1. Introduction

The SPE paper SPE-183145-MS

*Integration and data analysis of conventional core data with NMR and CT data to characterize an evaporitic carbonate reservoir.*

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describes how different rock types are being defined by combining multiple information (logs, NMR analysis, Porosity, Permeability).

The Core Profile workspace of PerGeos already provides the right tools to visualize logs, CT cores, Bore Hole images and Photographs.
A unique preprocessing step allows the cores barrel to be intelligently removed, the core to be re-oriented if it is not perfectly vertical, and all the cores to be stitched together regardless of the total size.

This allows a user to browse in real time an entire 3D digital well of 100+ cores and apply post-processing operations such as logs generation from image segmentation and analysis.
Given the great ability to automate analysis with scripting, a script module computing the heterogeneity logs described in the referenced paper has been developed and successfully applied on different whole cores.

Thus, what appeared to be a painful manual task is now fully automated and applicable to the whole core in a few mouse clicks.

2. Core profile features

Barrel removal, stitching and realignment

The Barrel removal is obtained after the registration based realignment by a cylindrical cropping.
Barrel removal and core realignment

The stitching into a single file from 100+ individual cores is achieved by using a proprietary multi-resolution file format (LDM) allowing an immediate and complete visualization independently of the machine power.

Example stitched dataset of 72Gb
Petrophysical properties

Permeability, Porosity, MICP and other properties or numbers can be computed in PerGeos from microCT sub-plugs taken from the full core.

CoreProfile represents plugs and sub-plugs digital images and petrophysical results through the link annotation interface. That way, the results can be cross-checked with the depth and the associated logs. At any time, a new porosity / permeability / MICP simulation can be run from the microCT sub-plug in the PerGeos workspace.

Highlight of CoreProfile link annotation window browsing a microCT scanned sub-plug

Note: porosity / permeability logs could also be computed and displayed from multiple sub-plugs.
3. Heterogeneity logs script module

The module written in TCL will compute for every Z-slice of the core the greyscale histogram given a fixed range.

*Note: the pre-processing barrel removal step guarantees that the histogram only reflects the core data*

N values will be retained, equally distributed, and for each of them a log will be generated along the core.

*Note: pre-processing steps such as beam hardening correction and de-noising can be utilized prior to the histogram computation*

A histogram is computed for every slice. The histogram values for a single intensity (number of pixels with that value) are written in one log.
4. GUI

**Heterogeneity logs generation module**

**Range**: intensity range of the core

**Number of Logs**: number of bins of the histogram to retain. Bins are equally distributed along the core CT intensity range

**Logs Path**: path where to save the logs

**Action**: triggers the logs computation
5. Heterogeneity Logs display

Heterogeneity logs displayed next to the CT Core and cylinder Slice(1366, 1571.5, 1777, 1982, 2188)

All generated logs can be displayed in the same window. Options such as visibility and color can be adjusted.

Note: next PerGeos release will add more options for logs visualization
Heterogeneity logs of low values displayed next to the cylinder slice.

Heterogeneity logs and segmented facies.