

# Austria

**Capital city:** Vienna  
**Inhabitants:** 9 Million



## INSTITUTIONAL SETTING AND PURPOSE

The Sub department Water Balance (Wasserhaushalt – Hydrographisches Zentralbüro) belonging to the Department of Water Management in the Federal Ministry for Agriculture, Regions and Tourism (BMLRT) coordinates the data collection, quality control, evaluation and publication of hydrographic information, including groundwater.

\* Note that from January 8, 2018 to January 28, 2020 the Ministry was called Federal Ministry for Sustainability and Tourism (BMNT). Before 2018, it was called Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW). Older publications refer to BMLFUW or BMNT as the institution in charge of groundwater monitoring in Austria.

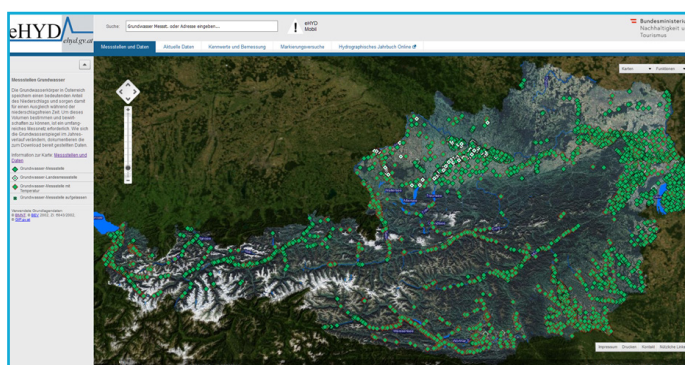
## CHARACTERISTICS OF THE NETWORK

Since 1893, the results of the observations of quantitative monitoring have been summarized in the Hydrographic Yearbook of Austria, which includes a chapter dedicated to the status of pore groundwater since 1948 and a chapter with hydrologic properties of springs to characterise joint and karst aquifers since 1995. According to the Yearbook 2016, the observation network of the Hydrological service has a national coverage of around 83,850 km<sup>2</sup>, and comprises 3535 groundwater level measuring points, 1518 groundwater temperature measuring points and 91 springs. Groundwater levels are collected either weekly (41% of the measuring-sites) or continuously in 15minutes to 1hour-intervals, and groundwater temperature is collected in the same way, the percentage of continuous sites about 89%. At springs all parameters (water level/discharge, water temperature and electrical conductivity referred to 25 °C) are measured every 15 minutes.

There also exists a soil-water-monitoring network in Austria partly since 1995. In open-land-sites values of water-content, soil-moisture-tension and soil-water-temperature are collected continuously in 4 to 7 depths from 5 to 160 cm underground. In lysimeters infiltration water is collected in buckets and mea-

sured continuously or weekly. Since 2019 there are special sites to monitor the surface-water-content. These data are not published yet.

The web-GIS-platform eHYD – hydrological data in the internet shows the location and the ID of all monitoring points with published data on the map “monitoring points and data” (Messstellen und Daten), Figure 1.



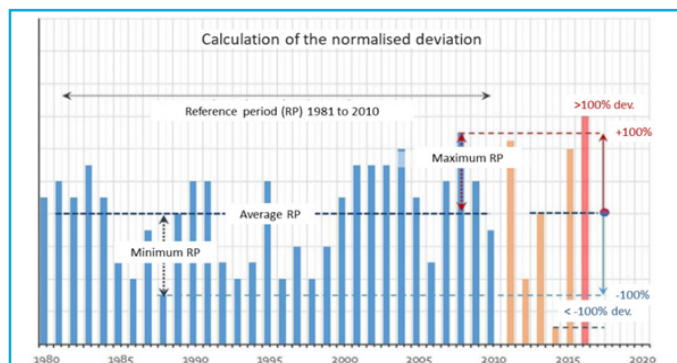
**Figure 1 – eHYD platform. Map: monitoring points and data (Messstellen und Daten) - groundwater monitoring points**

## PROCESSING

Until 2012 the Hydrographic Yearbook auf Austria was printed and contained a short description of the hydrological processes in the respective year and a large number of tables with measured values and statistics. From 2013 the tables are only published online, and the printed part of the Hydrographic Yearbooks of Austria contains a detailed description and analysis of the hydrological conditions during the year. To assess the status of the groundwater resources in Austria three different methods are used.

