

The weather in 2018

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Warmth and a lack of rain without end, this is how the year 2018 presented itself in Switzerland. Ten out of twelve monthly temperatures were substantially above normal values, six of these reaching extremes. The endless warmth resulted not only in a new annual record, it also meant that the summer half year was as warm as never before since measurements started in 1864. The record warm temperature was also accompanied by an unusual lack of rain, lasting for months. In Eastern Switzerland the massive rain deficit turned into a once-in-a-century event.

As can be seen in Table 1 below, the temperature 2018 was well above the norm value 1981–2010 (reference period), with a slightly smaller deviation in the high Alpine regions in comparison to the lowland regions north of the Alps. Precipitation totals reached the normal value in the Jungfrau region. In many parts of Switzerland the annual precipitation amounts were between 80 to 95 percent of the normal values 1981–2010.

Record breaking nationwide annual temperatures

The annual temperature in the nationwide average reached 6.9 °C, the highest value since measurements started in 1864. The year 2018 is the fourth in a short succession with a far-above-average temperature. Together with the previous record years of 2015 with 6.6°C, 2014 with 6.5°C and 2011 with 6.6°C it stands out clearly from all other years since the beginning of observations in 1864.

On the Jungfrauoch the annual temperature reached -5.8 °C. It was the second warmest year since the beginning of the measurement in 1933. At this high elevated site the year 2018 is the third in a short succession with a far-above-average temperature.

Table 1. Annual values 2018 referring to the parameters temperature and precipitation as well as the deviations from the reference period 1981–2010 for the stations Jungfrauoch and Berne. As precipitation is not measured on Jungfrauoch the values pertaining to the Kleine Scheidegg are used here.

	<i>Jungfrauoch</i>	<i>Berne</i>
Average temperature	-5.8 °C	10.5 °C
Deviation	+1.4 °C	+1.7 °C
Precipitation	1596 mm	907 mm
Deviation	98 %	86 %

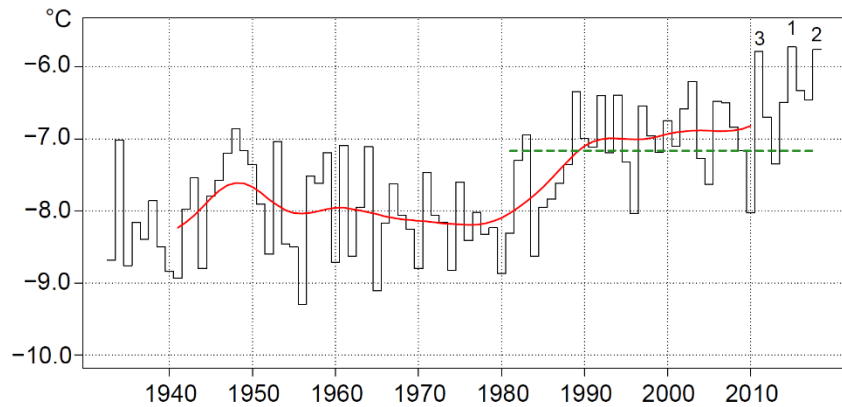


Figure 1:
Annual temperature from 1933 to 2018 on Jungfrau-joch (3580 m asl). The year 2018 reached -5.8°C . The red line shows the weighted average over 20 years. The green dashed line shows the Normal 1981–2010 (-7.2°C).

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Normal winter temperature, record warmth in January

In the nationwide average, the winter temperature for 2017/18 was within the normal value range for 1981–2010. However, there were wide fluctuations from month to month. Over the whole of Switzerland December temperatures were 0.6°C below normal for 1981–2010, in February it was 3.0°C colder than the normal value. In the midst of these two months January was unusually warm. In January 2018 the meteorological station Geneva registered the record-breaking temperature of 6.0°C . Previously, the mildest January values in Geneva were around 4.5°C . In the nationwide average, too, January 2108 came top in the long series since observations started in 1864 with 3.1°C above the normal value for 1981–2010.

Abundant snow in the mountains

In a number of regions, winter precipitation amounted to over 130 percent of the normal value for 1981–2010. Many areas in the Canton of Valais and some regions in the Canton of Grisons registered over 200 percent. South of the Alps there were regions registering 150 percent, locally even 180 percent of the normal value.

In January 2018 95 weather stations announced record monthly precipitation. In 72 of these stations measurement series go back more than 50 years. In Valais January 2018 brought not only the highest January precipitation total at four stations for over 50 years, but also the highest monthly-total overall: Zermatt measured 257 mm, Stalden/Ackersand 220 mm, Visp 328 mm and Grimentz 254 mm.

