# Application of digital petrophysics to Brazilian pre-salt carbonate rock: comparative study on two different facies

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**Abstract.** Since the time Digital Rock Physics (DRP) gained momentum, a lot of attention has been dedicated in development and improvement of simulation algorithms, performance evaluation and accuracy validation against laboratory measurements etc. Thanks to these efforts we have robust understanding of associated uncertainties, limitations and assumptions. For e.g. we know that in terms of absolute values, there is a persistent overestimation of predicted elastic properties for all elastic simulators (regardless of the methodology). However what is also true, and perhaps slightly overlooked, is that we can still extract valuable trends, sensitivity ranges and data for comparative studies starting from a set of images despite these limitations.

In this work we focus on such an application to look at the variability of carbonates. Due to giant discoveries made in the past years pre-salts are of significant economic importance. We employed our DRP workflow on two Brazilian pre-salt carbonate samples with different morphology and mineralogy. A high permeability (754 mD) and porosity (14.1%) coquina sample S1 consisting primarily of calcite and quartz was chosen in contrast to a low permeability (6.15 mD) spherulite sample S2 of similar porosity (13.4%). The samples were imaged with Micro-CT at three resolutions (including a full plug image at coarse resolution) and DRP was used to characterize elastic properties, single phase flow and pore network extraction properties. As expected, numerical predictions overestimated laboratory measurements in all cases when compared. However we perform a systematic comparison between common parameters of both samples to identify if any one sample suffered a higher degree of overestimation and why? Furthermore we highlight the challenges in image processing and segmentation and the consequential effect of segmentation sensitivity on derived properties.