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From Images to Rock Properties

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From Images to Rock Properties

In the Oil and Gas industry, digital images of rock samples are being collected and utilized for reservoir formation characterization more frequently than ever. This is in part due to the fact that imaging tools such as X-ray CT scanners and SEM's have become more prevalent, and also due to the challenges and time-consuming processes in traditional core analysis of unconventional and complicated conventional reservoirs. Rock images (e.g. optical images of thin section) have traditionally been used for qualitative and to a limited extent quantitative analysis of rocks, often using laborious point-counting methods. With the advent of computerized image analysis techniques and image-based simulation models, the information that can be obtained from rock images has been tremendously improved both in quantity and quality. Nowadays, one can use rock images to characterize the pore-space of a rock sample to calculate porosity and then simulate the fluid flow in the digitally characterized pore-space to calculate permeability and even multi-phase flow properties. The accuracy of the image-based results would depend on the quality of the images, the resolution at which the images are acquired, and the algorithms behind the image analysis and image-based modeling tools. Having high-quality imagery data at multiple scales and multiple resolutions, and consistent and robust image analysis workflows is the key for achieving the best results.

PerGeos, the Digital Rock Image Analysis and Modeling Suite has been developed for large and multi-modal data analysis. Using this software suite, one can analyze data from multiple sources and at multiple scales. Combined with the workflow automation capability, the analysis tools in PerGeos are used to generate effective workflows for various types of data and analyses. An overview of the digital rock technology will be presented in this talk. Examples of micro-CT, whole core CT, SEM, and FIB-SEM data analysis of rock samples will be shown.

References

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