

Sequence Stratigraphic Understanding of Total Organic Carbon Contents and Preservation Potential in the Offshore Fine-Grained Successions of the Ordovician Sino-Korean Carbonate Platform, Mid-Eastern Korea

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Abstract

Recognition of principal stratigraphic surfaces in fine-grained offshore successions and understanding of total organic carbon (TOC) distribution have gained attention in sequence stratigraphy. In order to define key stratigraphic surfaces accurately, this study constructed a sequence stratigraphic framework for the Jigunsan Formation (which represents a mixed carbonate-siliciclastic depositional system) based on detailed outcrop descriptions and geochemical/mineralogical analysis (TOC, XRD, XRF, and ICP-MS). In particular, we focused on detecting inherent key horizons at the stratigraphic level and defining their systems tracts. Our integrated analysis suggests that the Jigunsan Formation can be subdivided into early- and late-stage transgressive systems tracts (TSTs) and early stage highstand systems tracts; the present study employs the new concept of the rapid back-stepping surface to establish transgressive systems tracts in t and t_0 , consider the distinctive TOC pattern of the Jigunsan Formation. The late TST starts with a rapid back-stepping surface and a high peak in TOC, followed by a gradual decrease upward, and ends with a maximum flooding surface. Our results will help improve the understanding of source rock distribution in mixed carbonate-siliciclastic successions within a stratigraphic framework, particularly for unconventional oil and gas fields with shale reservoirs.