ＳＰＨ法を用いた微粒子流入による浸透率変化シミュレーション
Permeability variation due to sand particles in an infiltration flow using Smoothed Particles Hydrodynamics method.

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Sand control is recognized as a key issue to prevent troubles caused by sand with the production of oil or gas. Sand grains are produced by the increment of the effective stress in the sub-surface due to the production of fluid resources and are carried by the fluid. these grains could not only hinder the flow to decrease the permeability in reservoir but damage the production line. It is therefore important to take a measure for controlling sanding problem. Research has begun to use numerical simulations as a new methodology since the mechanism has not been well understood yet due to the complexity of solid-fluid interation behavior. In the present study, we focus on the problem in the prevention of fluid path in porous media and conduct numerical ezperiments to deal with the soil-fluid interaction. Among possible parameter such as average grain size, average pore throat diameter, fluid viscosity, pressure gradient, and many others, we focus our attention to the effect of grain shape in the mechanism to hinder the fluid flow in porous medium, i.e. to decrease the permeability. Existing studies have mainly considered grains of spherical shape becouse of the simplicity to deal with both solid-fluid and solid-solid interactions in their numerical models. It is, however, well known that the shape of grains could not be. We employed a Smoothed Particle Hydrodynamics(SPH) method, i.e., one of particle methods. To deal with non-spherical particles with arbitrary shapes at the same time in a simple way in our simulation. As an initial step, we modeled a pore throat with a 2D pipe, put immovable solid obstacles in a flow to respresent matrix grains, and movable sloid particle of both spherical and rectangular shapes as sand grains. After the simulation of the transportation of movable solid particles, we could observe the rectangular and circular grains to show different interaction behaviors with immovable particles and the variations of the permeability in time. Our results indicate that the shape of shape of grains has strong in fluence to the permeability in porous media. We think the shape of floating grains should be taken into account for evaluating the sanding problems.