HYDROGEOLOGICAL MONITORING SYSTEM – – GRAPHICAL PRESENTATION — THE COMPUTER SOFTWARE VERSION AND DATA BASE AVAILABLE IN THE INTERNET

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Abstract: The computer software *Hydrogeological Monitoring System — Graphical Presentation* was produced in Polish Geological Institute. There are two versions of this software, PC didactic version and Internet version. These two versions of the software are aimed at enabling the fast and easy access to the data from the investigations which are being carried out for many years in the PGI Groundwater Monitoring System. Program *Hydrogeological Monitoring System — Graphical Presentation* is available on the Polish Geological Institute WWW page (*www.pgi.waw.pl/soh*). The Internet version in comparison to the PC version contains additional information on the PGI Groundwater Monitoring System, the scope of investigations with the detailed information on chemical analyses, organization of the measurements and how to get access to the resulting data. The program is a very interesting and modern form to make accessible hydrogeological data — information on watertable and chemical fluctuations in groundwater in Poland.

The computer software *Hydrogeological Monitoring System — Graphical Presentation* was produced in Polish Geological Institute in 1996 (authors: K. Janecka-Styrcz, J. Prażak — PGI, The Holy Cross Mts. branch; B. Kazimierski, E. Przytuła – – PGI Warsaw). The software is intended for taking a view and printing data from hydrogeologica investigations being carried out by PGI in The Groundwater Monitoring System (The project "Organization and observations of groundwater in the basic system of monitoring in Poland" is financed by the Ministry of Environmental Protection, Natural Resources and Forestry). There are two versions of this software:

> PC didactic version for universities, state administration, users with no access to the Internet. This version is run under Windows 3.1, 3.11 and 95.
> The software is written in Borland Pascal 7.0 with the support of the Object Windows Library

- Internet version on the Polish Geological Institute WWW page·
  (*www.pgi.waw.pl/soh*)

These two versions of the software are aimed at enabling the fast and easy access to the data from investigations have been carried out for many years in the PGI Groundwater Monitoring System. This data is put into the database (Hydrogeological Monitoring System — Database).

Program *Hydrogeological Monitoring System — Graphical Presentation* is available on the Polish Geological Institute WWW page (*www.pgi.waw.pl*). It is presented on this page among other geological databases. The Internet version in comparison to the PC version contains additional information on the PGI Groundwater Monitoring System, the scope of investigations with detailed information on chemical analyses, organization of the measurements and how to get access to the resulting data.

The *Hydrogeological Monitoring System — Graphical Presentation* is the main part of the software. The PGI Groundwater Monitoring System points can be displayed over six background maps:

- map of the major productive aquifers in Poland after Paczyński, 1995 (Figure 1),
- map of the hydrogeological units in Poland after Paczyński, 1995,
- map of the major groundwater reservoirs in Poland after Kleczkowski, 1990,
- map of the regional water authorities activity areas,
- map of the PGI branches activity areas,
- map of voivodeships in Poland.

There is access to the list of the PGI Groundwater Monitoring System points in alphabetic, as well as numeric order. Transition between maps and tables is simple, facilitated by the active menu and go-to-the-previous-page buttons like in the Netscape program. Access to the information on the particular observation point and this point monitoring data can be done by clicking this point location on one of the above listed maps on the screen. The other way is to click the point name in the displayed list of the observation points.

