks, there have been virtually continual southerly and easterly winds which have also brought heavy snowfalls which have sometimes lasted four or five days together, so here in this eastern part of the

country right to Eyjafjall there are such amounts of snow that old people can scarcely remember its like.

Thodal, writing from Bessastaðir, confirmed this severe winter in the northwest, north and east saying:

Winter severe in Ísafjarðarsýsla, Húnavatnssýsla, but especially in Þingeyjar and Múla districts. Hard also in Skaftafellssýsla, but nevertheless somewhat milder, and the need not so great.

In the south, however, the weather was said to be often calm with tolerable frosts and not much snow. In the west, it seems to have been fairly cold. A typical account is from Mýrasýsla:

Winter cold and dry with frequent northerly winds, although the frost never became severe.

The Sheriff of Dalasýsla wrote that conditions were very difficult, especially from 20 January to Easter, not because the weather in itself was so very severe, but because, after a brief thaw, a severe frost followed so the ground everywhere was covered with ice instead of snow and this prevented the livestock from feeding out-of-doors.

In the south, the spring weather was mostly quite mild and good. In the north, it was variable. In the east, and some western districts, however, this season was quite cold. The Sheriff of Suður-Múlasýsla, for example, wrote that:

... in many ways it was a hard spring. Although April was quite good to the 20th, cold weather began again at the end of the month, and lasted into summer. The sea ice came in May, although not in any great amount.

In Vestur-Skaftafellssýsla, the season was said to be unusually good.

The first signs of the volcanic eruption in Vestur-Skaftafellssýsla were some weak tremors felt in May, and then strong earthquakes in southeast Iceland in early June. The eruption actually began on Whit Sunday, 8 June. A chronicle of eruption and related events in Vestur-Skaftafellssýsla to the end of 1783 has been compiled by *Sigurður Þórarinnsson* (1984). This year there was also a marine volcanic eruption, on a much smaller scale, off Reykjanes, as well as volcanic activity in Vatnajökull.

The effects of the Skaftáreldar eruption (mainly in association with the falls of tephra) were felt and seen all over Iceland, and many of the descriptions of the summer this year were, naturally enough, taken up with the effects of the eruption. Some accounts of summer weather and eruption effects in different parts of Iceland follow.

The Sheriff of Rangárvallasýsla wrote that the weather was pleasant to Whitsun (8 June) when the eruption occurred.

After that the air was full of ash and smoke which has lasted up to the present time (26 August). On the rare occasions that we have had a glimpse of the sun it has looked like the reddest blood. The grass was singed and seemed to wither and stopped growing, so now there is a great lack of grass everywhere. Up to fourteen days ago (12 August) the summer has been dry.

In Kjós district there was a night frost at the beginning of June which, according to the Sheriff, spoiled any good prospects for the grass growth.

Then the eruption, both in the western sea, and in Skaftafell district, occurred with dust and fumes and megrass which had been green, was made quite yellow and white by sulphurous rain. After that, the grass withered to the roots . . . Thus the harvest could not be begun before 30 July which is three weeks later than usual. The failure was still so great that, on the homefields, where one in an average year would have got 300 horseloads of hay, there was not more than 200 to 220, and in Gullbringusýsla the failure has been even greater.

There were similar accounts from the rest of the country. The Sheriff of Snæfellsness district ascribed the unfruitful summer to

. . . the foggy air, which we have experienced all the time from 16 June to the end of August. During this time one seldom saw the sun, and when it was seen it was very red. The air has smelt strongly of sulphur, and we have experienced a very fine dust which has fallen on the ground chiefly in calm weather when white linen or woollen goods have been put out. The mouths of sheep and cattle have also been yellow with sulphur . . . and all animals have been restless.

In Dalasýsla, Magnús Ketilsson wrote:

From early June, and to this time (13 August) we have lived in continual smoke and fog, sometimes accompanied by sulphur-steam and ashfalls. The grass has withered and the livestock have been extremely restless. People involved in fishing have not been able to get out on the sea because of the continual smoke and murmurings, and it has rarely been possible to see further than a mile away.

