

Sea Level Induced Carbonate/Siliciclastic Switch Along the Gulf of Papua Shelf Edge: Last Glacial Cycle (150 ky) and Plio-Pleistocene (3.5 My) Records

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The Gulf of Papua (GoP) is one of the best modern examples of low latitude mixed carbonate/siliciclastic system where the northern extremity of the Great Barrier Reef meets huge volumes of siliciclastics dumped by the Fly and others PNG rivers. Results of studies, focusing on the GoP shelf edges and adjacent upper slopes, demonstrate a clear switch from thick prograding muddy early sea level fall siliciclastic wedges and lowstand shelf edge deltas to transgressive growth of healthy coralgal edifices.

In Ashmore Trough, a proximal slope basin adjacent to the southern GoP shelf edge, a siliciclastic mud unit, well imaged in 3.5 kHz profiles as a distinctive semi-transparent homogeneous 18 to 50 m-thick package, was deposited during an early sea level fall interval. Based upon 3.5 kHz profiles, industry seismic lines, and one piston core, the shelf edge itself consists also of partially eroded siliciclastic prograding lowstand shelf edge deltas and coastal sediment accumulation.

Along the southwestern GoP shelf edge, the surveys uncovered a 30 to 50 m-high ridge that parallels the shelf edge with linear segments exceeding 10 km in length. Analyses of a core, recovered in a re-entrant in front of the ridge, demonstrate that a coast-line, essentially siliciclastic, reached the present-day shelf break during Last Glacial Maximum - LGM (23 cal. Ka) and the Oldest Dryas - OD (17.5-16.5 cal. ka). During a major pulse of sea level rise, between ~ 15.0 and 13.0 cal. ka, a coralgal reef established itself on top of a LGM/OD siliciclastic beach barrier complex, and subsequently drowned. On the northwest PNG shelf edge, an early transgressive, as thick as 80 m, coralgal edifice complex, established itself on top of a LGM shelf edge delta lobe. A piston core sampled the flank of one of the coralgal edifices and recovered a coral colony in growth position at ~ 107 m below modern sea level and dated at 19 cal. Ka.

The siliciclastic/carbonate switch observed during the last glacial sea level cycle in the GoP was repeated several times during the last 4 My. On seismic lines provided by Fugro/Finder Exploration Ltd, high-amplitude mounded seismic facies are overlying a series of prograding transparent/low amplitude wedges. These features are interpreted, as in the late Quaternary, to represent early transgressive shelf edge carbonate edifices, established and growing on top of siliciclastic muddy wedges deposited during intervals of forced regressions.