OIL TRANSPORT THROUGH THE SCALE-INVARIANT POROUS MEDIA

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The objective of the paper is to develop a numerical model describing the interface between drops of oil and water while their joint movement through the porous media. The fluids have different viscosities. Porosity and permeability have pulsations from an extreme wide range of scales. The refined scaling theory of *Kolmogorov, 1962* [1] and the lognormal model is used for the media. The Kolmogorov's scaling is similar to multifractal one which was considered in [2]. The displacement of one fluid by another one is displayed with the passive particles which label the interface between the fluids. The motion of the interface between the fluids is calculated from the equation:

$$m(\mathbf{x})\frac{d\mathbf{x}}{dt} = \mathbf{v}(\mathbf{x}), \;\; \mathbf{x}|_{t=0} = \mathbf{x}_0^{(i)}, \;\; i = 1, ..., N, \tag{1}$$

where i stands for the number of particle, $m(\mathbf{x})$ is porosity, $\mathbf{v}$ is velocity. Darcy's law gives the velocity $\mathbf{v} = -\varepsilon(\mathbf{x})\nabla p$, where p is pressure, $\varepsilon(\mathbf{x})$ is permeaubility. The steady filtration through the fractal porous media was considered in [3]. Evolution of a drop is displayed in Fig. 1. The different spatial moments of drops are calculated and their statistical characteristics are presented. Dispersion is

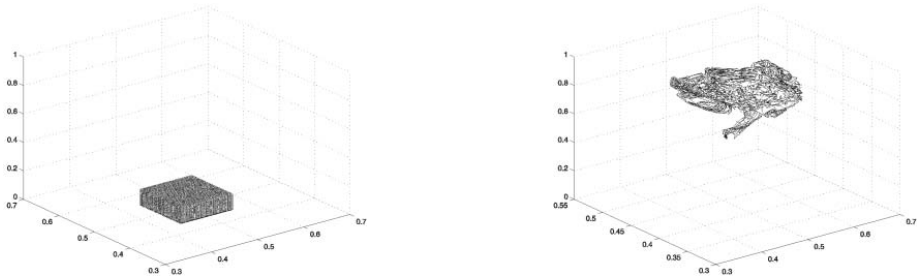

Figure 1: Development of the fluid interface

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described by the second order diffusion tensor $D_{ij}(l)$. All these components $D_{ij}(l)$ are computed. The value of the transverse diffusion is investigated and compared to the longitudinal one, while the statistical parameters of the medium and the viscosities of the fluids vary.

References

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