

Name of research institute or organization:

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The weather in 2014

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Throughout 2014 weather extremes were chasing one another in Switzerland. Together with the year 2011 it was the warmest since observations started in 1864. After record snowfalls in the south at the beginning of the year the entire country experienced mild weather conditions during the first half of the year. High summer was characterized by rainy and cool weather and an extreme lack of sunshine everywhere. In July record precipitation fell north of the Alps. Autumn brought again extremely warm temperatures to all Swiss regions and record precipitation with flooding to the south.

As can be seen in Table 1 below, the temperature 2014 was well above the norm value 1981–2010 (reference period), with a significantly higher deviation in the lowland regions north of the Alps than in the high Alpine regions. Precipitation totals reached 114 percent of the normal value in the Jungfrau region and were in the range of the normal values in the lowland regions north of the Alps.

Table 1. Annual values 2014 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 at Jungfrauoch the values pertaining to the Kleine Scheidegg are used here.

	<i>Jungfrauoch</i>	<i>Berne</i>
Average temperature	-6.5 °C	10.0 °C
Deviation	+0.7 °C	+1.2 °C
Precipitation	1867 mm	1034 mm
Deviation	114 %	98 %

Together with 2011 warmest year since observations started

Averaged over the whole of Switzerland the year 2014 brought a temperature surplus of 1.24 °C compared with the normal value 1981–2010. In the previous record year 2011 the temperature was 1.21 °C above the climate normal. In view of the extremely minor difference both years have to be rated as equal in terms of surplus temperature. At Jungfrauoch the temperature surplus 2014 reached 0.7 °C compared with the normal value 1981–2010, i.e. rank 7 in the measurement series since observations started in 1933.

Record snow south of the Alps

From mid-December 2013 to February 2014 south-westerly and southerly currents were predominant in the Alpine regions. They brought enormous amounts of rain and snow to the

areas south of the Alps. Lugano recorded by far the highest amount of precipitation since observations started 151 years ago. It amounted to 698 mm - one third more than the total in the former record winter of 1950/1951. In Locarno-Monti the total even amounted to 754 mm. Here slightly less precipitation (722 mm) had been recorded in the previous record winter of 1950/1951.

As a result of the copious precipitation, a huge total of new snow was observed in higher regions south of the Alps. At the meteorological station Bosco-Gurin in the Ticino mountains almost 7 m of new snow was recorded between December and February. This is the highest value in the measurement series available since 1961. Segl-Maria in the Upper Engadin received a total of 4 m in the three winter months, representing the second-highest value in the measurement series spanning 150 years. However, the record winter of 1950/1951 brought far higher new snow totals (up to 7 m) to these regions.

A winter with a substantial lack of snow in the northern lowland regions

The three winter months brought hardly any snow to the northern lowland regions. The meteorological station Zurich-Fluntern registered only 1 cm of new snow in January. It was the winter with the least amount of snow in the Zurich measurement series spanning over more than 80 years. In addition, the winter half-year ranked second in terms of lack of snow – there was only some additional snowfall amounting to 25 cm in November 2013. This was in stark contrast to the previous year when Zurich recorded a winter half-year with the most new snow for over 40 years (slightly above 2 m).

Third-warmest winter in Switzerland

The prevalent south-westerly and southerly currents of the winter provided an ideal basis for an almost permanent influx of mild air masses from the sub-tropical Atlantic, from the western Mediterranean and from Northern Africa. At the same time conditions north of the Alps were perfect for the development of Foehn situations. The permanent arrival of warm air eventually led to the third-warmest winter in Switzerland since observations started 150 years ago. Under the influence of the Foehn, the Rhine valley near Chur registered the warmest winter in its measurement series, which in this area spans 120 to 140 years. At Jungfrauoch winter temperature reached rank ten in the measurement series available since 1933.

