

Name of research institute or organization:

Federal Office of Meteorology and Climatology MeteoSwiss

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The weather in 2016

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Report for the International Foundation HFSJG

In Switzerland the year 2016 was 0.7 °C milder than normal values 1981 – 2010. Averaged over the country it was among the ten warmest years since observations started in 1864. The year began with an almost record-breaking warm period in winter. Several regions north of the Alps registered a first half of the year with the highest precipitation totals since observations started. Summer only arrived in July, but it persisted with uncommon warmth until September. Towards the end of the year a stable zone of high pressure with a record lack of precipitation led to a significant lack of snow in the mountains.

As can be seen in Table 1 below, the temperature 2016 was above the norm value 1981–2010 (reference period), with similar deviation in the high Alpine regions and in the lowland regions north of the Alps. Precipitation totals reached the normal value in the Jungfrau region as well as in the lowland regions north of the Alps.

Table 1: Annual values 2016 referring to the parameters temperature and precipitation as well as the deviations from the reference period 1981–2010 for the stations Jungfraujoch and Berne. As precipitation is not measured on Jungfraujoch the values pertaining to the Kleine Scheidegg are used here.

	<i>Jungfraujoch</i>	<i>Berne</i>
Average temperature	-6.3 °C	9.4 °C
Deviation	+0.8 °C	+0.7 °C
Precipitation	1618 mm	1056 mm
Deviation	99 %	100 %

Second warmest winter

The winter 2015/2016 was characterised by mild weather almost throughout. Above all the record warmth in December 2015 was outstanding, with a temperature of almost 4°C above the normal values 1981–2010. It was over 1°C above the previous December record from the year 1868. On only a few days around mid-January was there wintery cold with temperatures substantially under average and a snow cover even in low-altitude areas. Averaged over the three winter months December 2015 to February 2016 a temperature surplus of 2.5°C resulted for Switzerland compared with normal values 1981–2010. Only the record winter 2006/2007 brought similarly mild conditions with a surplus of 2.6°C and the winter 1989/1990 with a surplus of 2.4°C. The remaining very mild winters since observations started in 1864 produced temperature surpluses under 2°C. At the Jungfraujoch it was the third warmest winter with a surplus of 2.3°C.

Contradictory start to the year

North of the Alps January brought a lot of precipitation. Frequent and – towards the end of the month – strong precipitation activity led to record January totals at certain meteorological stations which have measurement series dating back over more than 100 years: the station Eschenz in the Lake of Constance region registered 185 mm, Mormont in north-western Switzerland 189 mm, while St. Gallen with 164 mm and Basel with 132 mm recorded their second-highest January totals. In lower-altitude areas north of the Alps it was – overall – the second-wettest January since observations started in 1864. On the other hand, only half of the normal January precipitation fell in certain regions south of the Alps. However, Januaries without any precipitation are a well-known phenomenon in these parts.

Extremely mild end to the winter

In the course of a generally mild February there were several episodes of unusually warm weather. In Samedan the daily maximum temperature rose to a February record of 11.7°C on 21 February. Here the same value had been reached on 19.2.1998. In Samedan the long-term measurement series of homogenous daily maxima reaches back as far as 1869. In Berne the fifth-highest February daily maximum since observations began in 1864 was registered (16.4°C).

