Recognition, Analysis and Interpretation of Disturbed Deep-Marine Successions from Borehole Images

McGarva, Roderick M., Adam J. St;yles, and Deborah A. Walker, TASK Geoscience Limited, Aberdeen, United Kingdom

Deep marine successions are an important and developing target for the exploitation of hydrocarbons. Within such successions the presence of syn-sedimentary deformation is commonly observed and can have a strong influence on reservoir quality. Deformation in deep marine successions, typically as slides, slumps and debrites can act at reservoir scale with both positive and negative consequences.

Borehole images allow visualisation of syn-sedimentary deformation fabrics which, in conjunction with a range of analytical tools, can allow their characterisation. Features typically observed on images include bedding surfaces, over-steep bedding, fractures and faults. Specific features that need to be understood in the interpretation of deformed sections include: slumps, over-steep beds, undeformed intervals, repeated sections, detachment surfaces and debrites. Other characteristics that may be related to syn-sedimentary deformation include large scale rotations between dip domains, uphole progressive dip rotations and the recognition of genetic layer-bound deformation.

In addition to background sedimentation and healing phases, five principal styles of deformation have been identified on borehole images that represent progressively increasing slope development. These include creep fabrics, coherent block rotations, translational slide blocks, layer bound "Christmas tree" style deformation and slump complexes (or mass transport complexes if occurring at the base of a sequence).

Borehole images offer ready visualisation of extensive wellbore sections, providing abundant oriented features and information on lithologies, lithofacies and fractures. Images reveal the presence of common syn-sedimentary features within many deep marine successions that need to be accounted for within the context of reservoir modelling.