

Name of research institute or organization:

**MeteoSwiss, Zürich**

Title of project:

The weather in 2010: Report for the International Foundation HFSJG

Report by:

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Project description:

In Switzerland in 2010 it was slightly warmer and in the western part of the country somewhat drier than usual. From the beginning of the year through the middle of March the weather was mainly characterized by low winter temperatures with frequent snow fall especially in the plains. Phases of fair weather occurred starting from the second half of March and especially in the second half of April. The early part of the summer, starting with May, was mainly rainy, cool and unusually cloudy until the second half of June. Mid-June to mid-July was a hot summer period and dry especially in the west. During the rest of the summer and autumn the weather was unsettled with frequent snowfall in the mountains. By November it snowed in the plains. December brought even more new snow to the lowland and unusually low temperatures in the high mountain areas.

Compared with the long term mean from 1961-1990, the year 2010 was slightly warmer in the plains north of the Alps, and in the high mountain areas slightly cooler, as shown below in table 1. The temperature surplus in Bern was +0.7 degrees and at Jungfrauoch it was -0.1 degree warmer than the long term mean. The amount of precipitation in the Jungfrau region was within the range of the long term average.

Table 1: Comparison of temperature and precipitation 2010 in respect to the long-term mean 1961-1990 at the stations Jungfrauoch and Bern. For temperature the deviation from the long-range mean is shown. Precipitation is expressed relative to the average amounts. Because precipitation is not measured at Jungfrauoch, values from Kleine Scheidegg have been used instead.

	Jungfrauoch	<i>Bern</i>
mean temperature	-8.0 °C	8.6 °C
deviation	-0.1 °C	0.7 °C
precipitation	1517 mm	915 mm
relative to average	96 %	89 %

### Harsh winter in the plains

The first few weeks of the year brought typical winter conditions. Switzerland registered the coldest January in the last 23 years. Although the daily temperatures were not extremely low, they remained below average for almost the entire month.

It snowed often in the plains north of the Alps, but the amounts were usually small. In January Zürich broke its record with 16 days of measurable new snowfall; in Basel the registered 11 days were the second highest value of the measurement series. Heavy snowfall covered western Switzerland in mid-January and toward the end of the month even greater amounts fell in the eastern part of the country.

The first few days of February were extremely cold. In La Brévine the temperature sank to -35.6 degrees and in Engadin to -25 degrees to -30 degrees. Except for one short foehn phase, the cold winter weather with snowfall into the plains continued through the middle of February. High mountain stations registered the coldest winter in around 30 years. At Jungfraujoch and Grosser St. Bernhard it was even the coldest winter in 40 years.

Winter temperature Jungfraujoch 1937/38 - 2009/10

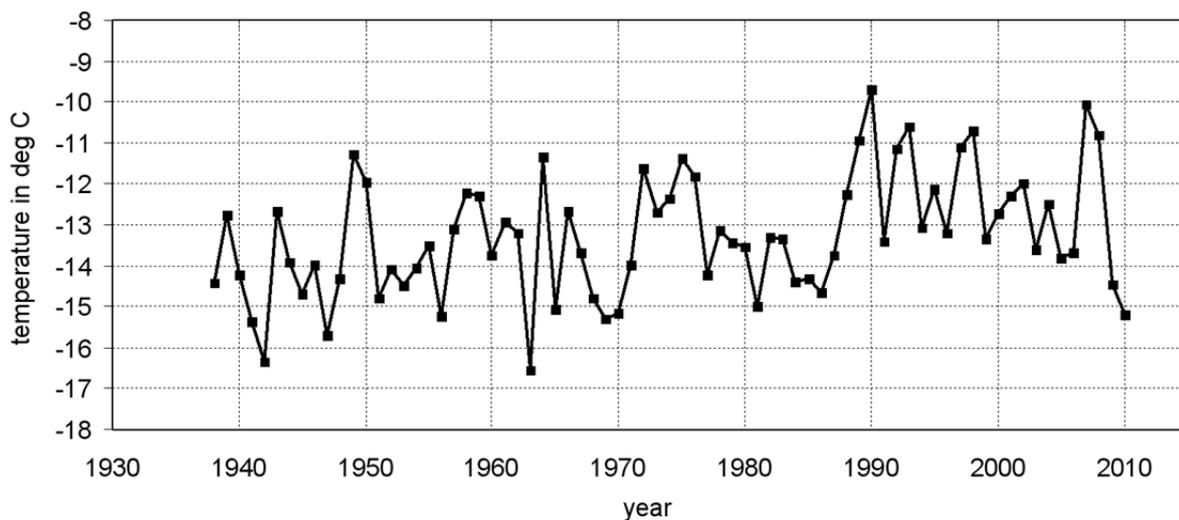


Figure 1: Winter temperatures from 1937/38 to 2009/10 at the Jungfraujoch measurement station (homogeneous data). The winter 2009/10 with -15.2°C was the coldest winter in 40 years.