In the eastern part of Iceland, the Sheriff of Suður-Múlasýsla wrote that the effects of the eruption were first noticed there at Whitsun,

. . . and there is also an eruption off Reykjanes with continual sulphurous smoke and steam. It became so

dark that travellers could scarcely find their way . . . The sun at rise and set became as red as blood. This lasted from the above-mentioned time to the 12 or 14 September, and has caused very unfortunate consequences. Leaves on the trees withered so that in June it looked as though it was far into October. The grass on the homefields in some places became pale and stopped growing.

However, he added that the cold from the sea ice had also had a great effect on the grass.

Jón Jónsson gives a separate account of the weather, and the effects of what he termed the "mist". The first two weeks in June were very cold and there was much sea ice in Eyjafjord. During the last two weeks, the weather was often good, but on the 26 and 27 June there was very much sea ice in the fjord. The first two weeks of July were tolerable, but cold. The sea ice went on 1 July, and "did not come back much". The third week was very good. The last week or so was colder and wet, with snow in the mountains. August was generally mild and calm. In his account *Lítill Fráskiring Hvorsu Misturið Er* (A Short Description of What the Mist is Like), the entries are written daily from the time when the eruption began to mid September. There are a few descriptions for October, November and December. Jón also gives an account of the effects of the mist on the grass, the livestock and other matters. On the 21 and 22 of June, for example, the grass "lost its fertility".

The harvest this year failed everywhere, and the autumn was generally cold. In the north, Jón Jónsson wrote that, in September, the latter part of the first week was very severe with snow, cold and frost. The week 7 to 13 September was very frosty but calm, while from 14 to 20 September the weather was calm and tolerable. October was quite harsh.

Most sources say that the winter began very early this year. The Sheriff of Dalasýsla said that it began on 14 September, and from this time the livestock had to be given fodder almost continually. The account from Mýrasýsla records a very wet autumn, but most other sources dwell on its severity. A good description comes from Barðastrandasýsla:

At the beginning of September heavy stormwinds occurred. These caused considerable damage in many places. On 2 October there was much frost with some snow and northeasterly stormwinds. This meant that all autumn work was stopped . . . as the earth never thawed thereafter. Cattle needed to be given fodder after 2 October. The harvest everywhere was the poorest, so people immediately slaughtered a lot of livestock.

1784

The winter of 1783 to 1784 not only began early but was very severe and long-lasting in most districts. Governor Thodal wrote that the severity of this winter surpassed that of 1781 to 1782. Although the early part of the winter was very cold, the worst part seems to have been from January onwards. Magnús Ketilsson, in Dalasýsla, wrote:

Up to Christmas, winter was tolerable, but later it was extremely severe. All the earth became covered, not just with snow, but with hard ice, which not even the horses, let alone the sheep, could dig through. This situation lasted to the end of April. The frost was not merely severe, but was long-lasting. Often for five days in a row the thermometer would be eighteen degrees and more below freezing, and seldom less than twelve degrees.

As with the temperature readings given earlier, it is not certain which units were used here. The Sheriff of Suður-Múlasýsla noted that all fjords were frozen over on 20 February, and this was something that had not occurred for thirty-eight years. (He is probably referring to the very severe ice year of 1745 — in fact thirty-nine years before.) The account from Norður-Múlasýsla described how travellers rode and sledged on the ice.

This was also a heavy sea-ice year. The ice was first seen off the northern coast in January, and off the east on round March 7. According to the Sheriff of Suður-Múlasýsla the ice extended for as far as the eye could see from the tops of mountains. This large extent of ice is also mentioned in the report from Barðastrandarsýsla.

Almost all sources state that the severe winter continued to the end of April. Thodal recorded that the month of May was excellent; there was no frost or snow, just good weather with reasonable rain. However, most other sources record a very cold spring. The Sheriff of Mýrasýsla wrote that, since May, the weather was somewhat milder, but it was mostly cold and damp. In Norður-Múlasýsla, the Sheriff noted that the ice (not the sea ice) did not leave the fjord before June, and it was not until it did that the severe weather was finally stopped by a warm southerly wind.

The summer of 1784 was cold in most districts. Some sources also complain of wet weather. Magnús Ketilsson wrote:

The greatest danger for the hay harvest is the very wet weather which now reigns (13 August) so none of the hay is harvested.

