

3D digital core imaging: A critical calibration tool for the integration and characterization of fractures from borehole images

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ABSTRACT

CoreScan systems are used to make high resolution 3D digital scan images of the exterior of core.

The core is typically cleaned and aligned, to avoid any mismatch of features, before being scanned on a rotating roller base that ensures full 3600 coverage of the outer surface of the core. In themselves, these 3D digital core scans are a primary record of the state of the core before it is slabbled or plugged and they provide an immediate, easily disseminated visual image of the rock, showing textures, natural colors, oil-staining, bedding, fractures and, importantly, their structural or sedimentological relationships and intersections.

It is when these scans are integrated with other forms of borehole image that they prove most useful. Distinguishing whether fractures are open or closed in borehole images can be extremely challenging, particularly if the resistivity images are recorded in an oil-based mud system. In these cases, both open (oil-mud-filled) and mineralized fractures can appear as resistive features. Reference to the 3600 core scan serves as a critical calibration tool to distinguish the fracture types through direct comparison of the photographic and resistivity features. Similarly, drilling or handling induced fractures can be distinguished from natural fractures.

This study shows that the digitally acquired 3600 core scans can be easily depth shifted and oriented to match borehole image features by applying a variable azimuthal rotation about the borehole axis, using core GR and well- defined high angle geological features as the reference between the datasets. The scans can be combined into core strings and once both data types are aligned, the nature of fractures can be easily determined from 3D digital core scans and the borehole image logs can be calibrated accordingly. Oriented features can then also be directly picked from the core scans to supplement and support the borehole image interpretation.