MULTISCALE FRACTURE ANALYSIS OF LOWER CRETACEOUS PLATFORM CARBONATES: IMPLICATIONS FOR MECHANICAL STRATIGRAPHY AND PERMEABILITY ANISOTROPY

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Abstract

Most carbonate reservoirs are highly fractured, and thus their permeability is mainly controlled by fracture networks. The prediction of porosity and permeability in subsurface carbonate successions is essential for reservoir characterization, both in terms of hydrocarbon exploration, production and for Geo-Energy applications. Outcrop analogues are nowadays widely used to understand the characteristics of subsurface fracture networks and their evolution in time. This final master project analyzes the orientation, intensity, and spatial distribution of fracture networks in the Barremian-Aptian carbonate succession from the western Maestrat Basin (Galve sub-basin, eastern Iberian Chain). The succession was studied through a combination of methods, including the analysis of fractures in the field, rock sampling and the quantification and statistical analysis of fracture patterns from orthophotos and virtual outcrop models acquired with an unmanned aerial vehicle (UAV). The study obtained different fracture network intensities, ranged from 10.29 m^{-1} to 18.98 m^{-1}, distinguishing a fracture length between 2-20 meters approximately, and it has revealed that fractures affecting the succession are mainly arranged into orthogonal systems, dominant N-S to NW-SE and NE-SW orientations, respectively. The genesis of the fracture networks has been associated to the Early Cretaceous extension period that affected the eastern Iberian Plate owing to the opening of the Bay of Biscay domain.