In the mountains huge amounts of snow fell in December and January. Especially in January the danger of avalanches was high to very high across wide areas of the Alps. Some valleys could only be reached by helicopter for several days. In Arosa at 1880 m the winter of 2017/18 brought the considerable fresh-snow total of 5.3 m. Only in the winter 2011/12 was there a higher fresh-snow total (5.8m) during the past 50 years. The habitually dry station of Grächen in Valais at 1600 m measured a winter fresh-snow total of over 2 m, which corresponds to one of the highest winter totals since observations started 50 years ago.

Stormy winter

North of the Alps the winter brought stormy weather. In the months of December and January the station Zurich-Fluntern

registered increased storm activity after several years of generally calm conditions. Especially the January storms caused some damage, in particular storm Burglind on 3 January 2018.

Substantial warming in spring

With spring 2018 as the second-warmest spring on Jungfrau-joch since the beginning of observations in 1933, the substantial spring warming continued unbroken. On Jungfrau-joch average March was within the range of the normal value 1981–2010. Nationwide average March recorded 1°C below the normal value 1981–2010. Certain regions south of the Alps registered 1° to 2°C below normal in March: one of the coldest months of March in 30 years.

March was followed by the second-warmest April on Jungfrau-joch and also nationwide. Averaged over the whole of Switzerland April values showed a surplus of 3.9°C , on Jungfrau-joch a surplus of 4.3°C compared with the normal value. And the warm weather continued. Spring ended with the fifth-warmest May countrywide and the second-warmest May on Jungfrau-joch with a surplus of 2°C above the normal value 1981–2010.

Accumulation of extremely warm summers

Summer 2018 – with its 15.3°C countrywide – was the third-warmest since the beginning of observations in 1864. It was the third summer in short succession with a far-above-average temperature. On the Jungfrau-joch summer 2018 was the fourth-warmest since the beginning of observations in 1933. The average of the three summer months June to July reached 1.1°C . Together with the summers 2017, 2015 and 2003 it stands out clearly from all the other summers since the beginning of observations.

Up to the year 2000 summers on Jungfrau-joch with a temperature of 0°C were considered to be extreme; 1°C was never surpassed. The average summer of the past with -1.8°C has disappeared from the Swiss climate. In the past 20 years the coolest summers recorded only slightly below -1°C . The evident, substantial increase in the summer temperature is one of the clear signals of current climate change.

10-day heat wave in the north

North of the Alps persistent summer heat set in from 30 July, with daily maximum temperatures of over 30°C in many places. The ten-day heat wave brought an average maximum temperature of 32° to 34°C to the low altitudes north of the Alps. In certain regions it

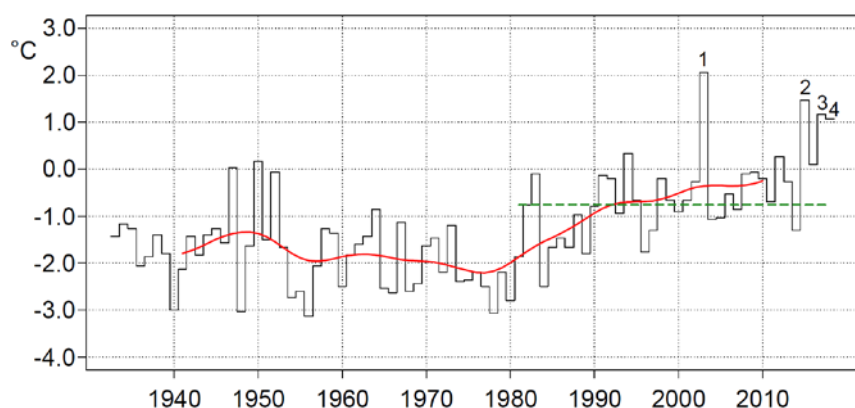


Figure 2. Average summer temperature from 1933 to 2018 on Jungfrauoch. The summer 2018 reached 1.1°C. The red line shows the 20-year running average, the green line the summer normal for 1981–2010 of -0.7°C. The summer 2018 was 1.8°C above the normal value for 1981–2010.

was the third or fourth most intensive heat wave since the beginning of observations, e.g. in Basel, Zurich and Lucerne.

Long spell of hot weather south of the Alps

Daily maximum temperatures south of the Alps rose locally to over 30°C on a regular basis, from as early as 22 July. The heat period lasted for 18 days. Locarno-Monti recorded the third most intensive 18-day heat wave since observations started in 1935. The average maximum temperature amounted to 32.6°C. It was comparable with the most intensive 18-day heat wave in summer 2003, with 32.8°C. Slightly hotter was the most intensive 18-day heat wave in Locarno-Monti in summer 2015 with 33.1°C.

