

# The weather in 2021

**Stephan Bader<sup>1</sup>, Brigitta Klingler Pasquil<sup>2</sup>**

<sup>1</sup> Climate Division MeteoSwiss, Zurich-Airport, Switzerland

<sup>2</sup> English translation

stephan.bader@meteoswiss.ch

## Report for the International Foundation HFSJG

In the year 2021, for once, it was not high temperatures but abundant precipitation that was the dominant weather element in Switzerland. A mild and wet winter with heavy snowfalls locally was followed by a cold spring with a wet finish. North of the Alps the summer was one of the wettest since the beginning of observations. The persistently high amounts of rain led to the flooding of several rivers and lakes towards mid-July. In contrast to the wet summer, autumn was in most parts lacking in precipitation, but with plenty of sunshine.

As can be seen in Table 1 below, on Jungfraujoch and in the lowland region Berne north of the Alps the temperature 2021 was slightly above normal values 1981–2010. Precipitation amounts were also slightly above normal values at both measurement sites.

### Annual temperature in comparison

Averaged across the country the annual temperature 2021 was at 0.3 °C above normal values 1981–2010. Compared with normal values 1991–2020 – as employed from 2022 – the annual temperature remained slightly below average. Between the two normal periods lies a warming of 0.5 °C. Since the pre-industrial

normal value 1871–1900 (3.9 °C) the annual temperature in Switzerland has risen by around 2 °C.

On Jungfraujoch the annual temperature 2021 was at 0.2 °C above normal values 1981–2010 and at 0.3 °C below normal values 1991–2020. From the normal period 1981–2010 (-7.2 °C) to the normal period 1991–2020 (-6.7 °C), the annual temperature on Jungfraujoch has increased by 0.5 °C.

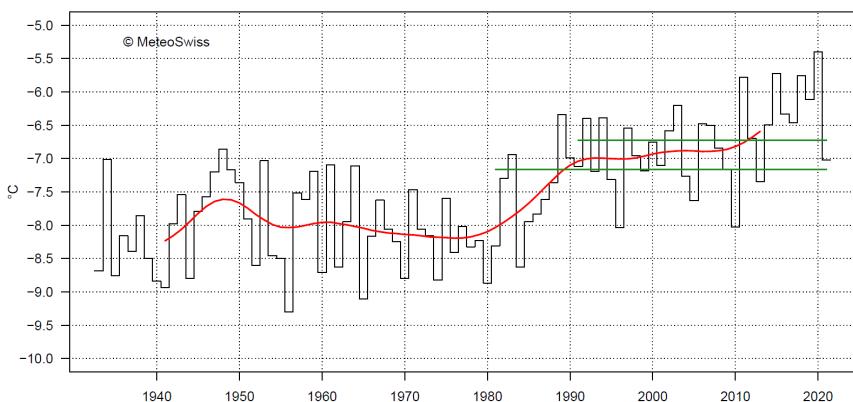
### Winter with a very mild finish

The winter temperature December 2020 to February 2021 registered over the entire country at 0.9 °C above normal values 1981–2010. Locally, one of the ten mildest winters since the beginning of observations in 1864 was recorded. It was mainly a very mild February which contributed to this result.

In the country-wide average, December was 0.5 °C milder than normal values 1981–2010. In mountain regions, December values remained regionally up to 1 °C below normal 1981–2010. January, too, turned out cold in mountain regions above 1000 m a.s.l., with values up to 2 °C below normal values 1981–2010. North of the Alps, however, January temperatures were above normal in certain areas.

*Table 1: Annual values 2021 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 | -7.0 °C             | 9.2 °C       |
| Deviation           | +0.2 °C             | +0.4 °C      |
| Precipitation       | 1803 mm             | 1137 mm      |
| Deviation           | 111 %               | 107 %        |



*Figure 1. Annual temperature from 1933 to 2021 on Jungfraujoch (3580 m asl). The year 2020 reached -7.0 °C. The red line shows the weighted average over 20 years. The green dashed line shows the Normal 1981–2010 (below, -7.2 °C) and 1991–2020 (above, -6.7 °C).*

With a country-wide average of 3.1 °C above normal values 1981–2010 Switzerland recorded one of the ten mildest months of February since measurements began in 1864. Many days with temperatures far above average were countered by a short cold spell. With 3.9 °C above normal values 1981–2010 Jungfraujoch registered the fourth-mildest February since the beginning of observations.