Winter weather dominated again in the first half of March. After intensive snowfall especially in the central plains, there were several days of icy and stormy winds (Bise). Even in the plains the highest daytime temperature stayed under freezing, and the shores of Lake Geneva and Lake Neuchâtel were frozen solid from the spray blown up from the waves by the strong winds. On March 10 it snowed down into the plains in southern Tessin as well.

### Slow approach of spring

Masses of warm air from the southwest were the first clear signs of spring around the middle of March. With help of the foehn, temperatures reached 23 degrees in the central plains on March 25, which hadn't occurred in March since 1990. But only a day later a stormy advance of cold air brought the springtime weather to an abrupt

end. Snow fell below 900 meters on the northern side of the Alps, and a considerable amount of up to 90 cm fell along the high crests of the southern Alps. From then until the middle of April the weather was mainly dominated by cold air masses with frequent tendency to showers.

Prolonged spring weather began in the second half of April. The temperatures rose often above 20 degrees, and at the end of the month most of Switzerland enjoyed its first summer day with temperatures reaching 25 degrees or more.

During this phase of fair weather the volcano Eyjafjalla erupted over a period of several days. The fine volcano ash reached Switzerland on April 17 via upper winds. To prevent possible damage to aircraft engines from the volcano ash, air traffic was stopped entirely for three days.

### **Hazy and rainy early summer**

After the hard winter in the plains, any hopes for a pleasant early summer were badly dashed. May turned out to be mainly rainy, cool and generally cloudy. In the German speaking part of Switzerland there has never been a cloudier month of May except in 1939 and 1984 since the beginning of measurements in the 19th century. The rainy and hazy weather continued until June 5, only to return once more between June 12 and 20.

### **Glorious foehn in the plains**

The foehn ushered in a welcome interruption to the grey and rainy early summer on the northern side of the Alps. On June 9 and 10 it developed into an unusually strong and prolonged event far into the midlands. The foehn churned up the water in Lake Zürich with a force that is usually only observed on Urnersee. In Wädenswil the foehn gusts reached 90 km/h, which is typically measured at station in Urner Reusstal known for its foehn storms. On June 10 the foehn pushed through to the northern border of Switzerland, causing temperatures of over 30 degrees in the plains.

### **Midsummer heat wave**

Summer arrived in the last 10 days of June and unfurled its full force between July 8-21 in a real heat wave that brought temperatures of over 30 degrees daily. Nevertheless, no absolute record high temperatures were measured. On the national average Switzerland had the sixth warmest July and notably the Lugano station in Tessin the second warmest July since measurements began in 1864. The heat led to drought conditions especially from western Switzerland and over the Seeland up to the region of Basel. This was due to the concentration of thunder storms in the mountains and eastern Switzerland. Especially fierce thunderstorms hit the northern rim of the Alps on July 10 and 12.

### **Repeated cold air incursions**

After only a month's duration, summer receded for some time from the northern side of the Alps in the last ten days of July. Northwest currents repeatedly brought in cool and moist air to Switzerland from the north Atlantic. Toward the end of July the snowline fell below 2500 meters, and in the first few days of August it fell as low as 2100 meters in the eastern Alps, covering the higher passes with a thin layer of wet snow.

Summer returned during the last 10 days of August. Warm air masses from Spain caused the warmest night of the year on August 6/7 with unusually high 25 degrees

widespread over Switzerland. In Basel the temperature at midnight was over 29 degrees. But only a few days later currents from the northwest brought in cold polar air that caused snowfall in the eastern Alps down to 1400 meters. Several mountain passes had to be closed temporarily. After a phase of fair and mild early autumn weather, the same pattern repeated itself in the mountainous areas. Simultaneously in the plains it was cool and very rainy, especially in the eastern part of Switzerland.