Prolonged lack of rain

After a month of April with extremely little rainfall and a May also lacking in rain in many parts, summer brought another persistent lack of precipitation. Averaged across the entire country the rain total from June to August amounted to only 71 percent of the normal value 1981–2010. The summers with a more pronounced lack of rain were in 2015 and before that in 1983 and 1984. In several regions June brought only 20 to 40 percent of normal rain totals. Individual stations in the Central and Eastern Alps with measurement series spanning over 100 years registered a record deficit in June precipitation. In July a massive rain deficit with precipitation totals of only 20 to 30 percent of normal values 1981–2000 was observed locally on the Eastern Plateau and again along the eastern slopes of the Alps.

Sunshine records in summer

All three summer months turned out very sunny in the lowlands of Switzerland. Geneva registered 908 sunshine hours: the sunniest summer since observations started in 1897. A comparable total of sunshine hours, with slightly under 900 hours, was last observed in the summer of 2003. Basel with data reaching back to 1886 registered 835 sunshine hours, a value on a record-breaking scale. In Basel only the previous record summer of 2003 was on a par with 834 sunshine hours. On the Jungfrauoch the summer sunshine duration was in the normal range.

Summer half-year with record warmth

From April to September 2018 countrywide all months reached top temperature values placing them between the second- and seventh-warmest on an overall scale. The persistently high monthly

values resulted in a new nationwide warmth record for the summer half-year with a surplus of 2.4°C above the normal value 1981–2010. Even the outstanding heat of the legendary summer of 2003 was slightly surpassed. On Jungfrauoch the record warm summer half-year reached -1.0°C. This also corresponds to a surplus of 2.4°C above the normal value 1981–2010.

Autumn with record temperature in the south

Switzerland experienced the third-warmest autumn since observations began in 1864. Averaged over the entire country, the autumn temperature was 1.8°C above the normal value 1981–2010. Four out of the five warmest autumns have been registered within the last 15 years. The only two warmer autumns were 2014 with a surplus of 2.1°C and the record-breaking autumn of 2006 with 2.7°C above normal.

In certain regions south of the Alps the warmest autumn since the beginning of observations was recorded. In Lugano and Locarno-Monti the autumn temperature was 2.2°C above the normal value 1981–2010. In the warmest autumn so far, in 2006, the temperature in Lugano showed a surplus of 1.8°C, in Locarno-Monti 1.9°C compared with normal values.

Once-in-a-century lack of rain in Eastern Switzerland

In Eastern Switzerland the lack of rain persisting from spring to autumn turned into a once-in-a-century event. In the eight months from April to November only 59 percent of rainfall was recorded, compared with the normal value 1981–2010. There was a lack of rain corresponding to over three normal summer months. This is the most severe April–November rain deficit in Eastern Switzerland since the beginning of observations in 1864.

In the nationwide average the lack of rain from April to November 2018 occupies third place with 69 percent of the normal value 1981–2010. A similar rainfall deficit over the whole of Switzerland was recorded in the April–November period of 1921 with 68 percent of the normal value. So far, the most severe lack of rain was observed in the April–November period of 1962 with only 60 percent of the normal value 1981–2010.

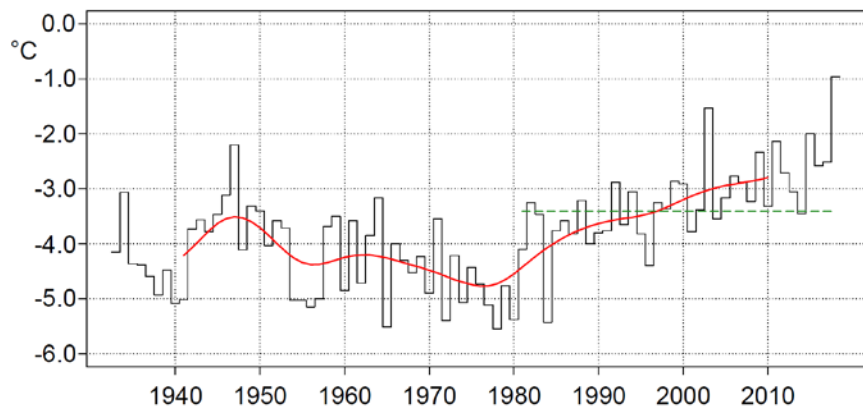


Figure 3. Average temperature of summer-half-year from 1933 to 2018 on Jungfrauoch. The summer-half-year 2018 reached -1.0°C . The red line shows the 20-year running average, the green line the normal 1981–2010 of -3.4°C . The summer-half-year 2018 was 2.4°C above the normal value 1981–2010.

Rain and snow

At the end of October and within three days, many parts south of the Alps registered 200 to 300 mm precipitation, locally even 400 mm. In neighbouring Grisons there were also substantial precipitation totals: over 200 mm. A large portion of it fell as snow. The station Arosa registered a new October record with 72 cm of fresh snow within a day. At the beginning of November heavy rainfall continued south of the Alps. On 6 November 2018 this led to flooding at Lago Maggiore.

