

Mathematical Modeling and Practical Verification of Groundwater and Contaminant Transport in a Chosen Natural Aquifer

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A b s t r a c t

The paper addresses the 2D mathematical equation of conservative contaminant transport in an aquifer for chosen contaminants. The contaminants (chlorides and sulfates) are subject to instantaneous reversible part of sorption process. The term of instantaneous reversible sorption in the presented equation has been described by the non-linear Freundlich adsorption isotherm, widely applied in practice in relation to static processes (for local equilibrium). The numerical solution (using the finite difference method) has been based on the previously calculated values of longitudinal and transverse dispersion coefficients and the non-linear adsorption parameters for the chosen contaminants. Based on this model, the values of chloride and sulfate concentration isolines have been calculated and compared with the measured maximal concentrations in the chosen natural aquifer (installed piezometers). Additionally, the values of chloride concentrations have been calculated taking into account the influence of radioactive decay term, using the numerical value of the first-order decay rate constant for an adopted theoretical radionuclide.

Key words: advection, dispersion, instantaneous reversible sorption, contaminants, contaminant transport, groundwater.