ORAL PRESENTATION

Integrated Stratigraphic and Provenance of the Cuu Long Basin, Offshore Vietnam

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Well to well correlations of the Cuu Long Basin are typically challenging, due to the highly variable nature of the wireline signature and resolution of the seismic data. Traditionally the Cuu Long Basin is subdivided based on Seismic Groups; Seismic Group G, which rests on crystalline basement, Seismic Groups F and E which represents the main extensional phase of rifting and Seismic Groups D and C which represent the thermal subsidence and extension phase of basin development. These seismic groups also have lithostratigraphic equivalents, the Ca Coi, Tra Cu, and Tra Tan Formations, respectively. Recently a sequence biostratigraphic approach has utilized palynology to provide an improved perspective of the age of Seismic Groups B to D, by reference to age-calibrated eccentricity-driven climate cycles, however, this approach is inherently weak in Seismic Groups E, F and G, due to limited palynomorph recovery.

Within this study a holistic approach is taken to establish an integrated stratigraphic framework using whole rock elemental chemostratigraphy, biostratigraphy, seismic and wireline data, for the Cuu Long Basin, Offshore Vietnam. In addition, selected samples have been analysed by automated Raman heavy mineral analysis to further refine the provenance of key sandstone intervals.

Key ratios, from the whole rock elemental dataset, effectively represent changes in sediment provenance, weathering, and geological process have been used to geochemically define a series of chemostratigraphic super-groups, groups, and packages from selected well penetrations across from the study area. The stratigraphy has been divided into two chemostratigraphic super-groups; the first (MS1) is broadly consistent with the occurrence of Seismic Groups G through E, which are inferred to be mineralogically and texturally immature relative to the second mega-unit. The second chemostratigraphic super-group (MS2) is consistent with Seismic Groups D and C; these sediments are characterised by sediments which are geochemically inferred to be more texturally and mineralogically mature.

These chemostratigraphic super-groups are then further subdivided into a series of chemostratigraphic groups, which are recognised as being broadly equivalent to the established seismic groups. In addition, these chemostratigraphic groups are further subdivided into numerous chemostratigraphic packages demonstrating a robust and high resolution chemostratigraphic scheme for the Cuu Long Basin. Chronostratigraphic control is defined by the additional use of sequence biostratigraphy based on palynology on twelve of the twenty-two wells evaluated for chemostratigraphy. The holistic approach of biostratigraphy and chemostratigraphy efficiently utilises two tools, which complement each other in the correlation of the study wells.

These geochemically characterised boundaries are demonstrated to be consistent across the study area and are consistent with seismic picks. One such example is the boundary between the super-group MS1/MS2, which is consistent with the Seismic Groups D/E boundary. Geochemically, a distinctive increase in weathering indices, and Fe/Mn ratios is observed across this boundary going up-section. Furthermore, heavy minerals, from automated Raman analysis, demonstrates a clear change in the heavy mineral assemblage across this stratigraphic surface. Heavy mineral assemblages below the MS1/MS2 boundary consistently reflect a sediment with abundant epidote and titanite to a sediment with abundant zircon. Incidentally, the MS1/MS2 boundary is consistent with the initiation of thermal subsidence and extension.

In conclusion, this study has established a robust chemostratigraphic/biostratigraphic framework across the study wells within the Cuu Long Basin, which is supported by seismic and wireline validation. Utilization of chemostratigraphy, combined with selected provenance analysis, will allow improved well to well and well to seismic correlations, and will aid in defining stratigraphic traps, the understanding of play fairway distribution and the overall evolution of the basin.

SPEAKER BIOGRAPHY

David Riley is a staff geologist and the stratigraphy manager of Chemostrat Ltd, which provides chemostratigraphic, geochemical, mineralogical and provenance analysis for petroleum exploration companies. David graduated from the University of Leicester with a PhD in geochemistry in 2012, joining Chemostrat Ltd as a geologist. Since then, David has worked on multidisciplinary studies from Canada, North Sea, Europe, SE Asia and Australia.