



Hydraulic conductivity of sandstones in the Baltic Basin - a comparative study of pumping tests and grain size distribution

E. Pērkone (1), J. Bikše (2), J. Jātnieks (3), I. Klints (4), A. Dēliņa (5), T. Saks (6), B. Raga (7), and I. Retiķe (8)
(1) University of Latvia, Riga, Latvia (el.perkone@gmail.com), (2) University of Latvia (janis.bikse@lu.lv), (3) University of Latvia (deltazzx@gmail.com), (4) University of Latvia (ilzestankevica@inbox.lv), (5) University of Latvia (aija.delina@lu.lv), (6) University of Latvia (tomas.saks@lu.lv), (7) University of Latvia (baibaraga@gmail.com), (8) University of Latvia (inga.retike@lu.lv)

Aquifer fluid conductivity properties describe ability of sediments to transmit groundwater, and consequently govern the groundwater flow. Studies and knowledge of hydraulic conductivity (K), transmissivity and storativity for the particular aquifer is of great importance for hydrogeological problem solving process.

This study presents the results of the comparative study between hydraulic conductivity, grain size distribution, sediments lithology of the lower Devonian Emsian stage, middle Devonian Eifelian and Givetian stage, upper Devonian Frasnian stage, and Cambrian clastic sediments in the central part of the Baltic Basin. The aim of this study was to find characteristic hydraulic conductivity values for each aquifer based on aquifer grain size distribution and lithology on the one hand and pumping test results on the other.

For the calculation of the hydraulic conductivity one has to take into account not only grain size distribution but effective porosity, temperature and kinematic viscosity of the fluid as well, which are lacking in this study.

Pumping test results provide a range of at least two orders of hydraulic conductivity values for each aquifer. To characterize the typical values for each aquifer and further subdivide each aquifer into regions of different hydraulic conductivities, pumping test results were correlated with grain size distribution. As a limiting factor for the hydraulic conductivity in the sandstones the fraction of the fine particles with the size less than 0.05 mm were chosen. The correlation of hydraulic conductivity and grain size distribution was carried out by comparing the <0.05 mm fraction and respective hydraulic conductivity values in the wells. The results suggest that grain size distribution in general does not correlate with conductivity obtained from the pumping tests. In general comparing hydraulic conductivity values obtained from pumping tests with calculated values from grain size distribution, calculated values in some cases differ from obtained for some units (1 – 3 m/dnn) but in some cases more than two times, what is connected with uncertainty of existent data and imperfections of calculation methods. Correlation with the lithology of the aquifer (as described in boreholes) shows better results and allows to subdivide the aquifer into two clusters of typical K values.

Correlation of the grain size and hydraulic conductivity provided a range of the average hydraulic conductivity values for each aquifer. For example in D2ar and D2br aquifers K values varies from 1 - 7 m/day, in D3gj 1 - 8 m/day and in D3am aquifer 1 - 5 m/day.

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