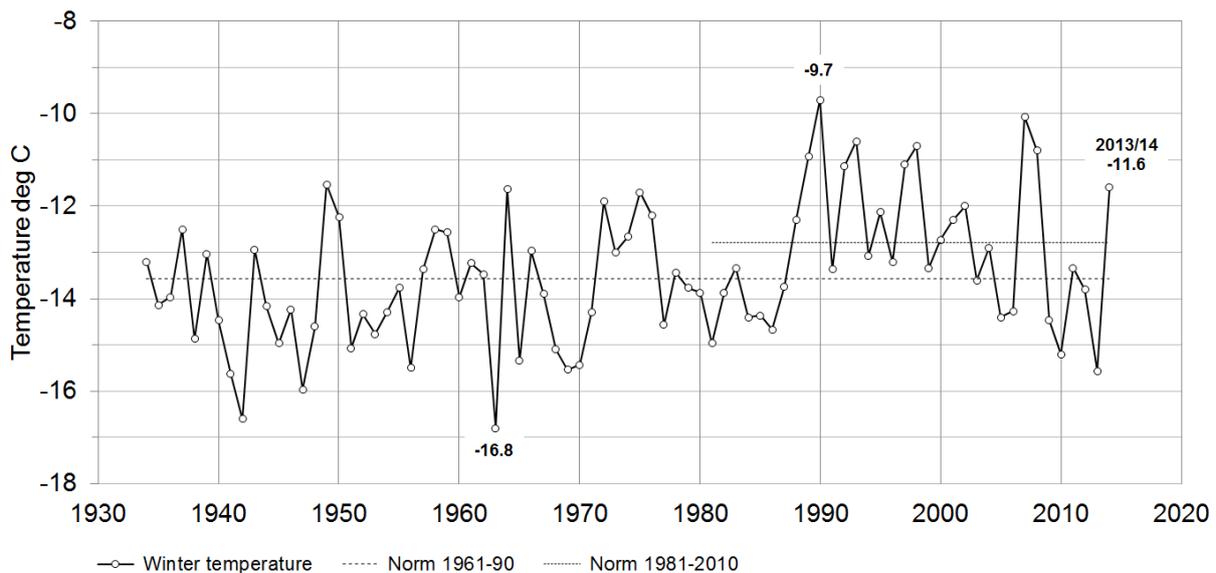


Figure 1. Winter temperatures (DJF) from 1933/34 to 2013/14 at Jungfrauoch (3580 m asl; homogeneous data).

Mild and very sunny in spring

The above-average warmth of the winter also persisted in the months of March and April, accompanied by very sunny weather and widespread dry conditions which continued until May in the cantons of Ticino and Grisons. Spring again brought some heavy snowfall to parts of the Ticino mountains. At the meteorological station Bosco-Gurin the new snow total eventually reached over 9 m for the entire winter half-year October 2013 to April 2014 - the second-highest total in the measurement series available since 1961.

First half of the year extremely warm

In the first half year all the months except May recorded above-average temperatures. The persistent temperature surplus led to the third-warmest first half-year since observations started 151 years ago. Averaged for Switzerland as a whole, the mean temperature from January to July was 1.5 °C above the normal value 1981–2010. It was comparable to the first half-year 2011 when a surplus of 1.6 °C was recorded. The first half-year 2007 with a mean temperature 2.3 °C above the normal value 1981–2010 was, however, significantly warmer – by almost one degree - than its counterpart in 2014. This comes as no surprise considering the fact that in 2007 the warmest winter (2006/2007) was followed by the second-warmest spring (2007) since observations started.

Short heat wave in early summer

Summer began with a heat wave lasting about a week in the first half of June. In many areas temperatures rose to between 31 and 34 °C. The highest temperatures were recorded in Sion (36.2 °C) and in Basel (35.5 °C). At many meteorological stations record temperatures for the first half of June were observed.

Record rain and record lack of sunshine in high summer

During the high-summer months of July and August frequent and often heavy rainfall was the decisive weather element. Especially in July there were excessive amounts of rain. In the western half of Switzerland a substantial number of stations measured new record totals of July rainfall, in the eastern half this was true for a few stations. There was flooding and mudslides in many areas, in some places causing considerable damage. The region Emmental-Entlebuch was affected several times.

The persistently rainy weather resulted in an unparalleled record lack of sunshine in western Switzerland and in Ticino. Here the two high-summer months together yielded a total of only 360 sunshine hours. In the high-summer 1980 – the former record-holder in terms of lack of sunshine – values in these regions were between 410 and 430 sunshine hours.

On the Swiss Plateau, too, the high-summer yielded the least amount of sunshine in the measurement series with only 310 hours. Here the difference to the high-summer 1980 – former record-holder in terms of a lack of sunshine - was notably smaller since 330 sunshine hours were observed at that time on the Plateau. In general homogenous measurement series of sunshine hours dating back to 1959 are available in Switzerland.

