

## Bulletin of the American Physical Society

### 71st Annual Meeting of the APS Division of Fluid Dynamics Sunday–Tuesday, November 18–20, 2018; Atlanta, Georgia

#### Session G36: Suspensions: Fluid-Particle Interaction

10:35 AM–12:45 PM, Monday, November 19, 2018  
Georgia World Congress Center Room: B408

Chair: Brian Utter, Bucknell University

#### **Abstract: G36.00008 : Particles sedimenting in a permeable medium\***

12:06 PM–12:19 PM

← Abstract →

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In many systems found in nature or in technological contexts, micro-objects (particles, microorganisms, etc.) sediment in a more or less crowded environment – in a fluid with solid-like intrusions, which increase the effective friction force exerted on them by the fluid. Therefore, it is interesting to investigate how this increased friction affects basic features of many-body dynamics, known for Stokes fluids: chaotic scattering, related to existence of periodic, usually unstable orbits, and formation of long-lasting particle clusters. In this work, such a crowded environment is modeled as porous medium. We study sedimentation of many-particle systems for decreasing values of the medium permeability. The fluid motion is described by the Brinkman-Debye-Bueche equations, and the motion of particles by the corresponding point-force model. We investigate dynamics of many particles which initially form 2 or 4 coaxial rings. For large permeability, we find a family of periodic orbits, analogical to those found in Stokes fluids; for smaller permeability, such solutions are absent and particles do not form long-lasting clusters. Results might be useful for medical and industrial applications.

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