#### Record temperatures in February

In the last third of February along with a lot of sunshine, there were record-breaking maximum day temperatures north of the Alps. At Vaduz station, a new record of 21.9 °C on 21 February 2021 generated almost early-summer conditions.

#### A winter rich in precipitation

High levels of precipitation and vast amounts of snow in certain areas characterized the months of December and January, resulting in widespread above-average winter precipitation totals. Locally, it was one of the winters with the highest amount of precipitation since the beginning of measurements. In December the precipitation totals in Val Müstair and in Val Poschiavo reached new monthly records. There were copious amounts of fresh snow in the Alps, extending down to lower altitudes south of the Alps. In January, many observation stations registered the highest amounts of precipitation in at least the past 60 years. Precipitation totals in the mild month of February remained below average in many parts. Only southern stations received above-average amounts. Due to the mild air, precipitation often fell as rain even in higher altitudes.

#### Local snowfall records

In January with its copious precipitation, snow often fell also at low altitudes north of the Alps. In mid-January, Eastern Switzerland experienced one of the most severe snowfalls since the beginning of observations. The Chur station registered 82 cm: the highest 3-day fresh-snow total in the measurement series stretching back over more than 100 years.

#### Lack of sunshine in the South

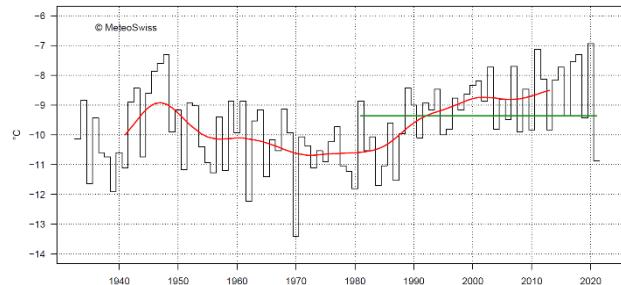
As a consequence of frequent precipitation, winter south of the Alps was mostly cloudy. At Locarno-Monti the sunshine total in winter registered at 75 % of normal values 1981–2010, at Lugano at 77 % of normal values: this corresponds to 3<sup>rd</sup> and 4<sup>th</sup> place respectively in the 60-year homogenous observation series. In winter a lack of sunshine was also recorded in summit locations, in

the Central Valais and in the Jura. In all other areas values mostly reached 80 to 100 % of normal values 1981–2010.

#### Sahara dust

In February two Sahara dust events in Switzerland led to massive opacity of the atmosphere, especially during the first event on 6 February. During the second surge from 22 to 25 February, opacity of the atmosphere was clearly evident, however, not as pronounced as during the first event.

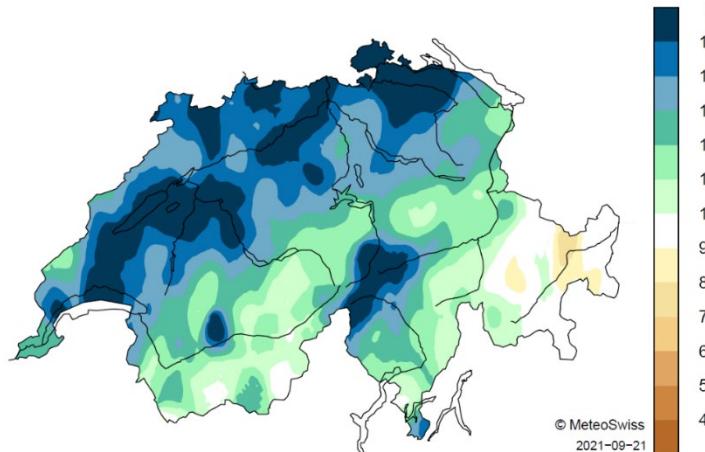
#### Cold spring with a wet finish



*Figure 2. Spring temperature from 1933 to 2021 on Jungfraujoch (3580 m asl). Spring 2021 reached -10.9 °C. The green line shows normal values 1981–2010 (-9.4 °C). The red line shows the 20-year running average.*

Switzerland and Jungfraujoch experienced the coldest spring for over 30 years with a country-wide average of 1.1 °C below normal values 1981–2010 (1.5 °C below normal values 1981–2010 on Jungfraujoch). After a March registering slightly above average, a cold period commenced in April and May. Averaged over the entire country, it was the coldest April in the past 20 years. The country-wide May temperature remained on average 2.3 °C below normal values 1981–2010. In the past 30 years only the May months of 2019 and 2013 registered similarly cool temperatures. On Jungfraujoch it was even the coldest May in the past 30 years (2.8 °C below normal values 1981–2010).

