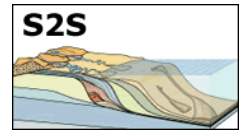


Sediment Transport And El Niño In Gulf Of Papua



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In tidally dominated deltas, sediment discharged from the river sources must transit through an estuarine region located within the distributary channels, where particle pathways can undergo significant transformations. Water-column profiles and time-series data were collected in the distributaries and shallow nearshore region offshore of the Fly River, Papua New Guinea, during monsoon conditions of 2003 and 2004. Within the distributaries of this tidally dominated delta, near-bed fluid-mud concentrations were observed at the estuarine turbidity maximum. Discharge and morphology of the distributaries determine the location of estuarine processes and control the sediment flux to the marine environment. Sediment delivery from the delta to the broad shallow nearshore region northeast of the river mouth and to the steep Umuda shelf valley is influenced by the shorter pathway of the northernmost distributary. The shallowest portion of the nearshore region (<10 m water depth) is a zone of temporary storage where unconsolidated sediment is easily resuspended. Umuda shelf valley constrains and enhances tidal currents, and provides a steep conduit to seaward transport of fluid muds. Comparison of 2003 and 2004 data shows evidence of reduction in fresh-water supply to the Gulf of Papua during the moderate 2003 El Niño conditions. El Niño creates a large negative perturbation (i.e., low flow) to the relatively constant sediment discharge. This reduction of discharge limits transport of sediment from the distributaries to the nearshore zone of temporary storage. As the sediment stored nearshore feeds the prograding clinof orm found seaward, the perturbation propagates throughout the dispersal system.

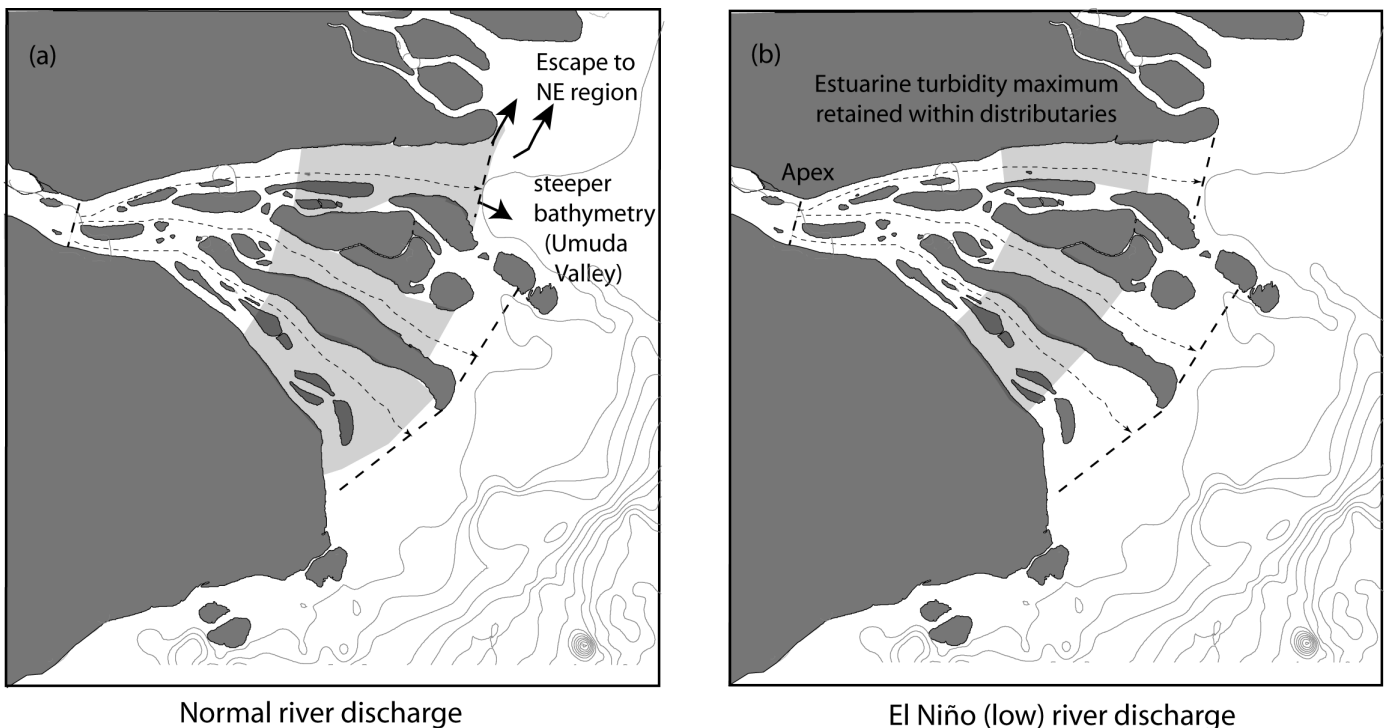


Figure: Conceptual diagram showing zone of estuarine processes during (a) normal conditions (non-El Niño) and (b) El Niño conditions. The dashed lines indicate the pathway from the apex to the individual distributary mouths. Predictions of the zone of the estuarine turbidity maximum (shaded gray) are based on past studies and observations in 2003 and 2004. Under normal conditions, the estuarine processes reach farther out the distributary channels, and sediments contained in the estuarine turbidity maximum have the opportunity to escape to the NE region and/or flow down slope over the steeper bathymetry associated with Umuda shelf valley.

A.S. Ogston, R.W. Sternberg, C.A. Nittrouer, D.P. Martin, M.A. Goni and J.S. Crockett, 2008, Sediment delivery from the Fly River tidally dominated delta to the nearshore marine environment and the impact of El Niño, Jour. Geophys. Res., 113, F01S11, doi:10.1029/2006JF000669.

