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Using data from colloid transport experiments to parameterize filtration model parameters for favorable conditions

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Colloid filtration in porous media spans across many disciplines and includes scenarios such as in-situ bioremediation, colloid-facilitated transport, water treatment of suspended particles and pathogenic bacteria, and transport of natural and engineered nanoparticles in the environment. Transport and deposition of colloid particles in porous media are determined by a combination of complex processes and forces. Given the convoluted physical, chemical, and biological processes involved, and the complexity of porous media in natural settings, it should not come as surprise that colloid filtration theory does not always sufficiently predict colloidal transport, and that there is still a pressing need for improved predictive capabilities. Here, instead of developing the macroscopic equation from pore-scale models, we parametrize the different terms in the macroscopic collection equation through fitting it to experimental data, by optimizing the parameters in the different terms of the equation. This way we combine a mechanistically-based filtration-equation with empirical evidence. The impact of different properties of colloids and porous media are studied by comparing experimental properties with different terms of the correlation equation. This comparison enables insight about different processes that occur during colloid transport and retention under in porous media under favorable conditions, and provides directions for future theoretical developments.