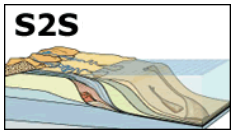
Sediment Nature/Accumulation in Slope Basins Linked to Sea-Level Changes at Millennial Scale, (Pandora Trough, Gulf of Papua)



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S. Jorry[1], A. Droxler[1], G. Mallarino[2], G. Dickens[1], S. Bentley[3], L. Beaufort[4], L. Peterson[5], B. Opdyke[6]

[1]Rice University; [2]PanTerra Geoconsultants, Leiderdorp, The Netherlands; [3]Memorial University of Newfoundland, Canada; [4]CEREGE-CNRS Université Aix-Marseille 3, France; [5]University of Miami; [6] Australian National University, Australia.

Sea-level and climate fluctuations clearly influence the nature and timing of sediment deposition in slope basins adjacent to continental shelves. Over the last glacial cycle, several studies in either purely siliciclastic or carbonate settings have shown their opposite response in terms of lowstand versus highstand shedding, respectively. By contrast, no study has examined late Quaternary sediment accumulation in turbiditic basins along modern tropical mixed siliciclastic/carbonate systems. Here we analyse three sediment cores collected in Pandora Trough (Gulf of Papua) to trace the basin fill during the last 25 kyr. We show that the Pandora turbiditic basin exhibits a detailed sedimentary pattern at millennial scale probably linked to abrupt sea-level fluctuations since the Last Glacial Maximum (Jorry et al., 2008). Siliciclastic turbidites, deposited in large numbers during the last glacial, disappeared during meltwater pulses and warming intervals, and systematically re-occurred during the Oldest and Younger Dryas cooling. The exportation of neritic carbonates by gravity flows and export through the water column occurred when adjacent isolated atolls were re-flooded during meltwater pulse 1B. Application of our findings to the interpretation of deep oceanic systems demonstrates that turbiditic basins bear the record of millennial scale sea-level fluctuations, and suggest that a potential sea-level fall during the Younger Dryas cannot be excluded.

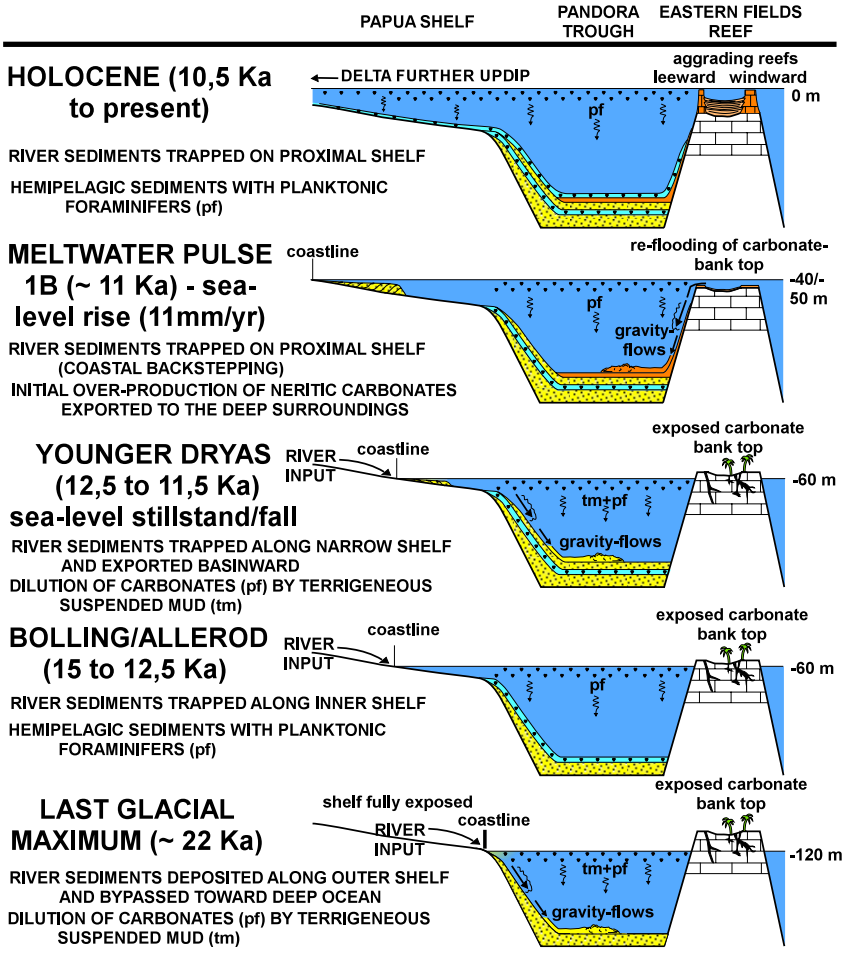

Figure: 2D-schematic diagrams showing the variations of sediment nature, transport and accumulation linked to sea level fluctuations at millennial time scale and explaining the sedimentary pattern observed in central Pandora Trough, from LGM to Holocene. Siliciclastic gravity-flows are dominant during LGM (I), the Oldest Dryas (III), and Younger Dryas (V), and are interrupted by the deposition of hemipelagic carbonate enriched oozes during the the 19 kyr warming (II) and Bølling-Allerød warming (IV). The deposition of a calci-turbidite and initial export of bank-derived fine aragonite occurred at about 11.5-11.0 kya in Pandora Trough triggered by the re-flooding of the Eastern Fields, Boot/Porlock Reefs bank-top during the MWP-1B (VI), when over-production of neritic carbonates is exported to the deep ocean. The typical atoll modern morphology of Eastern Fields is reinforced by a rim aggradation during the early Holocene transgression.. Additional neritic sediment accumulated and was preferentially trapped in the lagoon during the late Holocene with typical water depths averaging between 40 and 55 m.

Jorry, S. J., A. W. Droxler, G. Mallarino, G. R. Dickens, S. J. Bentley, L. C. Peterson, and B. Opdyke (2008), Bundled turbidite deposition in the Central Pandora Trough (Gulf of Papua) since Last Glacial Maximum: Linking sediment nature and accumulation to sea-level fluctuations at millennial time-scale, J. Geophys. Res., doi:10.1029/2006JF000649, 2008.