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Flow logging applied in fractured rocks

J. Urík (1,2), J. Lukeš (2), M. Kobr (1), S. Mareš (1), and J.H. Williams (3)

(1) Charles University in Prague, Faculty of Science, Albertov 6, 128 43 Praha 2 (urik@aquatest.cz), (2) Aquatest, a.s., Well logging department, Geologická 4, 152 00 Praha 5, (3) U.S. Geological Survey, 425 Jordan Road, Troy, NY 12180-8349

Fractured zones are usually identified by the basic logging methods but the volume of permeable fractures intersecting boreholes is often too small for their identification. Fluid logging measurements can help to localize natural flow and determine hydraulic properties of fractures during the pumping. Borehole flowmeter measurements or fluid logging measurements are conventional methods used for the determination of quantitative parameters of the flowing fluid in boreholes with the goal to estimate hydraulic conductivity of aquifers. With the increasing interest in the research of fractured formations and their hydraulic properties, new field techniques based on the repeated measurement of the vertical velocity in an observation borehole during the short hydraulic test (hydraulic pulse) in an other borehole of the tested locality have been elaborated. There is a tendency to increase the lateral range of investigation, it means to make the cross-hole tests in boreholes with greater distance. Such cross-hole tests need to make the measurement of the induced vertical flow in the observation borehole with high resolution flowmeters able to measure vertical flow velocities in the range 10–4 m/s and the flow rates in the range 10–6 m3/s. The new photometric flowmeter was developed for this purpose. The results of the photometric flowmeter measurements were compared with the fluid logging measurements and with heat-pulse flowmeter measurements. In our contribution examples of the comparison of measurements mentioned above in two boreholes situated in granite massif in the Czech Republic are demonstrated. Boreholes were drilled in the program of Czech state institution SÚRAO (Radioactive Waste Repository Authority). The research project is financially supported by the Grant Agency of the Czech Republic under the No. 208/07/0777.