The repeated cold air incursions continued in October. First a Scandinavian/east European high pressure system brought golden autumn days to the higher altitudes, while the plains were often covered with autumnal fog. But starting at the middle of the month the cold air masses dominated again. On October 25 the eastern Alps were covered in white down to 700 meters. Cold air masses kept the snow on the ground for several days. At the end of October and into the middle of November the foehn melted the snow far up mountainsides.

### **Snow in the plains on December 1**

In mid November the foehn returned and pushed temperatures up to 18 degrees in the northern plains and in the foehn valleys even up to 21 degrees. Shortly thereafter, mild, humid air from the south glided in over an opposing front with cold air out of the northeast, sending snowfall to the plains and up to a half a meter of new snow to the mountains only two days after the foehn had subsided. And the winter weather persisted. On the southern side of the Alps it snowed down to 1000 meters on November 21, and locally it snowed down as far as 600 meters. In late November cold polar air sank the temperatures in the plains of the northern side of the Alps and in Jura to local record low readings for November. La Brévine registered -31.4 degrees on November 30. The previous low temperature for November was -28.0 degrees.

A layer of snow covered Switzerland just in time for the beginning of winter, and on December 1 it snowed even more than usual, especially in the western part of the country. In Geneva the December snow depth record was broken with 31 cm, forcing the airport to close for hours. Another snow storm hit the plains on December 17 with a widespread layer of 10 cm or more. On Christmas Eve it snowed widespread again down into the plains. On Christmas Day, the lowlands of northern Switzerland from Geneva to Lake Constance were covered in white. Thanks to sufficiently low temperatures, the winter wonderland was preserved in most areas until toward the end of the year.

### **Record new snow amounts in the plains**

The heavy snowfall was a new snow record for December. The measurement station Bern-Wabern registered a new snow record there of 57 cm, but Zürich set an even higher new snow record for December with 58 cm. These amounts of new snow had been previously measured only in 1979 and 1962.

### **End of the year was very cold in the mountains**

Harsh winter weather had the high mountain peaks in its grip. Jungfrauoch and Säntis registered deviations of -2.9 and -3.1 degrees respectively compared to the long term monthly average. Similarly low temperatures were measured there the last time in 1981.

Jungfrauoch (3580 m)  
01.01.2010 – 31.12.2010

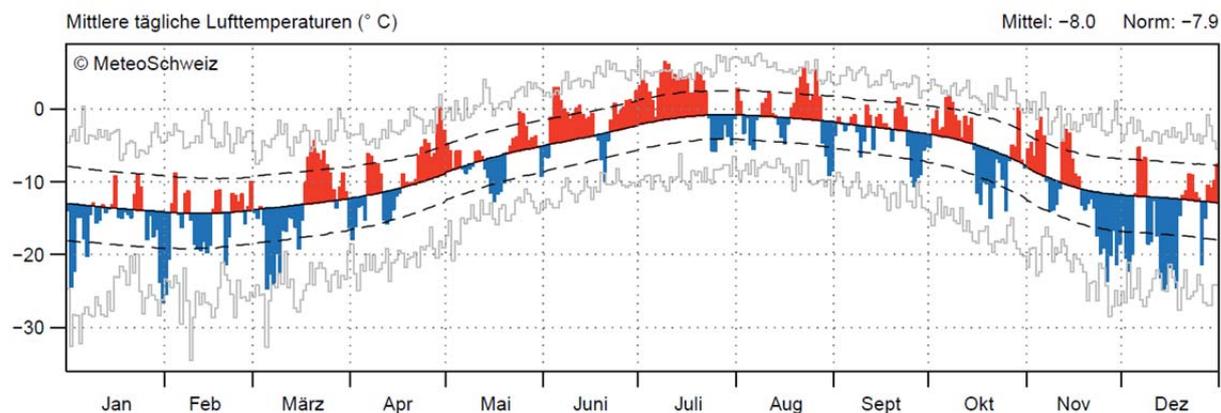


Figure 2: Time series of the daily mean temperatures in 2010 measured at the station Jungfrauoch in comparison to the long-term mean 1961-1990 (solid line) and long-term standard deviation (dashed line). The two grey curves show the highest and lowest daily mean temperature since measurements have been recorded.

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