Variations in fracture system geometry and their implications for fluid flow in fractures hydrocarbon reservoirs

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Abstract

Studies assembling high quality datasets of fracture systems (joints and faults) from four reservoir analogues are described. These comprise limestones (Ireland), sandstones (Norway and Saudi Arabia) and chalk (Denmark). These are used with existing information from the literature to review the major controls and scaling behaviour of fracture systems expected in reservoir rocks. Lithological layering was found to be important and two end-member fracture systems have been identified. In "stratabound" systems, fractures are confined to single layers, sizes are scale restricted, and spacing is regular. In "non-stratabound systems", fractures show a wide range of sizes (often power-law), are spatially clustered and vertically persistent. In nature, variations between and combinations of these systems exist. These end-member systems have contrasting implications for fluid flow, including the scale of fracture that controls flow and the existence of a representative elementary volume, and thus on appropriate modelling approaches.