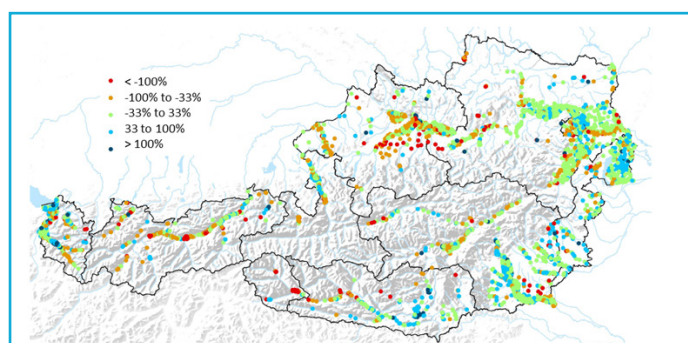
The first method compares the annual average with the mean of a selected historical record. In the case of 2016, for each monitoring point, the annual average value for 2016 was compared with the mean for the period 1981-2010. Only monitoring

points with values from 1981 to 2016 were included, Figure 2.



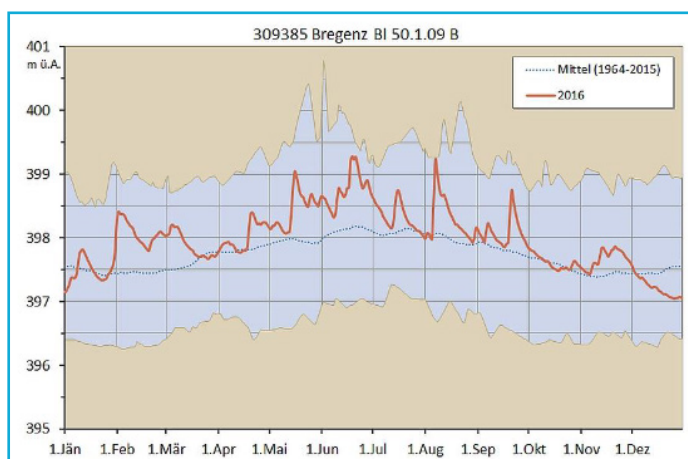
**Figure 2 – Calculation method for normalised deviation**

Annual averages greater than 100% or less than -100% for the period 1981-2010 are considered as values that have never occurred before or during the comparison period. Values between -100% and 100% correspond to the variances observed in the comparative period.



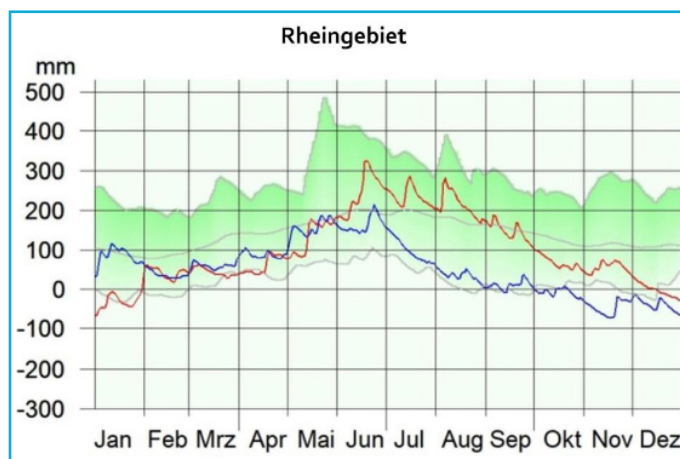
**Figure 3 – Deviation of the average groundwater level for the year 2016 from the reference period 1981-2010 as a percentage of the maximum or minimum values in the reference period 1981-2010**

The second method is an analysis of seasonal change, based on comparison of daily groundwater level mean values at selected monitoring points with their long-term daily mean, minimum and maximum, Figure 4. The same is done for springs.



