Geophysical Research Abstracts
Vol. 18, EGU2016-475, 2016
EGU General Assembly 2016

A fast and robust new pore-network extraction method based on hybrid median axis and maximal inscribed ball techniques

Sizonenko Timofey (1), Marina Karsanina (2), Irina Byuk (1), Kirill Gerke (3,1,2)

(1) Institute of Physics of the Earth of Russian Academy of Sciences, Russian Federation (luckydevil2007@gmail.com), (2) Institute of Geosphere Dynamics of the Russian Academy of Sciences, Moscow, Russia, (3) The University of Melbourne, Department of Infrastructure Engineering, Australia

To characterize pore structure relevant to single and multi-phase flow modelling it is of special interest to extract topology of the pore space. This is usually achieved using so-called pore-network models. Such models are useful not only to characterize pore space and pore size distributions, but also provide means to simulate flow and transport with very limited computational resources compared to other pore-scale modelling techniques. The main drawback of the pore-network approach is that they have first to simplify the pore space geometry. This crucial step is both time consuming and prone to numerous errors. Two most popular methods based on median axis or inscribed maximal balls have their own strong sides and disadvantages.
To address aforementioned problems related to pore-network extraction here we propose a novel method utilizing the advantages of both popular approaches. Combining two algorithms resulted in much faster and robust extraction methodology. Moreover, we have found that accurate topology representation requires extension of the conventional pore-body and pore-throat classification. We test our new methodology using pore structures with "analytical solutions" such as different sphere packs. In addition, we rigorously compare it against inscribed maximal balls methodology's results using numerous 3D images of sandstone and carbonate rocks, soils and some other porous materials. Another verification includes permeability calculations which are also compared both against lab data and voxel based pore-scale modelling simulations.
This work was partially supported by RFBR grant 15-34-20989 (X-ray tomography and image fusion) and RSF grant 14-17-00658 (image segmentation and pore-scale modelling).