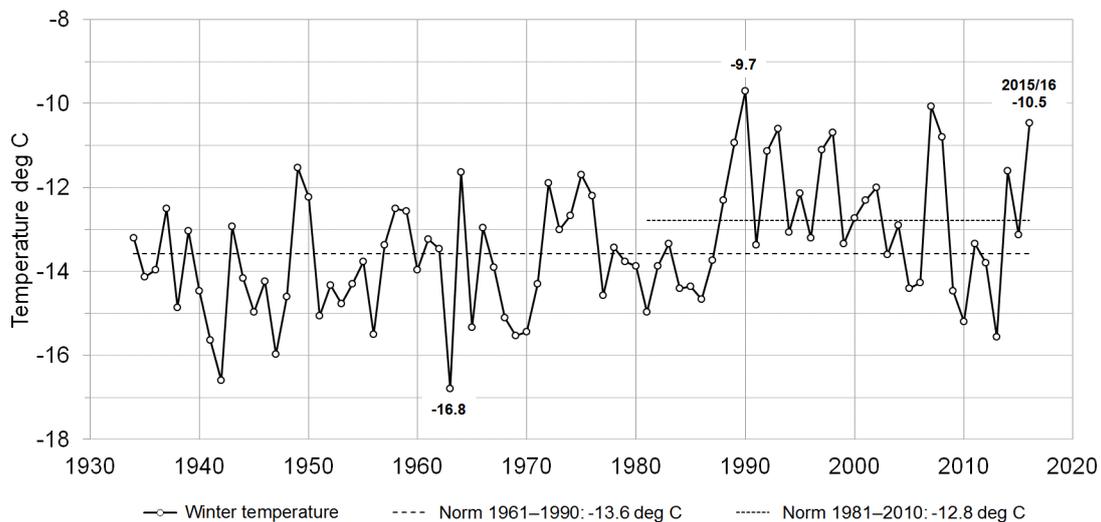


Figure 1. Winter temperatures (DJF) from 1933/34 to 2015/16 at the Jungfrauoch (3580 m asl; homogeneous data).

Strong March snowfall in the south

Strong snowfalls in the first days of March brought 22 cm of snow to Locarno-Monti within one day, 15 cm to Lugano. San Bernardino at 1640 m a.s.l. had 61 cm of fresh snow. Only on 17 March 1975 had the Locarno-Monti station with its measurement series dating back to 1935 registered more March snow falling within one day: 25 cm. In San Bernardino the March snow record from 1979 was equalled. Here data for fresh snow have been available since 1968.

Locally record wet conditions in May

Overall, spring brought precipitation in abundance to many parts. Only in March was precipitation scarce, except south of the Alps. In April and above all in May precipitation totals were generally above average. Locally there were May totals of 180 to 250 percent of normal values. Lucerne registered 270 mm, Château d'Oex 239 mm and Thun 198 mm; at all these stations it was the May with the most precipitation since observations began in the 19th century.

“Föhn” with staying power

As early as the beginning of April a “Föhn” wind persisted without interruption for 65 hours or almost three days at the classic “Föhn” location Altdorf. One month later it managed a period of almost 93 hours, from the morning of 7 May to the morning of 11 May 2016 - almost four days without interruption. It was the second-longest “Föhn” period in Altdorf since continuous measurements started in the year 1981. Only a full two hours before this long “Föhn” event an uninterrupted “Föhn” period of almost two days had ended. Overall, Altdorf was therefore under the spell of “Föhn” for five and a half days. The longest uninterrupted “Föhn” period in Altdorf was observed in April 1993 and had a duration of 138 hours and 20 minutes, that is, almost six days.

Normal spring temperature

Averaged over the entire country the spring temperature 2016 was within the normal values 1981–2010, however, there were substantial regional differences. In the north-west the spring temperature remained up to 0.6°C below the climate normal. In southern Switzerland there were local surpluses as high as 0.7°C. In many parts the months of March and April were too cold. In the mountains and south of the Alps April was 1° to 2°C too mild.

Early summer with severe weather events

Overall, June presented itself grey and rainy. In the first half of the month thunderstorms brought heavy precipitation and local flooding. Towards the middle of the month humid air from the Mediterranean triggered severe precipitation in southern and eastern Switzerland. The surfaces, which were already soaked by the previous June weather, reacted with mudslides and flooding to this heavy precipitation, leading to major damage locally. Lake Constance and Walensee overflowed and the Rhine burst its banks. In the last third of the month torrential rains again caused severe weather damage in the eastern half of the country.

Record wetness in the first half of the year

North of the Alps the first half of the year 2016 ended with the highest precipitation totals in certain regions since observations started in 1864. This was caused by the impact of continuous strong precipitation activity since the start of the year. Up to the middle of the year all months – with the exception of March – brought substantially above-average precipitation totals. At the meteorological stations Basel, Neuchâtel and Lucerne precipitation totals from January to June rose significantly above their previous record marks in the measuring period spanning 153 years. Basel registered 732 mm of rain, Neuchâtel 771 mm and Lucerne 875 mm.