For each point in the PGI Groundwater Monitoring System the user can get data on its location (locality, commune, voivodeship, geographic coordinates, "1942" coordinates, elevation, hydrogeological region after Paczyński). Other obtainable data: borehole depth, aquifer depth, stroken and stabilized watertable depth, aquifer stratigraphy and lithology, date of the borehole completion and commencement of the monitoring activity. The user can get these data as a hard copy.
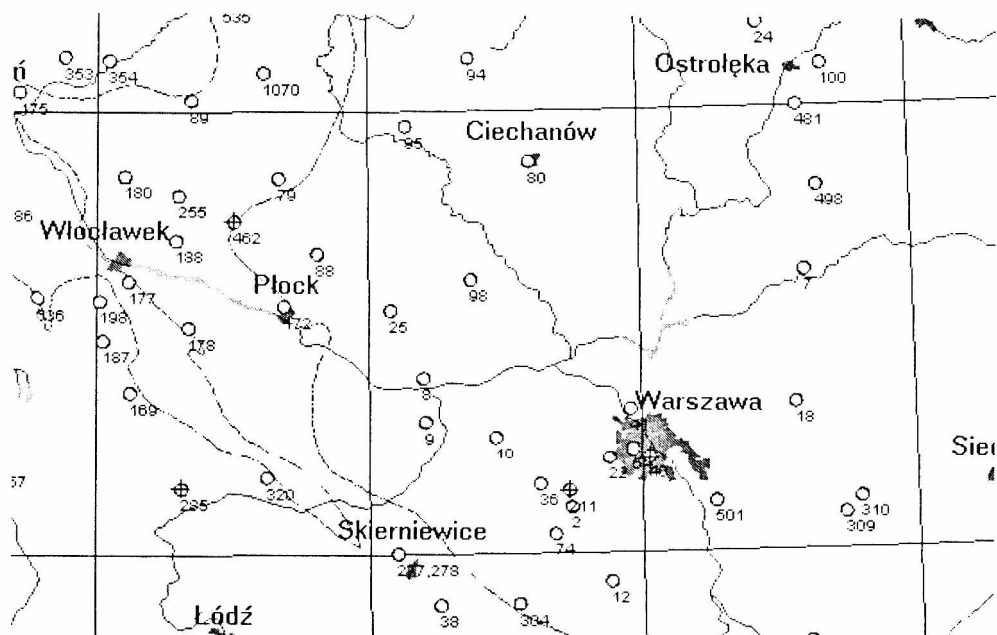
Figure 1. *The PGI Groundwater Monitoring System points displayed over the fragment of the map of the major productive aquifers in Poland (after Paczyński, 1995)*

The program contains watertable measurement results for wells and yield for springs in the form of plots for a particular hydrologic year or perennial period. These plots can be viewed on screen, printed or saved as graphic files in GIF format. Statistics is presented in text form (arithmetic mean, minimum, maximum, amplitude of watertable fluctuations, mode and median) for a defined period of time (Figure 2).

Physico-chemical properties of water samples from the PGI Groundwater Monitoring System are put together in tables which can be displayed for each observation point. From these tables the user can get:

- water chemical type (after Altowski and Szwiec),
- balance of macroelements in water together with the chemical composition of water in form of diagrams (macroelements: HCO_3^-, SO_4^{2-}, NO_3^-, Ca^{2+}, Mg^{2+}, Na^+, K^+) for each chemical analysis (Figure 3),
- water quality classification for each observation point as recommended by the State Inspectorate of Environmental Protection.

Apart from the individual chemical characteristics for the observation points these data can be viewed in tables covering the whole monitoring period:

- tables containisng water quality assessment with the specification of chemical elements whose concentrations exceed the standards determined for the second water quality class (class II),
- tables with the specified chemical elements whose concentrations exceed the drinking water standards,

• tables of water chemical types.

All the above information can be displayed on screen, printed or saved in a file.
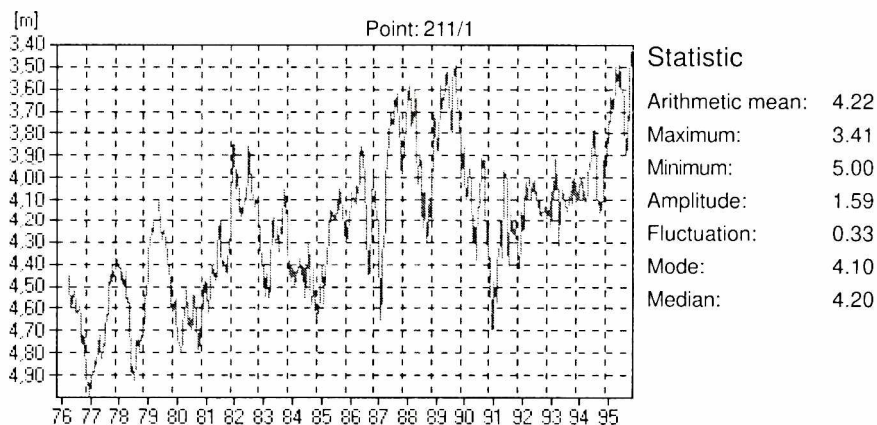