While south of the Alps precipitation totals in October and November were clearly above the normal value 1981–2010, the two months were again decidedly lacking in precipitation north of the Alps. Only in December did the territory north of the Alps receive above-average precipitation, for the first time in a long while. Winter came to the Alps. Towards Christmas many parts of the mountains had a snow cover which corresponded to normal or slightly-above-average values (source: Institute for Snow and Avalanche Research SLF, Davos).

Annual balance

In most parts of Switzerland, the annual temperature in 2018 rose from between 1.5° to 2.0°C above the normal value 1981–2010. South of the Alps and in the Engadine values showed a surplus of 1.0° to 1.5°C compared with the normal value. Averaged for the whole of Switzerland the annual temperature registered was 1.5°C above the normal value 1981–2010 - a new record since observations started in 1864.

In many areas the annual precipitation total reached 80 to 95 percent, certain regions south of the Alps 100 to 115 percent of the normal value 1981 – 2010. The Valais received above-average amounts of between 110 to 150 percent of normal values. In Eastern Switzerland the annual total remained clearly below average, with only 70 to 80 percent of the normal value 1981 – 2010.

North of the Alps the annual total of sunshine hours in 2018 amounted to between 110 to 125 percent compared with the normal value 1981–2010. In the Alps and South of the Alps 100 to 110 percent of normal values were recorded. In some regions north of the Alps the year 2018 belongs among the 10 sunniest since observations started.

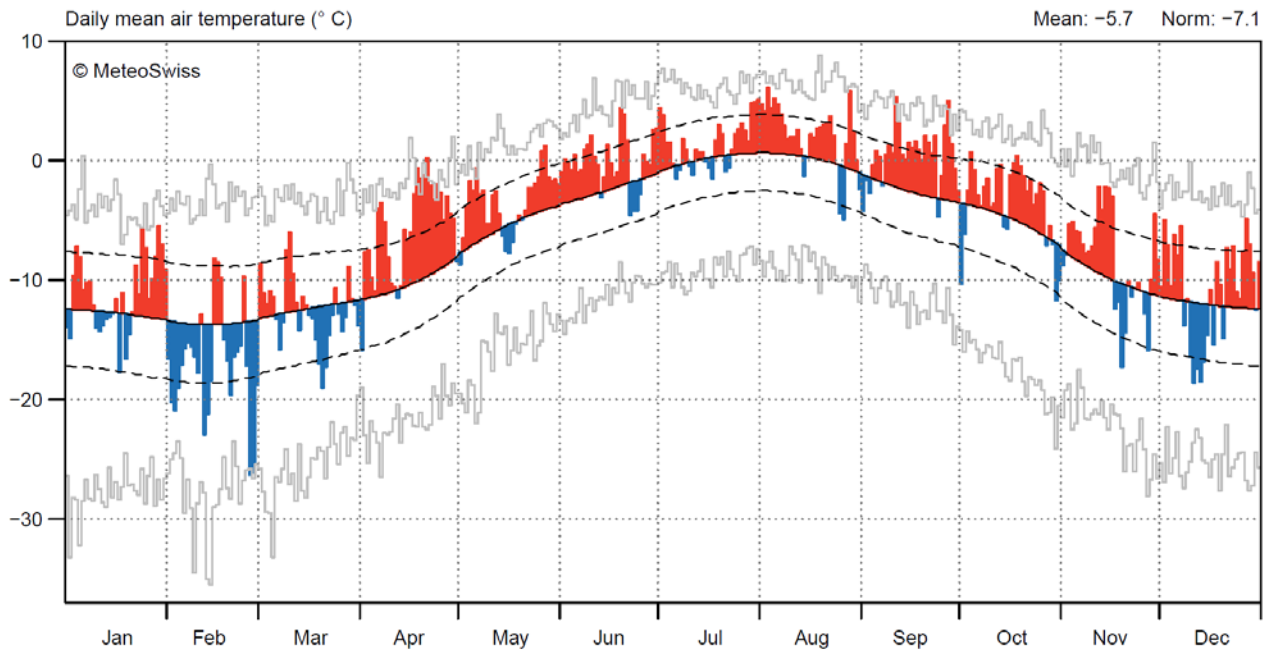


Figure 4. Development of the 24-hour mean temperatures 2018 on Jungfrauoch (3580 m asl), in relation to the long-term mean value 1981–2010 (solid line) and the long-term mean fluctuation (dashed line, standard deviation). The two grey curves show the highest and the lowest 24-hour mean temperatures since observations started. Three Missing values end of July (x).

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