After March and April with little precipitation, most regions in Switzerland received abundant precipitation in May, with the exception of areas south of the Alps. Locally, May totals amounted to as much as 250 % of normal values 1981–2010. It was the beginning of a 3-month period with unusual precipitation intensity.



*Figure 3. Regional distribution of precipitation totals in the summer 2021, displayed in % of normal values 1981-2010.*

#### Wet summer

North of the Alps, the summer 2021 was one of the wettest in the long-term series, registering locally above 160 % of normal values 1981–2010. Berne registered the third-wettest summer since the beginning of measurements 1864: 162 % of normal values 1981–2010. In Alpine regions, Göschenen recorded the clearly wettest summer since observations started in 1883: 191 % of normal values 1981–2010. Here, similar precipitation totals were observed in the severe-weather summer of 1987 with around 180 % of normal values 1981–2010.

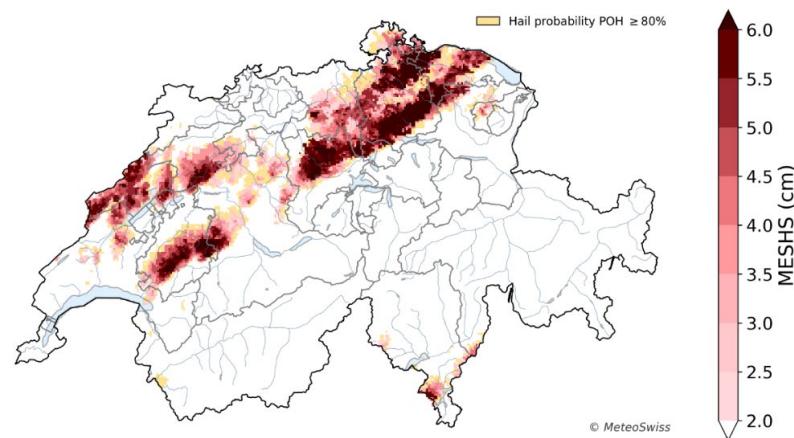
South of the Alps precipitation totals in summer reached high values above all in north-western Ticino. Airolo registered around 170 % of normal values 1981–2010, making it 8<sup>th</sup> in the measuring series starting in 1884. In other areas south of the Alps precipitation totals remained rather moderate with 100 to 140 % of normal values 1981–2010.

#### Flooding

North of the Alps and in certain regions, summer saw the wettest June and the wettest July recorded since observations began, and this after a May with copious amounts of precipitation. At several meteorological stations with long-term series, July was altogether the wettest month since the start of observations. Towards mid-July, the persistently large amounts of precipitation led to the flooding of several rivers and lakes north of the Alps, some of them bursting their banks.

#### Massive hailstorms

North of the Alps, June in particular brought several disastrous hailstorms. Hailstones reached sizes up to 6 or 7 cm and more in certain regions – a rare occurrence. The hail devastated greenhouses, roof tiles, harvests and gardens. In addition, blocked drainpipes – caused by ripped-down foliage – contributed to flooding. On 28 June 2021 Switzerland experienced its second most extensive hail event since beginning of the data series 2002, covering 9000 km<sup>2</sup>.



*Figure 4. The swath cut by hail on 28 June 2021. Daily maximum (cm) of maximum expected severe hail size (MESHS) for the Swiss radar domain. Hail smaller than 2 cm is possible in orange areas (hail probability  $\geq 80\%$ ). The selected region (state, i.e. Canton) is indicated by black contours.*

Especially in July, hailstorms caused a lot of damage to crops south of the Alps. In certain regions a total loss of grape and vegetable harvests was noted. Hailstones had a diameter of 4 to 5 cm. In those parts, hailstones of such a size are observed on average only every 10 to 20 years.

