

> Hydrological Yearbook of Switzerland 2016

Discharge, water level and water quality of the Swiss water bodies

Summary of the publication “Hydrologisches Jahrbuch der Schweiz 2016”
www.bafu.admin.ch/uz-1712-d

> Summary

Weather conditions

On average, 2016 was 0.7 degrees Celsius warmer in Switzerland than in the reference period 1981–2010. The highest precipitation levels for the first half of the year since records began were registered in regions on the north side of the Alps. Summer did not arrive until July, but temperatures remained unusually high until well into September. Prolonged high pressure and record drought at the end of the year resulted in extreme snow deficiency in the mountain regions.

Snow and glaciers

Averaged out over the entire winter of 2015/16, snow depths were only normal in Lower Valais and the north-west side of the Alps at altitudes above approximately 1400 metres above sea level. They were below average in the other regions. Following intensive snowfall in May and June 2016, the prospects for Switzerland's glaciers looked good for a prolonged period. However, the very warm late summer resulted in high glacier melt.

Discharge conditions

In the major river areas on the north side of the Alps, the annual average discharge exceeded the values for the reference period 1981–2010 by a few percentage points. The discharge from the Alpine Rhine corresponded approximately to the norm. The annual average discharge in the river areas on the south side of the Alps, in the Engadin and Valais, was lower than usual. In many areas, the apparent equilibrium in the annual discharge values was the outcome of a mainly wet first half of the year followed by a dry second half. In many catchments, the discharge values for June 2016 exceeded the average June discharge values for the reference period. Widespread low discharge values were recorded in the second half of the year, particularly in the months of October and December. In December, when precipitation levels were the lowest for that month since records began in 1964, the discharge in some catchment areas was around one fifth of the usual volume. There was a major flood event on the Alpine Rhine in mid-June.

Lake levels

The average annual water levels of Lake Constance (+26 cm) and Lake Maggiore (–27 cm) deviated considerably from the long-term average values. The average annual water levels of the other major lakes were only a few centimetres above or below the norm. The strong and persistent precipitation from mid-June in the central and eastern Pre-Alps prompted the

strongest rise in the level of Lake Constance recorded since 1999: the water level in June and July exceeded the high water limit without interruption for over 40 days. Extreme low water levels were also recorded in various lakes in 2016. Lake Neuchâtel reached its lowest level ever at the end of the year. There were two low water phases on Lake Maggiore: one at the beginning of the year and a second in the autumn.

Water temperatures

Due to the mild weather, water temperatures in 2016 rarely exceeded the previous annual average values, however they were not lower either. Thus the rising trend in annual average values that began in the 1960s continued. In terms of the monthly maximums, the warm winter resulted in several new monthly maximums being recorded in the early months of the year. High air temperatures in late August and September also resulted in the previous monthly maximums being exceeded at 18 of the FOEN's monitoring stations.

Stable isotopes

Winter 2015/16 was very mild and this was reflected in above-average δ values in the precipitation for this time of year. High δ values were also recorded in summer 2016. The below-average δ values recorded since 2013 and compared to the values recorded over many years along the river Aare, in the Rhine at Weil and in the Rhone above Lake Geneva continued in 2016. Due to the hot summer, more glacier melt water with negative δ values was discharged.

Groundwater

The low groundwater levels and spring discharges from the dry end of 2015 rose steadily due to the above-average precipitation in the first half of 2016. Increasingly high groundwater levels and spring discharges were observed from April until June. Temperatures in August were above average and it was also very dry on the whole, thus the groundwater levels and spring discharges normalised as a result. Following consistently low precipitation, low groundwater levels and spring discharges were recorded in the Jura, Alps and Ticino. Only a few aquifers in the Central Plateau were able to benefit from the precipitation in November. In late December, low groundwater levels or spring discharges were recorded at approximately every third monitoring station.

> Further information

Further information on the topics of the Hydrological Yearbook and the FOEN hydrometric monitoring networks, and current and historical data can be found online at:
www.bafu.admin.ch/hydrologicalyearbook

- > Current and historical data:
www.hydrodaten.admin.ch/en/
- > FOEN Hydrological Bulletin:
http://www.hydrodaten.admin.ch/en/hydro_bulletin.html
- > FOEN Groundwater Bulletin:
www.hydrodaten.admin.ch/en/groundwater-bulletin.html
- > Results of the NAQUA National Groundwater Monitoring Programme: www.bafu.admin.ch/naqua
- > Results of the National River Monitoring and Survey Programme (NADUF) – data download:
www.eawag.ch/en/department/wut/main-focus/chemistry-of-water-resources/naduf/
- > National Surface Water Quality Monitoring Programme (NAWA): www.bafu.admin.ch/nawa
- > Water indicators and further information about water
www.bafu.admin.ch/water