# INTRODUCTION TO DIGITAL ROCKS: RESEARCH, DEVELOPMENT, AND APPLICATION

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**Abstract**

Digital Rocks technology utilizes high-resolution 3D rock images, advanced modeling and simulation techniques to "measure" petrophysical properties of the rock. Digital Rocks provides an alternative method to measures the basic rock properties which are used for reservoir characterization and performance prediction. A number of publications have been published on Digital Rocks, however these are generally limited in term of scope, and emphasis on single aspects, or present an individual application example. Here we describe the research and development of Digital Rocks, and explains how this technology can be applied to the petroleum industry. We describe the undertaken research, and the development of technology which includes extensive verification and validation of results. After research and development, the industrial application is a key challenge for this emerging technology. The fundamental capabilities required for Digital Rocks technology, including x-ray micro-CT imaging, image processing, numerical simulation are described in this paper. The given technology development and application examples to petroleum reservoir examples are specific to static rock properties. The presented results, includes comparisons of image-based porosity and simulated permeability, formation factor, and pore size distribution with conventional laboratory experimental data obtained from core plugs. Results show that Digital Rocks technology has the ability to improve reservoir evaluation and recovery methods. The quick numerical experiment can reduce the cycle time for appraisal, 3D visualization and reproducible numerical experiments at multiple conditions can reduce subsurface uncertainty and increase decision making power.

**Key Words:** Digital Rocks; Micro-CT; Reservoir Characterization; Petrophysics.