Statistic	
Arithmetic mean:	4.22
Maximum:	3.41
Minimum:	5.00
Amplitude:	1.59
Fluctuation:	0.33
Mode:	4.10
Median:	4.20

Figure 2. *Groundwater labels fluctuation at the observation point Brwinow (I/211-1).*
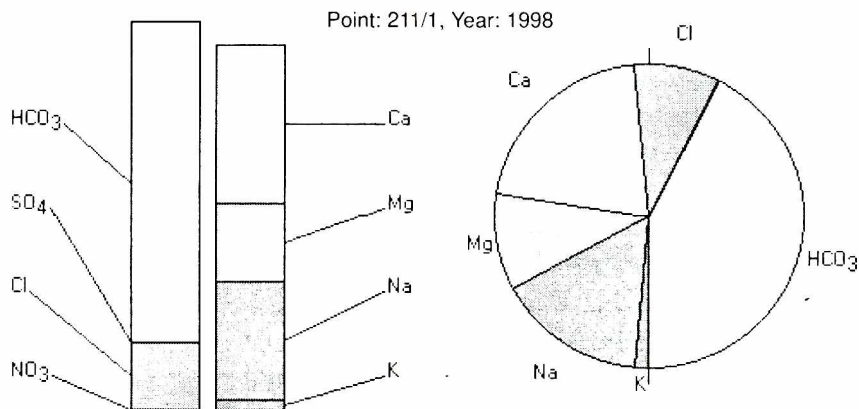*Caption: Statistics - arithmetic mean, maximum, minimum, amplitude of watertable fluctuations, mode, median*

Figure 3. *Diagrams of the chemical composition of water at the observation point Brwinow (I/211-1)*

The program *Hydrogeological Monitoring System — Graphical Presentation* can be accessed in the Internet from December 1996 and undergoes permanent improvement according to the users' suggestions. The authors are going to add the access counter to the Internet version of software to determine the number of users who are interested in the groundwater monitoring data collected by PGI in the nearly 30 year period. It would be interesting to know who are the most frequent users. There is a suggestion that this software users should be registered.

The first presentation of the PC version of the program *Hydrogeological Monitoring System — Graphical Presentation* took place during the seminar "The

Groundwater Monitoring System in Poland — the present state and in the future", organized in September 1996 in Szelment near Suwalki in north-east Poland.

Now the program is treated as a very interesting and modern form of sharing hydrogeological data. Both versions of the program (PC and Internet) are user-friendly. But the Internet one is very widely accesible, which makes it the optimal way for getting information on watertable and chemical fluctuations in groundwater in Poland.

References:

[1] Janecka-Styrcz K., Prażak J., Kazimierski B., Przytuła E., *System Obserwacji Hydrogeologicznych SOH — Graficzna Prezentacja Wyników — program komputerowy*, Oddział Świetokrzyski PIG, Kielce, PIG Warszawa (*www.pgi.waw.pl/soh*), 1996

[2] Kazimierski B., Przytuła E., *System Obserwacji Hydrogeologicznych, SOH — Graficzna Prezentacja Wyników - - program komputerowy i baza danych w wersji udostepnionej w sieci INTERNET*, INFOBAZY'97 Bazy danych dla nauki, TASK Gdańsk, p. 96-100, 1997

[3] Kleczkowski A. S. (red), *Mapa obszarów głównych zbiorników wód podziemnych (GZWP) w Polsce, wymagających szczególnej Ochrony*, AGH Kraków, 1990

[4] Paczyński B. (red.), *Atlas hydrogeologiczny Polski, 1:500 000*, PIG Warszawa, 1995

[5] Przytuła E., Janecka-Styrcz K., Kazimierski B., *Komputerowa baza System Obserwacji Hydrogeologicznych, SOH — Baza Danych, SOH — Graficzna Prezentacja Wyników*, Przeg. Geol. vol. 45, no 10, p. 974-977, 1997