According to the Sheriff of Suður-Múlasýsla, the summer was continually cold due to foggy weather. The account from Norður-Múlasýsla gives some interesting details:

From the end of May to the beginning of July the weather was milder . . . due to a warm southerly wind. During this short time an incredible amount of snow thawed, so all running rivers and streams burst their banks, and these floods did much damage, bringing mud, gravel, etc., on to the fields. Even houses were washed away. The water in Jökulsá rose to a great height. After that the weather changed suddenly to extreme cold with frost and strong northerly winds. This continued for about twelve days. Then the air became milder but up to now (15 September) this has alternated with continual northerly winds, frost and sleet, with very few days which could be called summer-like. As in the previous two years, the Greenland ice has been off the coast from the end of February to well into summer. This would probably have come right into land, if there had not been ice formed there already . . . The grass growth is no better than last year, and in some places worse.

Jón Jónsson wrote that the first few days of June were good, then it became very cold, with icebergs in Eyjafjord. After that the weather improved, but it was very dry which was not good for the grass. However, rain fell at the end of June and beginning of July. The weather was then quite good until around 7 July when it became colder. From the 11 to 17 July it was dry with night frosts. Jón speculated on the reasons for the poor grass growth. This might be due to the effects of the brown mist last year, but "the cause could also be that the ground has had the goodness taken from it due to the recent unusual amount of sea ice, and the accompanying great frosts and continual cold". From 18 July onward the weather was better, with some rain. The first week of August was harsh. The second was cold and stormy. The third week was stormy, but not cold, while the fourth week had much night frost.

The autumn of 1784 seems to have been reasonable in most places, although in some districts, particularly in the west, there were complaints of wet weather. The Sheriff of Norður-Múlasýsla wrote:

After the ship left, the weather was as good and mild as anyone could remember at this time of autumn, and quite the opposite to last year. This weather lasted to around mid November.

Jón Jónsson recorded that, in September, the weather was often cold and frosty, but it was often good too. The first three weeks or so of October were quite good, but after that it became winter-like and snowy.

CONCLUSION

Finally, we may sum up some of the variations in the climate of Iceland during the years 1701 to 1784. The winter-spring thermal index for the whole of Iceland shows that its mildest phase occurred at the start of the period, from 1701 to 1710. A cooling trend predominates from c. 1710 to c. 1750. The coldest decades were the 1740s and 1750s. As far as the whole of Iceland is concerned the 1740s appear to have been slightly colder than the 1750s, but the thermal index is based on winters and springs alone. During the 1750s there were several very cold summers. It is possible, therefore, that if the index had included all seasons of the year, this decade would have proved to be the coldest of the period. It is certainly during the 1750s rather than the 1740s that the climate appears to have had most impact on society (Ogilvie, 1981). During the 1760s there was an amelioration in the weather, but after 1771 a further cooling occurred. With the exception of 1781, which had a mild winter and fruitful summer in most places, the first few years of the 1780s were extremely cold with severe winters, cool summers and much sea ice.

That there is a broad agreement between temperature and sea ice can be seen by comparing the thermal index with the sea-ice index. The positive relationship is striking in certain decades, the 1740s for example. However, there are decades where ice and temperature appear to conflict. In the 1730s, for example, the climate was fairly cold, but there was little ice, while from 1701 to 1710 there was much ice, but the temperature was relatively mild.

The climate of Iceland is noted for its variability on all time scales, and the period considered here, 1701 to 1784, was no exception to this general rule. Considerable regional variability was also observed. The over-riding impression of the climate in the eighteenth century is, however, one of great severity, characteristic of the Little Ice Age. From a climatological and environmental point of view, the most interesting year of the century was undoubtedly 1783 to 1784. From the point of view of the people who experienced it, it was certainly the most devastating.

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Ágrip

LOFTSLAG Á ÍSLANDI 1701–1784

Gerð er grein fyrir hitastigi á Íslandi á árunum 1701 til 1784, skv. samtímaheimildum. Ef litið er á Ísland í heild var fyrsti áratugur 18. aldar mildasti hluti þessa tímabils, en árin 1740 til 1760 köldust. Fyrstu árin fyrir og eftir Skaftárelda voru mjög köld, að undanteknu árinu 1781.