Advances in stratigraphic trap identification

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Abstract

Stratigraphic trap identification will play a vital role in new hydrocarbon discoveries this century. The potential for large discoveries will make the risk-reward ratio worth the investment in an environment of declining reserves and increasing energy costs. Successful stratigraphic traps require not only sufficient reservoir quality, suitable geometry and connectivity, but must be coupled with a top and base seal and in many cases a distinct lateral seal of sufficient sealing capacity, geometry and integrity. They also require a pathway for hydrocarbon migration. In isolated reservoirs this may be achieved if the seals are also hydrocarbon sources. Most stratigraphic traps have a structural aspect to their success, and in some cases the relationship between depositional setting and evolving structure will be important.

Advances in high-resolution 3D seismic interpretation offer powerful tools for mapping stratigraphic traps, but there are pitfalls. Interpretation requires a combination of both geophysical knowledge and geological understanding of preservational geometries for a particular depositional system within its correct sequence stratigraphic context. Identification of the key surfaces that encapsulate the reservoir in a stratigraphic trap is a vital step in the exploration strategy. For example, early transgressive systems tracts may offer the best potential for isolated or pinched-out reservoirs beneath seals that can also act as excellent source rocks. The nature of the underlying systems tract is therefore critically important, especially the sealing capacity across the sequence boundary. Examples from a range of fluvial, deltaic, coastal and deepwater successions are used to illustrate how integration of these concepts can lead to identification of new plays, ideally avoiding obvious pitfalls, recognizing key risks, and leading to a protocol for evaluating stratigraphic traps on a risk-reward basis.

Keywords: Stratigraphic traps, reservoirs, seals, fluvial, deltaic, coastal, deepwater, 3D seismic, sequence stratigraphy.

Biography

Simon Lang has a BSc Honours (1985) and Phd (1994) from the University of Queensland. He worked for the Geological Survey of Queensland until 1992, when he joined Queensland University of Technology as a lecturer in sedimentology and stratigraphy, later moving to the National Centre for Petroleum Geology and Geophysics (NCPGG) in 1999 as Associate Professor in sedimentology and sequence stratigraphy. Simon has supervised over 50 Honours, Masters and PhD students on petroleum and mineral related projects in a range of basins in Australia, Indonesia, PNG, and Venezuela. He is currently the project leader on reservoir characterisation for the APCRC program on Geological Disposal of CO_2 (GEODISC), in addition to leading research on sedimentology, sequence stratigraphy and reservoir characterisation at the NCPGG. Simon conducts industry training courses on sequence stratigraphy and reservoir sedimentology, as well as doing consulting for a range of petroleum companies. Simon is a member of PESA, GSA, AAPG, SEPM, IAS and IPA.