Upscaling of absolute permeability for a super element model of petroleum reservoir

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Abstract

© Published under licence by IOP Publishing Ltd.This paper presents a new method of local upscaling of absolute permeability for super element simulation of an oil reservoir. Upscaling was performed for each block of a super element unstructured grid. For this purpose, a set of problems of a one-phase steady-state flow was solved on a fine computational grid with the initial scalar field of absolute permeability with various boundary conditions. These conditions reflect the specific variants of filtrational flow through the super element and take into account the presence or absence of boreholes in the coarse block. The resulting components of the effective permeability tensor in each super element were found from the solution of the problem of minimizing the deviations of the normal flows through the super element faces, averaged on a detailed computational grid, from those approximated on a coarse super element grid. The results of using the method are demonstrated for reservoirs with river-type absolute permeability. The method is compared with the traditional methods of local upscaling.