Finally a hint of summer

North of the Alps a grey month of June supplied only 3 to 8 summer days with temperatures of 25°C and higher, though south of the Alps 12 to 16 summer days were recorded. In July and August stations north of the Alps registered around 20 summer days. South of the Alps it was summery and warm almost throughout, with 26 to 28 summer days.

Brief record heat

From 22 August onward a high pressure zone from the west moved over Middle Europe and remained in place to 28 August. North of the Alps, helped by the maximum of sunshine duration, daily maximum temperatures rose to 30°C and above from 25 August onwards in many places. There were record values for the period from 25 to 31 August. In Geneva the daily maximum reached 33.5°C on 27 August, in Basel 33.8°C. In Geneva it was clearly the highest value for the end of August since observations started in 1864. Basel had a similarly high daily maximum with 33.7°C on 28 August 1992.

Extreme September warmth

South of the Alps, in the Valais and in western Switzerland, continuous high pressure influence in the first half of the month led in parts to the warmest September since

observations began in 1864. New September records were the result: Locarno-Monti registered 3.1°C above the normal values 1981–2010, Sion 3.2°C and Neuchâtel 2.7°C. In Lugano the record surplus of 2.8 Grad was again reached while in Geneva (2.6°C surplus) it was closely missed. In lower altitudes of northern Switzerland it was – overall – the fourth-warmest September since observations started in 1864.

A wintery spell in October

An October which was significantly too cold put an end to the unusual September warmth. Snowfall down to mid-altitudes and several ground frosts in the lower areas created a mood reminiscent of early winter. November brought wintery cold in the first half of the month. In mid-November abundant snow fell in the mountains. A few high-altitude ski resorts started their operations.

Record “Föhn” events

In November 2016 the “Föhn” showed exceptional tenacity. At the stations of Vaduz and Altdorf it persisted from 20 to 24 November for over four days without interruption. For Vaduz it was the longest continuous “Föhn” period with 108.2 hours, for Altdorf the second-longest with 109.3 hours since measurements started in the year 1981. With two more “Föhn” episodes at the beginning of November, “Föhn” hour totals amounted to a record number of 137 hours for November in Vaduz. With 135.5 hours Altdorf registered the second-highest “Föhn” hour total of any November.

December: records galore

North of the Alps and in the Alps a stable high-pressure zone led to the month with the least precipitation in many areas since observations started in 1864. In several regions of the western half of the Plateau and in the Valais December did not receive any precipitation at all.

Many parts of north-western Switzerland, the Jura heights and the Alpine zone experienced the sunniest December since the beginning of their data series in 1959. Many stations in the Alps and south of the Alps registered 20 to 27 sunshine days. In the fog areas between Lake Geneva and Lake Constance, however, there were, in some parts, only 2 to 5 sunshine days.

At higher altitudes north of the Alps, the second-warmest, south of the Alps the fourth-warmest December in the measuring period spanning 153 years was recorded regionally. As a consequence of the persistently dry and mild mountain weather the Alps remained without snow up to 2000 m a.s.l. At 2500 m a.s.l. snow depth amounted to a mere 20 to 30 cm.

