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Mathematical modeling of biocolloid transport in an experimental pilot-scale aquifer

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This study is focused on the development of a mathematical model for biocolloid transport in a three-dimensional model aquifer. The transport model is applicable to saturated, homogeneous porous media, accounting for three-dimensional hydrodynamic dispersion in a uniform flow field, sorption, and first-order decay of liquid phase and attached biocoloids with different inactivation rates. The numerical algorithms are based on the fully implicit finite difference method, which is known to be stable. The accuracy of the numerical model was tested for certain ideal cases with an existing analytical solution. Furthermore, the numerical model successfully fitted experimental data obtained from experiments conducted in a pilot-scale aquifer consisting of a rectangular glass tank with internal dimensions: 120 cm length, 48 cm width, and 50 cm height, carefully packed with well-characterized quartz sand. The fitted parameters values are in agreement with literature values.