#### Few hot days locally

In summer 2021 the temperature, averaged over the entire country, reached 13.8 °C. This corresponds to 0.5 °C above normal values 1981–2010 and is within the margin of averages of the past 30 years. In particular, the fourth-warmest June in Switzerland contributed to the summer warmth. July and August temperatures remained below normal values 1981–2010.

In many parts of Switzerland, the number of hot days with daily maximum values of 30 °C and more remained below 10. Geneva counted 8 hot days in the three summer months June to August, while 15 are considered to be the norm. Neuchâtel registered only one hot day, compared with 7 according to normal values 1981–2010. South of the Alps, hot days mostly amounted to between 10 and 15, at Biasca to just about 20. Normal values 1981–2010 are between 8 and 11 hot days in those parts.

The very warm summers of 2015, 2017, 2018 and 2019 provided for between 20 and over 30 hot days in some Swiss regions. Individually there were even around 40 hot days. A particularly extreme summer was 2003 with 50 to almost 70 hot days south of the Alps and, in certain areas, 40 to 50 hot days north of the Alps and in the Valais.

#### Little precipitation in autumn

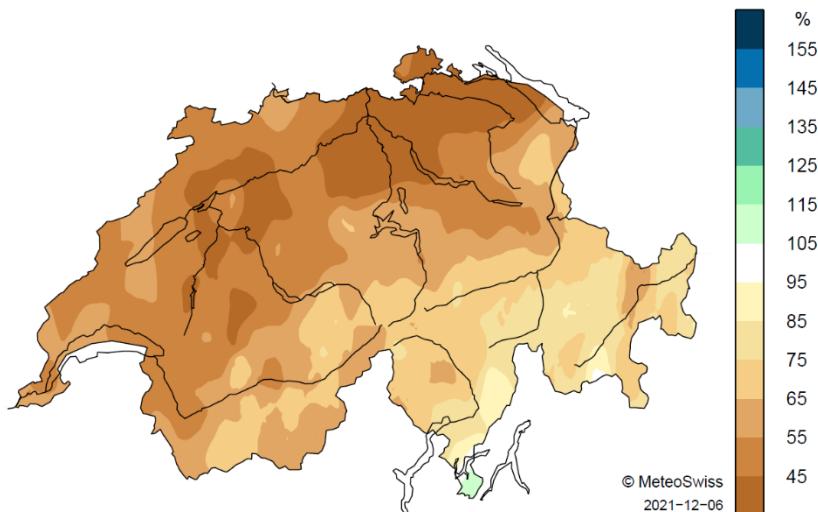
Autumn in Switzerland was characterized by a widespread lack of precipitation in all of the three months September to November. In certain regions north of the Alps, it was one of the autumns with the least recorded precipitation since the beginning of observations in 1864. In Zurich precipitation amounted to only 31 % of normal values 1981–2010, registering the lowest precipitation total since the start of observations in 1864. In Berne the lack of precipitation came second in the series stretching back to 1864. The precipitation total there amounted to 37 % compared with normal values 1981–2010.

#### Plenty of sunshine

Thanks to the sunny months of September and October, Switzerland experienced an altogether sunny autumn with slightly above-average temperatures. Locally, it was even the sunniest autumn in the past 60 years. Berne registered the fourth-sunniest, Basel, Neuchâtel, Zurich and Lucerne the sixth-sunniest autumn since 1961.

There were above-average sunshine hours in September and October, above all, north of the Alps. In certain areas, one of the sunniest Septembers in the past 60 years was recorded. Geneva registered the sixth-sunniest October since observations started in 1897.

In November, however, sunshine duration remained in many areas below normal values 1981–2010 due to frequent events of high fog.



*Figure 5. Geographical distribution of precipitation totals in autumn 2021, displayed in % of normal values 1981-2010.*

## Winter takes over

Alps received a lot of snow in many areas: 4-day fresh snow totals amounting from 50 to 60 cm. The highest daily fresh snow totals reached around 40 cm, locally even more than 50 cm.

From 3 to 4 November, the observation station Segl-Maria in the Upper Engadine registered 56 cm of fresh snow. Along with November 1898, this was the second highest daily fresh snow total for the month of November since the beginning of observations in 1864.