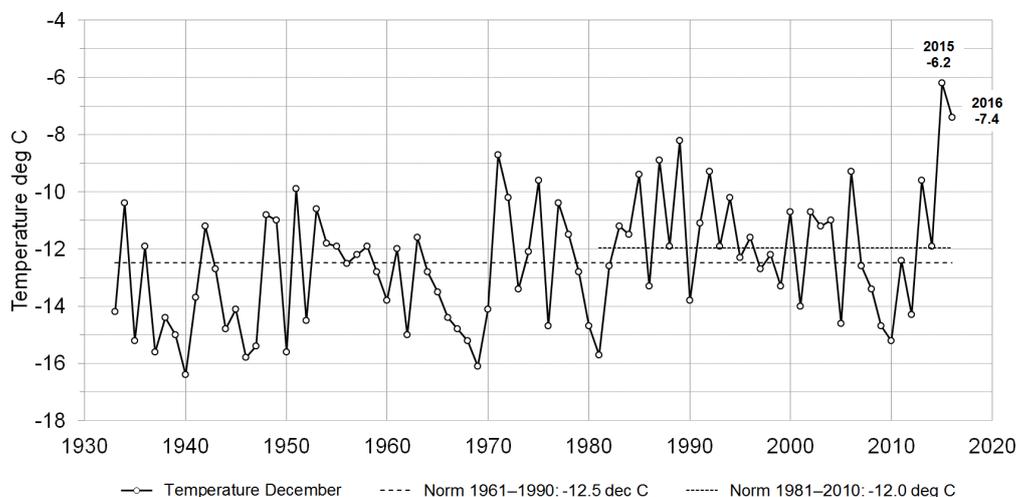


Figure 2. Temperatures December from 1933 to 2016 at the Jungfrauoch (3580 m asl; homogeneous data).

Annual balance

In most parts of Switzerland the annual temperature 2016 was 0.4 to 0.9°C above the normal values 1981–2010. A few meteorological stations recorded smaller surpluses of only 0.2 to 0.3°C or slightly over 1°C. Averaged across the country the annual temperature was 0.7 °C above normal values. Taking this into account, the year 2016 is among the ten warmest since observations started in 1864.

North of the Alps annual precipitation reached in many parts between 90 and 120 percent of normal values 1981–2010. The Alps and regions south of the Alps received mostly between 80 und 110 percent of the normal annual total. The first half year with its exceptional amount of precipitation north of the Alps supplied already 75 to 90 percent of the normal annual amount in some regions.

Overall, Switzerland registered an annual total of sunshine duration which amounted to between 90 and slightly over 100 percent of normal values 1981–2010. Across the country only the months of August, September and massively December brought sunshine duration above normal values. July supplied normal to above-average values to all of Switzerland, March supplied normal to above-average values to the Alps and Southern Switzerland. In the remaining seven months sunshine duration was below average in many parts.

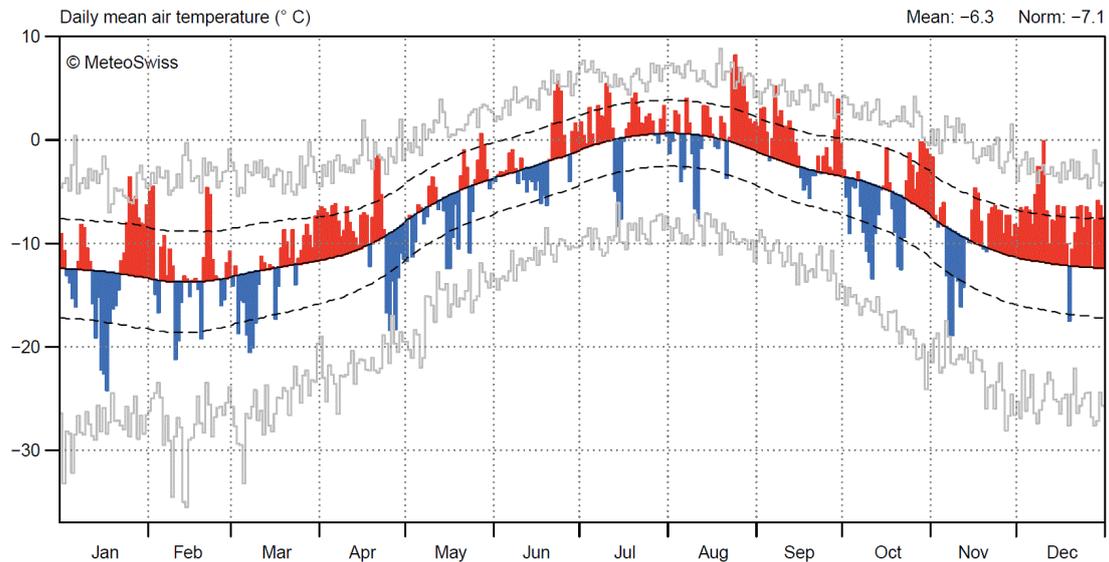


Figure 3. Development of the 24-hour mean temperatures 2016 at the Jungfrauoch (3580 m asl), in relation to the long-term mean value 1981–2010 (solid line) and the long-term mean fluctuation (dashed line, standard deviation). The two grey curves show the highest and the lowest 24-hour mean temperatures since observations started.

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