Brenk, Markus; Bungartz, Hans-Joachim; Mehl, Miriam; Muntean, Ioan L.; Neckel, Tobias; Weinzierl, Tobias
Numerical simulation of particle transport in a drift ratchet. (English) ｜Zbl 1185.35159｜

The authors simulate a particular drift ratchet which consists of a matrix of pores with asymmetrical oscillating diameter wherein a fluid with suspended particles is pumped forward and backward, and where the particles' long-term transport direction depends on their size. Thus, this setup allows for continuous and parallel particle separation, which has been shown experimentally. However, for deeper understanding and for an optimized parameters choice, further investigations, i.e., simulations, are necessary. In this paper, the authors present first results achieved with some parallel three-dimensional simulation codes applied to a still simplified scenario. This simplification is necessary to isolate different phenomena (e.g., asymmetries and Brownian motion) to check their relevance for the particle transport. The simulation codes are based on (adaptive) Cartesian grids in combination with finite volume and finite element discretizations. Cartesian grids allow for a very efficient implementation of the solver algorithms and an efficient balanced parallelization via domain decomposition. The achieved simulation results show the effectiveness of the considered approach and give some strong hints on a direct particle transport already with the simplified used here model.

Reviewer: Titus Petrila (Cluj-Napoca)

MSC:

35Q30	Navier-Stokes equations	
76S05	Flows in porous media; filtration; seepage	
76M10	Finite element methods applied to problems in fluid mechanics	
76M12	Finite volume methods applied to problems in fluid mechanics	
35-04	Software, source code, etc. for problems pertaining to partial differential equations	
76-04	Software, source code, etc. for problems pertaining to fluid mechanics	

Cited in **6** Documents

Keywords:

particle sorting; drift ratchet; Brownian motion; fluid dynamics; Euler approach; Cartesian grid

Software:

MpCCI; GENSMAC

Full Text: DOI