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Federal Departement of the Environment, Transport, Energy and Communications DETEC

Federal Office for the Environment FOEN
Hydrology Division
Hydrogeological basis Section

Basic information on monitoring groundwater levels and spring discharges

The NAQUA National Groundwater Monitoring QUANT module monitors groundwater quantity in Switzerland's characteristic groundwater resources by means of groundwater levels and spring discharges.

Data acquisition

Groundwater quantity is recorded at springs, piezometers or extraction wells that allow direct access to the groundwater. Measurements are made using fixed pressure probes that take a reading every five minutes and are registered by a digital data logger. The values are regularly inspected and checked for plausibility. At springs and piezometers, the natural state in the aquifer is monitored. In an extraction well, on the other hand, during pumping the groundwater level drops at and around the extraction site, but usually returns to its resting state during pumping breaks. Spring discharge is a groundwater outlet and is recorded at artificial overflows or at defined discharge cross-sections, similar to the measuring of watercourses.

NAQUA-QUANT piezometer site for monitoring groundwater level.

Statistics

The statistical evaluations at piezometers and springs are based on the average value of the groundwater level or discharge at each monitoring site. This average value is calculated from the average values of the time interval under consideration (day, month, year, standard period). The statistical evaluations at extraction wells are also based on the mean value of the groundwater level at each monitoring site, but are calculated using the maximum values of the time interval (day, month, year, standard period) that come closest to the resting state. The values measured in the standard

period 2001-2020 are currently being used to compare annual groundwater level or spring discharge with the long-term development. At present, 50 QUANT monitoring sites have such continuous data sets. All the other monitoring sites operating in 2022 have a shorter set of data.

Reference values

When describing long-term trends, groundwater levels and spring discharges are usually classified as low, high or normal in relation to expected conditions. Percentiles of the data set for the entire measurement period or a standard period are used for the calculation. Groundwater level or spring discharge rates are considered significantly lower than average if the current measurement is below the long-term 10th percentile, i.e. if it is in the lowest 10% of all values measured during the standard period of the given time interval (day, month, year). A groundwater level or spring discharge rate between the 10th and 90th percentile means that conditions are normal. If the latest measurement exceeds the 90th percentile, i.e. it is in the highest 10% of values measured, the groundwater level or spring discharge rate significantly exceeds the long-term average.

Link

NAQUA National Groundwater Monitoring
https://www.bafu.admin.ch/bafu/de/home/themen/wasser/publikationen-studien/publikationen-wasser/ergebnisse-grundwasserbeobachtung-schweiz-naqua.html