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Geomorphology and Quaternary sedimentary characteristics around large isolated carbonate platforms in the Xisha (Paracel) Archipelago, South China Sea

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A new high-quality multi-beam and seismic dataset imaged the slope of the Xisha (Paracel) Archipelago and revealed various peri-platform geomorphological units, including gullies, erosive grooves, confined channels, mounded sediments, arc-shaped depressions/channels, and large-scale canyons. Peri-platform-channelized geomorphological units indicate complex downslope gravity flow and alongslope bottom current processes around carbonate platforms. Gravity flows dominate the off-platform transport of excess neritic carbonates and contribute to peri-platform downslope erosive channelized geomorphologies. The bottom current reworks peri-platform sediments along the slope and also plays an important role in shaping the physical configuration of peri-platform slopes. Using satellite observations, seismic reflections and geomorphological analysis, we established a facies distribution model around the Xisha carbonate platforms. Our findings reveal a peri-platform transport system consisting of gullies-grooves-channels-canyons linking the neritic carbonate platform with deep-sea basins. This system has significant implications not only for the formation of potential hydrocarbon reservoirs in the deep-water basins but also for the evolution of the global carbon cycle.
Keywords: Carbonate platform, Peri-platform slope, Sedimentary processes, Contour current, Xisha (Paracel) Archipelago