Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Filtration by porous media: a microfluidics approach FILIPPO MIELE, Institut des sciences de la Terre, University of Lausanne, Lausanne 1015, Switzerland, MARCO DENTZ, Spanish National Research Council (IDAEA-CSIC), Barcelona 08034, Spain, VERONICA MORALES, Civil Environmental Engineering, University of California Davis, CA 95616, USA, PIETRO DE ANNA, Institut des sciences de la Terre, University of Lausanne, Lausanne 1015, Switzerland — The transport of colloids in porous media is governed by deposition on solid surfaces and pore-scale flow variability. Classical approaches, like colloid filtration theory (CFT), do not capture behaviours observed experimentally, such as non-exponential steady state deposition profiles and heavy tailed BreakThrough Curves (BTC). In the framework of CFT, a key assumption is that the colloid attachment rate k is constant and empirically estimated via a posteriori macroscopic data fitting. We design a novel experimental set-up based on time-lapse microscopy and continuous injection of fluorescent monodisperse colloids into a folded microfluidics device (1mt total length) designed with a controlled level of 2D spatial disorder. This set-up allows us to i) measure both BTC and deposition profile over several orders of magnitude and ii) to perform particle tracking and Lagrangian analysis of single colloid's trajectories. Based on this analysis, we propose a stochastic model that takes into account pore scale heterogeneities in terms of correlation length, velocity and attachment rate distribution, that captures the anomalous behaviour shown by the experimental data.

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Date submitted: 09 Aug 2020 Electronic form version 1.4