**Figure 4 – Daily average groundwater level of 2016 for a single monitoring point in Bregenz, compared to long term daily mean, minimum and maximum. Source: Hydrographic Yearbook of 2016**

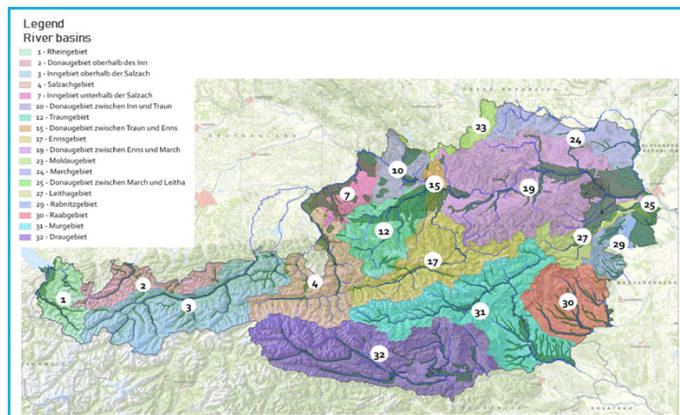
The third method is used to estimate the volume of water recharged or discharged from a catchment area. During the year, the groundwater volume fluctuations in each catchment area are calculated daily and presented in hydrographs, Figure 5. Each catchment area is composed of several groundwater areas.



**Figure 5 – Changes in groundwater volume (VOLPA Volume Per Area within 1 year (blue: hydrograph in 2015, red: 2016) in Rhein River Basin. The green area indicates the range of fluctuation between the daily minimum and daily maximum since 1990. Source: Hydrographic Yearbook of 2016**

Starting from 1 January 1990 until the end of 2015, groundwater levels (contour lines) for each groundwater area were constructed for each day using Kriging, and the volume change was calculated considering the average porosity per each groundwater area.

These changes were summed up within all catchment areas covered by groundwater monitoring stations and displayed in mm per area. The porosity values were derived from data from the Geological Survey, by assigning average porosities to the lithological units (from 7 to 25%). All catchment areas are shown in Figure 6.



**Figure 6 – Overview of the river basins after the WKEV (Water Cycle Survey Regulation) and the groundwater areas. Source: Hydrographic Yearbook of 2016**

## DISSEMINATION

Hydrographic Yearbooks of Austria beginning with 2004 are downloadable as PDF from the web page of BMLRT under the menu "Service" -> "Publications" or [https://www.bmlrt.gv.at/wasser/wasser-oesterreich/wasserkreislauf/hydrographische\\_daten/jahrbuecher.html](https://www.bmlrt.gv.at/wasser/wasser-oesterreich/wasserkreislauf/hydrographische_daten/jahrbuecher.html). Older printed Yearbooks can be asked for at the subdepartment Water Balance ([wasserhaushalt@bmlrt.gv.at](mailto:wasserhaushalt@bmlrt.gv.at)).

Since 2014 tables and evaluations in PDF-format are to be download separately from the web-application Hydrographic

Yearbook online at <https://wasser.umweltbundesamt.at/hy-djb/>. This application is part of the Water Information System Austria (WISA), which is a central platform to access data and information about the Austrian water sector. There are tables with monthly mean values, the annual mean, maximum and minimum of the year of groundwater level and groundwater temperature for every monitoring point grouped by river basin and groundwater basin. They are to be find under the menu "Download evaluations" (Auswertungen herunterladen) -> "River basins" (Flussgebiete).



