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Depositional architecture and evolution of the Late Miocene slope channel-fan-system in the northeastern shelf-margin of South China Sea

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The Upper Miocene in the Pearl River Mouth Basin of northwestern shelf-margin of South China Sea Basin contains a series of slope channel—fan systems. Their depositional architecture and evolution are documented in this investigation based on an integrated analysis of cores, logs, and seismic data. Four depositional-palaeogeomorphological elements have been identified in the slope channel-fan systems as follows: broad, shallow and unconfined or partly confined outer-shelf to shelf-break channels; deeply incised and confined unidirectionally migrating slope channels; broad or U-shaped, unconfined erosional-depositional channels; frontal splays-lobes and nonchannelized sheets. The slope channels are mostly oriented NW-SE, which migrated unidirectionally northeastwards and intensively eroded almost the whole shelf-slope zone. The channel infillings are mainly mudstones, interbedded with siltstones. They might be formed by gravity flow erosion as bypassing channels. They were filled with limited gravity flow sediments at the base and mostly filled with lateral accretionary packages of bottom current deposits. At the end of the channels, a series of small-scale slope fans developed and coalesced into fan aprons along the base of the slope. The unconfined erosional-depositional channels at the upper parts of the fan-apron-systems display compound infill patterns, and commonly have concave erosional bases and convex tops. The frontal splays-lobes representing middle to distal deposits of fan-apron-systems have flat-mounded or gull-wing geometries, and the internal architectures include bidirectional downlap, progradation, and chaotic infillings. The distal nonchannelized turbidite sheets are characterized by thin-bedded, parallel to sub-parallel sheet-like geometries. Three major unconformities or obvious erosional surfaces in the channel-fan systems of the Upper Miocene are recognized, and indicate the falling of sea-level. The depositional architecture of sequences varies from the upper slope to the slope base transitional to basin plain. The basal erosion and the unidirectionally migrating characters of the slope channels were supposed to be the result of the interaction of bottom currents and gravity flows. The intensive development of the channel-fan systems over the shelf slope might be related to the Dongsha Tectonic uplift which may resulted in stepped slope and concomitantly intensified gravity flow in the study area in Late Miocene.