At Jungfrauoch an unparalleled record lack of sunshine was observed for the whole summer (June-August). Here the three summer months together yielded a total of only 432 sunshine hours (76 percent of the mean 1981–2010).

Extremely warm temperatures in autumn and flooding in the south

With mild and overall dry conditions September brought some – if only temporary - stability to the turbulent weather developments in Switzerland. It was followed by the fourth-warmest October and the second-warmest November since observations started in 1864 – this for the whole of Switzerland. At mid-altitude stations November temperatures even reached record values, such as in Davos, Engelberg or La Chaux-de-Fonds. Together with the equally-mild

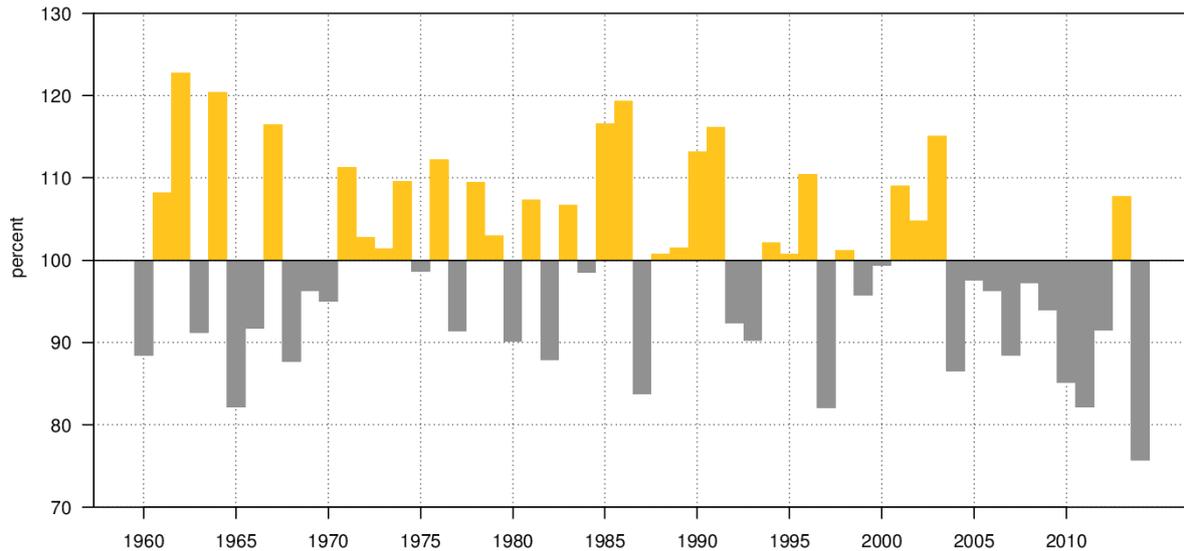


Figure 2. Sunshine duration summer (June-August) from 1960 to 2014 at Jungfraujoch (3580 m asl) in percent to the mean 1981–2010 (homogeneous data). 100 percent: 568 hours. Yellow bars: years above mean 1981–2010; grey bars: years below mean 1981–2010.

September, the result was the second-warmest autumn in the Swiss measurement series spanning over 151 years (averaged over the whole of Switzerland).

Along with extremely high temperatures, very wet weather arrived south of the Alps. After an October with already large amounts of rain there was extreme precipitation in November mainly in Ticino. Regionally, precipitation was four or five times the amount of an average November: Lugano registered 587 mm, an amount which resulted in the wettest November in its measurement series spanning 151 years; in Locarno-Monti November rainfall was, with 733 mm, the second-highest in the measurement series available since 1883; at the station Càmedo in the Centovalli precipitation amounted to 1143 mm which corresponds to the fifth-highest precipitation ever observed in Switzerland as a monthly total.

As a consequence of the persistently heavy precipitation, water levels in the lakes Lago Maggiore and Lago di Lugano rose significantly. Towards mid-November there was flooding at both lakes for several days, affecting shores and some urban areas of Lugano and Locarno. At Lago di Lugano water levels rose to a maximum of 271.88 m a.s.l. - only a few centimetres below the absolute maximum of 272.08 m a.s.l. recorded in November 2002. At Lago Maggiore the maximum water level remained about one meter below the absolute maximum of October 2000.

