Integrated Sequence Stratigraphy as a Tool for Reducing Uncertainty: Study Case in Cretaceous Platform Carbonates of the Maestrat Basin - Spain

Author block: D. Harishidayat, D. Muñoz-López, King Fahd University of Petroleum and Minerals; T. Bover-Arnal, Universitat de Barcelona (UB), Barcelona, Spain; A. Koeshidayatullah, A. Al-shuhail, King Fahd University of Petroleum and Minerals.

Abstract

Objectives/Scope: Data scale is a main issue in sequence stratigraphy analysis, and sometimes it does not provide an objective reference for the classification of stratal units (systems tracts and depositional systems). Our study aims to provide a workflow and analogue for handling this data scale issue in sequence stratigraphy by utilizing the well-exposed Cretaceous outcrops in the Maestrat rift basin (Spain) with lateral continuous coverage at the expense of vertical resolution.

Methods, Procedures, Process: The sequence stratigraphy analysis is optimum when information derived from multiple data resolution are integrated. In this study, integration of aerial outcrop photograph analysis with traditional geological mapping (including sedimentary and stratigraphic logs), rock sample analysis (including microfacies of thin sections), and seismic forward modelling are performed. This kind of integrated approach covers all range of data scale in an ideal sequence stratigraphy analysis i.e., thin section (very high resolution) to seismic reflection (low vertical resolution but covering lateral variations including lap-out relationships).

Results, Observations, Conclusions: Our integrated approach has identified four systems tracts and six stratigraphic surfaces. The highstand systems tract is characterized by sub-parallel aggradation-progradation stacking pattern of high seismic amplitude rudist and coral bearing platform carbonates. This systems tract is bounded at the top by a sequence boundary (a subaerial unconformity, which passes basinwards to its marine correlative conformity) that is onlapped by younger transgressive deposits. The forced regressive systems tract is a product of relative sea-level fall (after highstand normal regression) and corresponds to a downlapping grainstone wedge (basin-floor component) of high seismic amplitude deposited basinwards, above a basal surface of forced regression. The lowstand systems tract is characterized by relatively medium to high seismic amplitude with oblique tangential of the prograding stacking pattern (later aggradation) of rudist dominated limestones, which are topped by a transgressive surface exhibiting borings and ferruginous stains. The transgressive systems tract is characterized by relatively low to medium parallel seismic amplitude with backstepping stacking pattern of onlap series of reflector to the landward area with perforated and ferruginous hardground surface. This systems tract is bounded at the top by the maximum flooding surface that shows a lateral extent of continuous seismic reflector downlapped by overlying highstand slopes.
**Novel/Additive Information:** Our study has successfully demonstrated the robustness of integrating varied data scale to reduce the uncertainty in sequence stratigraphy analysis. Therefore, the workflow and case presented in this study could be implemented as an analogue for any carbonate platform - basin transition setting, worldwide.