



River estuaries of the Amazon-influenced Guianas coast: diversity and preliminary classification

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The morphology and dynamics of the 1500 km-long Guianas coast, South America, are strongly influenced by mud supplied by the Amazon River. A fraction of this mud (20% of nearly 1 billion tons annually) is organized into large banks that migrate along the coast under the influence of waves and currents, separated by 'inter-bank' zones. 'Bank' zones significantly dissipate the wave energy transmitted shoreward, whereas inter-bank zones are commonly characterized by a relatively mud-free shoreface, and wave energy is thus more efficiently transmitted to the shore. The alongshore alternation of shifting bank and inter-bank zones is strongly modulated by water discharge from the local rivers, which depends essentially on catchment size. The hydrology and sediment fluxes of many of these rivers, which drain the crystalline rocks of the Guiana Shield between the Amazon and the Orinoco River deltas, are still largely unknown. Even the catchment size of several of these rivers is not known with certainty. The relationship between discharge from these Guiana Shield rivers and the Amazon mud-bank belts results in a variety of estuarine morphological and dynamic configurations. Further estuarine diversity is engendered by lithology. A preliminary classification of 15 estuaries, based on plan morphology and ongoing analyses of estuarine hydrodynamics, suggests four basic types: (1) estuaries fixed by headlands of Precambrian basement rocks (Mahury, Cayenne, and Kourou Rivers); these are associated with small catchments and found only in French Guiana, where the basement crops out along the coast; (2) estuaries with mouths diverted westward (the direction of regional alongshore sediment transport) by prograded mud capes and spits, reflecting a significant influence of multi-decadal to multi-millennial coastal accretion of Amazon-derived mud (Cassipore, Uaçá, Rivers in Amapá, Brazil; Oyapock between Brazil and French Guyana; Approuague, Sinnamary and Mana Rivers in French Guyana; Suriname and Coppename Rivers in Suriname; Berbice River in Guyana); (3) estuaries oriented normal to the coast and associated with relatively large-discharge rivers (Maroni River between French Guiana and Suriname; Corentyne River between Suriname and Guyana); (4) a prograded estuary mouth with a transitional morphology towards a delta (Essequibo River in Guyana, the largest river on the Guianas coast after the Amazon and the Orinoco). On-going monitoring of the sediment fluxes and hydrodynamics of a type 1 (Mahury) and a type 3 estuary (Maroni), both of which are fixed (lithologically for type 1, and hydrodynamically for type 3), and akin, morphologically, to normal trumpet- or funnel-shaped estuaries, shows a tropical seasonal regime but which is strongly influenced by Amazon mud during the low-discharge dry season. This mud influence from the distant Amazon constitutes a unique aspect of the river mouths on the Guianas coast.