Waiting for winter

The above-average temperatures of autumn continued into December. Snow was mostly confined to altitudes above 1000 to 1500 m a.s.l., and that in below-average amounts. Even after the middle of December alpine snow cover reached only 30 to 60 percent of the normal amount in most areas. Approximately-normal snow conditions were restricted to the southern valleys of the Valais with 60 to 90 percent of normal snow amounts.

Strong onset of winter towards the end of the year

With cold air from north-west and north the weather switched from extremely mild to wintery cold within two days from 26 December onward. North of the Alps there was snowfall down to lowland areas from 26 to 29 December. Locally 20 to 30 cm of new snow were recorded in lower areas; in higher areas on the northern slopes of the Alps and in the Jura the new snow amounted to between 40 and 60 cm.

In Hallau in the canton of Schaffhausen the temperature fell to minus 21.1 °C in the morning of 29 December. This is by far the lowest December value in the measurement series spanning over more than 50 years. On 29 and 30 December temperatures remained below freezing point all day in most parts of Switzerland. Exceptions were the Lac Lemman region and Ticino.

Annual balance

In many areas the annual temperature in 2014 was between 1.0 to 1.4 °C above the normal value 1981-2010, about 1.0 °C south of the Alps and in the Engadin. Averaged over the whole of Switzerland the surplus amounted to 1.2 °C, thus equalising the previous record warmth of the year 2011.

In most regions annual precipitation reached normal or slightly below-average totals. South of the Alps and in the Engadin the year was significantly too wet compared with the reference period 1981-2010. In Lugano and Locarno-Monti the third-wettest year in the measurement series spanning well over 100 years was recorded, bringing 150 to 160 percent of the standard amount of precipitation. The last time such amounts were observed was in 1960 with a slightly higher percentage (over 160 percent) of the precipitation normal 1981–2010.

In many areas sunshine duration lay within the climate normal 1981–2010. In certain areas, however, the year was one with more sunshine than usual, such as in Zurich with 111 percent and in Lucerne and Neuchâtel with 110 percent of the normal value. In contrast, the Cantons of Grisons and Ticino and exposed high-mountain areas experienced a year with very little sunshine (only from 80 to 90 percent of normal values). In the Upper Engadin the year came third in terms of lack of sunshine, while on the Säntis and on the Jungfrauoch it ranked fourth. Homogenous measurement series of sunshine hours dating back to 1959 are available.

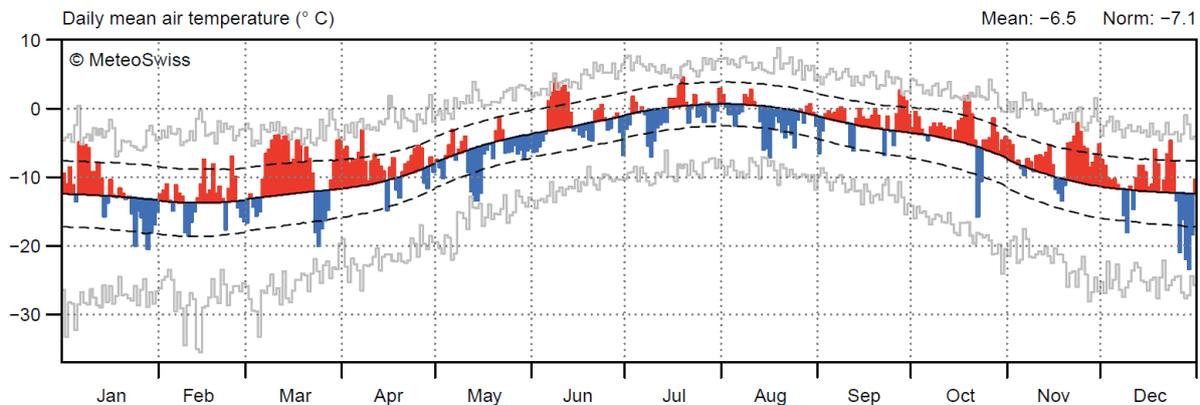


Figure 3. Development of the 24-hour mean temperatures 2014 at Jungfrauoch (3580 m asl), in relation to the long-term mean value 1981–2010 (solid line) and the long-term mean fluctuation (dashed line, standard deviation). The two grey curves show the highest and the lowest 24-hour mean temperatures since observations started.

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