Erstdatum: 14.02.2019		Hydrologisches Jahrbuch 2016												GWS 1	
Monats- und Jahresmittel der Grundwasserstände mit Extremwerten (Hauptwerte)															
- Grundwasserstände im G.A. -															
Nr.	Messstelle		Elev.- Höhe (müNN)	Elev.- Höhe (müNN)	Mittel in m ü.A.						Minderster und höchster beobachteter Grundwasserstand sowie absolute Höchst- beobachteter Überflutungsanstand				
	Messpunkt m ü.A.	m ü.G.			I	II	III	IV	V	VI	im Berichtsjahr		vor dem Berichtsjahr		
											m	Datum	m ü.A.	Datum	
Böckelschlagbegraben (Dünen vorwiegend aus Sand)															
					VIII	VIII	IX	X	XI	XII					
RHEINGEBIET															
Leibschal															
1	Herrnsberg, Bl. 01.04 1963	0.17	0.77	404.20 405.38	404.80 405.16	404.83 405.44	404.33 405.28	405.22 405.62	405.62 406.28	404.74	403.58 406.79	04.01. 21.06.	402.49 403.67	07.01.1986 11.01.1987	
2	Herrnsberg, Bl. 01.05	0.73		407.78 410.04	408.49 409.64	408.48 409.54	409.24 409.05	409.05 409.28	409.28 409.62	409.24	408.47 410.13	08.01. 11.11.31	407.93 408.51	27.05.1991 11.01.2002	
3	Herrnsberg, Bl. 01.06 410.55	0.85		407.26 405.45	405.47 405.45	405.48 405.65	405.45 405.78	405.45 405.20	405.48 404.94	405.31	406.24 406.24	31.12. 20.06.	407.93 408.51	28.10.1985 02.06.2013	
4	Herrnsberg, Bl. 01.07 A 430.51	0.90	1	417.11 416.30	417.35 415.42	416.68 418.18	417.63 417.94	417.78 417.80	418.11 418.16	417.82	418.00 418.38	09.01. 23.08.	415.91 418.42	05.10.2003 25.01.2011	
5	Herrnsberg, Bl. 01.08 428.15	1.09		437.42 425.37	425.49 425.42	425.34 425.33	425.31 425.08	425.53 425.39	425.60 425.99	425.36	424.91 425.92	25.12. 02.05.	426.51 426.56	01.07.2004 16.08.2004	
6	Herrnsberg, Bl. 01.02 399.03	0.75		337.64 396.60	396.60 396.73	396.59 396.48	396.75 396.46	396.72 396.55	396.47 396.57	396.64	396.41 397.28	17.04. 28.09.	394.01 397.64	08.02.1993 04.02.1999	
8	Leichau, Bl. 01.03 416.73	0.82		327.82 405.86	406.35 406.40	405.27 406.17	405.82 405.56	405.87 405.96	407.41 407.41	406.22	404.73 408.26	31.12. 20.06.	413.03 410.59	30.10.1996 02.06.2013	

Figure 7 – Table with monthly means, annual means, maxima and minima 2016 of groundwater level in the groundwater bain Leiblachtal in Rhein River Basin

For each observed spring a PDF with daily discharge means, monthly and annual means and extrema for all measured parameters (discharge, water temperature, electrical conductivity and in special cases turbidity) and hydrographs is downloadable under the menu “Download evaluations” (Auswertungen herunterladen) -> “Monitoring points” (Messstellen). The springs their PDFs wanted to be downloaded can be selected from a list or a map. Figure 8.

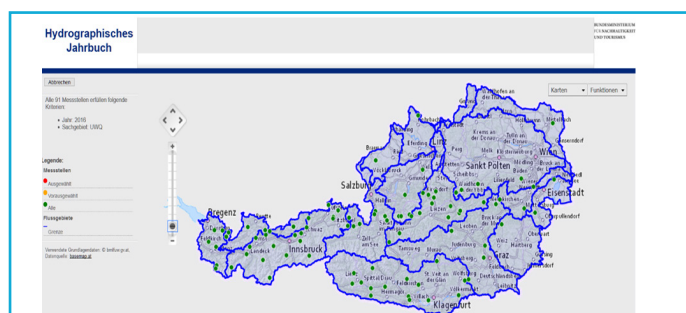


Figure 8 – Hydrographic yearbook online. Map with observed springs and borders of the river basins 2016

In order to give interested people access not only to PDF-Tables with values of one year, but also to long-term data in a format to be used further 2005 the web-GIS-platform eHYD went on-line. There, on the first register “Monitoring points and data” (Messstellen und Daten), data from the hydrographic archive can be downloaded. All measuring points published in the year-book are displayed in position either all together on one map or divided into the subject areas precipitation, surface water, groundwater (Figure 1) and springs. Clicking on the symbol of a measuring point opens a tooltip with links for downloading the verified data available at this measuring point in CSV format. The data range from the beginning of electronic availability to the last year published in the form of the Hydrographic Year-book. For groundwater there are downloadable monthly means