Geophysical Research Abstracts
Vol. 21, EGU2019-1830, 2019
EGU General Assembly 2019

Permeability upscaling in three carbonate samples using textures of Micro- Computed Tomography images

Mohamed Jouini, Ali Alsumaiti, Moussa Tembely, and Khurshed Rahimov
Khalifa University, Petroleum Institute, Abu Dhabi, United Arab Emirates (mohamed.jouini@ku.ac.ae)

Digital Rock Physics (DRP) is a technique using image acquisition of rock samples to help understanding rock properties behavior at pore scale. The standard technique consists of applying image segmentation to extract pore network then use numerical simulators to estimate rock properties such as permeability for example. Several research studies results showed the high potential of this technique to predict relevant rock properties results in sandstone reservoirs. However, this approach is suffering from a lack of clear methodology and workflow for carbonate rocks due to their high heterogeneities. In our study, we propose a new upscaling method at core plug scale to characterize absolute permeability using textures of Micro Computed Tomography images. First, we acquire three carbonate samples from a reservoir in United Arab Emirates oilfield with 1.5 inch diameter at a resolution of 40 microns using X-Ray Micro tomography. Based on visualized texture variability we extract and acquire 0.5 inches subsets representing each texture at a resolution of 14microns. Furthermore, after visual inspection, we extract inside these subsets smaller homogeneous subsets that we scan at 2 microns. These high resolution image textures will represent each class in our model. We use Lattice Boltzmann simulator to estimate permeability in each class. The main challenge is the upscaling of simulated properties from fine to coarse scales in order to obtain the effective rock property of core plugs. We propose to classify 3D micro-CT images of rock samples in terms of parametric texture model and predict the overall rock permeability by integrating classification result with absolute permeability simulations values computed locally for each texture class. Finally, we compare our simulation results with experimental measurements and discuss advantages and limitations of this new approach.