

Categorization of Basin-Filling Succession Trends Based on the Basin Mass Balance Between Accommodation and Sedimentation

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Basin filling successions and basin subsidence patterns of around 40 sedimentary basins over the world were investigated to examine basin filling succession trends, depositional system stacking patterns and their control factors. The results reveal that basin filling succession patterns can be categorized into several types for each tectonic type of sedimentary basins, if the succession is regarded as transgressive, regressive and aggradational trends. Passive margin/rift basins can be categorized into four basic types: simple transgression case, transgression to late regression case, transgression to early regression case and aggradation case. Foreland basins can be categorized into two basic types: eroded sediment supply-dominant T-R cycle case and thrust load subsidence-dominant case. Strike-slip basins can be categorized into three basic types: aggradation case, early deepening to late aggradation case and early aggradation to late deepening case. Intracontinental sag basins show aggradational stacks of small cycles in most cases. Basin subsidence analysis reveals that each tectonic basin type comprises own characteristics of subsidence patterns; namely, passive margin/rift basins show rapid subsidence and subsequent exponential decrease, foreland basins show a convex up pattern, strike slip basins show short lived, rapid subsidence, and intracontinental sag basins show long lived, gentle subsidence patterns.

It is interpreted that the mass balance between subsidence patterns and sediment accumulation creates characteristic basin filling succession trends. In the case of passive margin/rift basins, if subsidence rate is much larger than sedimentation rate, the simple transgression case may occur. Pure passive margin basins can be categorized into this case. If the sedimentation catches up with decreasing subsidence, the transgression to late regression case occurs. The aggradational case in rift basins with fluvio-deltaic sediments is a particular pattern that basin subsidence rate and sedimentation rate are totally balanced. This type of rift basins characteristically occur offshore China, Vietnam, Thailand and Malaysia, where tremendous amounts of clastics are supplied from the monsoon Himalaya region.

It is expected that this categorization of basin filling succession trends provides useful information for evaluation of reservoir and source rock potential of sedimentary basins.