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Approach for computing 1D fracture density: application to fracture corridor characterization

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Fracture density is an important parameter for characterizing fractured reservoirs. Many stochastic simulation algorithms that generate fracture networks indeed rely on the determination of a fracture density on volumes (P30) to populate the reservoir zones with individual fracture surfaces. However, only 1D fracture density (P10) are available from subsurface data and it is then important to be able to accurately estimate this entity. In this paper, a novel approach is proposed to estimate fracture density from scan-line or well data. This method relies on regression, hypothesis testing and clustering techniques. The objective of the proposed approach is to highlight zones where fracture density are statistically very different or similar.
This technique has been applied on both synthetic and real case studies. These studies concern fracture corridors, which are particular tectonic features that are generally difficult to characterize from subsurface data. These tectonic features are still not well known and studies must be conducted to better understand their internal spatial organization and variability. The presented synthetic cases aim at showing the ability of the approach to extract known features. The real case study illustrates how this approach allows the internal spatial organization of fracture corridors to be characterized.