Particles in fluids

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The interaction of a moving fluid with particles is still only understood phenomenologically when the Reynolds number is not vanishing. I will present three different numerical studies all using the solver "Fluent" which elucidate this issue from different points of view. On one hand I will consider the case of fixed particles, i.e. a porous medium and present the distributions of channel openings, fluid velocities and fluxes. These distributions show a scaling law in the density of particles and for the fluxes follow an unexpected stretched exponential behavior. The next issue will be filtering, i.e. the release of massive tracer particles within this fluid. Interestingly a critical Stokes number appears below which no particles are captured and which is characterized by a critical exponent of 1/2. Finally I will also show data on saltation, i.e. the motion of particles on a surface which dragged by the fluid perform jumps. This is the classical aeolian transport mechanism responsible for dune formation. The empirical relations between flux and wind velocity are reproduced and a scaling law of the deformed wind profile is presented.
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