At the end of November snow fell on both sides of the Alps down to low altitudes. Snowfall even at low altitudes persisted in the first days of December. At the end of the first third of December many mountain areas registered average or above-average snow totals. Snow depth in the Jura was significantly above average. In mountain regions south of the Alps snow depth remained below average in many regions.

## Mild end to the year

Towards the end of the year there was widespread heavy rain up to high altitudes. In mild weather conditions the snow line rose to around 2500 m. At the end of the year the maximum day temperature rose to approximately 16 °C in the north, 19 °C in the south. Several stations registered the highest December minimum temperatures in the period with homogeneous minimum values. At the end of the year the zero-degree line rose to above 3400 m – in the middle of winter.

## Summary

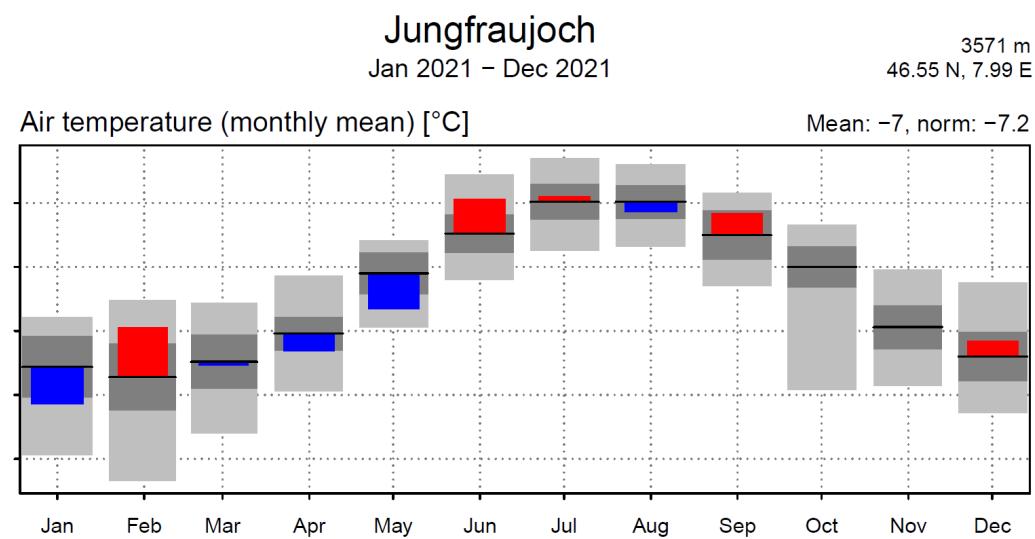
In many regions of Switzerland the annual temperature 2021 was 0.1 to 0.5 °C above normal values 1981–2010. In certain areas of the Ticino values were between 0.5 and 0.7 °C above normal values 1981–2010. The Engadine stations recorded an annual temperature between 0.2 below and 0.2 °C above normal values 1981–2010. The country-wide average annual temperature was 0.3 °C above normal values 1981–2010.

In many parts of the country annual precipitation totals 2021 reached 90 to 115 % of normal values 1981–2010. South of the Alps and in the Alps, values reached between 80 and 90 % of normal values 1981–2010 in certain locations.

The annual total of sunshine duration 2021 amounted in many parts to between 100 und 110 % of normal values 1981–2010. In southern Ticino it rose to approx. 120 % of normal values 1981–2010. On the Jura heights, sunshine duration remained very slightly below normal values 1981–2010 in certain locations.

## Address

Bundesamt für Meteorologie und Klimatologie MeteoSchweiz  
Abteilung Klima  
Operation Center 1  
Postfach 257  
CH-8058 Zürich-Flughafen  
e-mail: klimainformation@meteoschweiz.ch  
<http://www.meteoschweiz.admin.ch/home.html?tab=overview>



*Figure 6. Monthly mean temperature 2021 on Jungfraujoch (3580 m asl) in relation to the monthly long-term mean value 1981–2010 (solid black lines). Red bars show above, blue bars below normal monthly temperatures. The dark grey ranges show the monthly long-term mean fluctuation (standard deviation 1981–2010). The light grey ranges show the highest and the lowest monthly mean temperature since observations started.*