Trends in Digital Core Analysis: Treatment of Unresolved Porosity

Arns, Christoph Hermann, Abid Ghous, Tim J. Senden, and Mark Knackstedt, Australian National University, Canberra, Australia

Most rocks are inherently heterogeneous having been laid down in a range of depositional environments and possibly having undergone significant diagenesis. Pore sizes can vary over orders of magnitudes and connectivity of pores of different scales can impact greatly on flow properties. Typically, porosity cannot be resolved on all scales.

In this work we describe imaging of a range of core material from outcrops and reservoirs via 3-D via micro-CT. We also present methods to quantify the amount of microporosity as well as the flow properties of those microporous regions by differential imaging techniques. High resolution numerical simulations of single phase flow and solute transport are then undertaken. We perform lattice-Boltzmann calculations on the tomographic images, accounting for microporous regions by adding a Darcy-type flow in microporous regions and matching Darcy-like and Stokes like flow regions at the open-space, microporosity interface using Brinkman's equation. These results shows the important role of intermediate pore sizes in dictating the single phase flow properties and the potential for many large pores to act as no or slow flow zones.

For the same samples, we calculate the NMR relaxation response and analyse pore-pore coupling as well as pore-porous background coupling by using a network partitioning technique to label each pore (region) separately.

AAPG Search and Discovery #90061©2006 AAPG International Conference and Exhibition, Perth, West Australia 5-8, November 2006