

How Abundant are Fractures in Gently Deformed Carbonates?

Mohammed M. Al-Fahmi¹, Abdullah Al-Mojel², and Joe Cartwright¹

¹University of Oxford, Oxford, United Kingdom.

²University of Bordeaux, Bordeaux, France.

ABSTRACT

Gently deformed carbonates lack intense faulting and strong folding that drive and infill fractures till saturation levels. The concept of fracture saturation, therefore, may be applied for fracture abundance in highly deformed carbonates. But how abundant are fractures in gently deformed carbonates? This study examines fracturing and controls on fracture abundance from the carbonate reservoirs and outcrops of the Arab Formation. The Arab carbonates are gently deformed across the Arabian Sedimentary Basin by well documented forms of forced folding: The Central Arabian Arch, the N-S anticlinal structures and the salt-related domes. The study compares fractures from two outcrops in the Central Arabian Arch with fractures interpreted from geometrical reservoir core from a low-relief dome structure in Eastern Arabia. The study results demonstrate that lithological properties have different fracture abundances. Correlation between bed thicknesses and fracture abundance is not, however, discernible from reservoirs or outcrops. But fractures are unequivocally a lot more abundant in reservoirs than in outcrops. This can only be attributed to the different fracturing stresses, as the Arab strata have the same lithological properties. Notably, the bending of the dome is higher than of the Central Arabian Arch, and hence reflect greater strain and fracturing. The outcrops in the Central Arabian Arch are also less fractured than many well-studied outcrops from many places around the world. These gently flexed outcrops seem to have the potential to predict lowest fracture abundance and hence provide a baseline for subsurface carbonate fractures.