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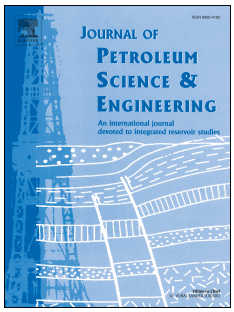

An automatic segmentation algorithm for retrieving sub-resolution porosity from X-ray tomography images

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An automatic segmentation algorithm for retrieving sub-resolution porosity from X-ray tomography images.☆

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Abstract

X-ray computed tomography is a nondestructive technique often used in geosciences to obtain a three-dimensional representation of the pore space geometry that will be used for running fluid dynamic simulations. However, rocks often display a very large distribution of pore sizes and consequently pores of size smaller than the X-ray tomography resolution. Not taking such pores into account leads to incorrect calculations of petrophysical properties of rock, therefore the problem of characterizing sub-resolution porosity is identified as a critical issue for geosciences applications. In this paper we propose a new algorithm that allows localization and quantification of sub-resolution porosity. The proposed algorithm can operate in two modes: one of them could be considered as a multi-phase segmentation and could be applied for a variety of X-ray tomography image segmentation tasks; whereas second modification gives better porosity estimation. The algorithm is applied to two images. Good quality image is processed with automatic choice of parameters and without preprocessing. Image of lower quality is processed with preprocessing and manual choice of parameters. In both cases, the computed porosity fits reasonably well with the laboratory measured porosity.

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