Geophysical Research Abstracts
Vol. 19, EGU2017-19341, 2017
EGU General Assembly 2017

Recent morphodynamics of a chenier beach in the Amazon-influenced mud-bank setting of Suriname, South America.

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The 350-km long coast of Suriname is part of a unique system in the world characterized by large-scale muddy sedimentation and chenier development. The mud is organized into discrete banks migrating alongshore under the influence of waves and currents, separated by 'inter-bank' zones, where cheniers commonly form. Braamspunt beach is a fine example of an open-coast chenier between the mouths of the Maroni and the Suriname Rivers. The former is the primary sand source for the beach, whereas the latter, near which the presently subsisting remnant of the beach is situated, forms a downdrift sink zone for this chenier. Satellite images between 1987 and 2016 shows that Braamspunt beach has significantly shortened over this period. This process has resulted from much of the sand supply coming from updrift (the Maroni) being integrated into a chenier driven landward by waves over mangroves and becoming overwhelmed by a mud bank migrating between the Maroni and Suriname Rivers. Two ground (hydrodynamics, GPS) and drone-photogrammetry surveys in 2016 show that Braamspunt beach is characterized by clear-cut longshore morphodynamic variations reflecting between the 'source' and the 'sink' zones. This gradient is related to different updrift (approaching mud bank) and downdrift (approaches to the Suriname estuary) contexts. The northern sector comprised two elements: the leading edge of the mud bank where the existing chenier (former open beach) has been isolated from the sea by mud and fossilized inland, and the 'terrestrial' shoreline junction with the leading edge of the mud bank. The latter segment consisted of a narrow 150 m-long sandy chenier migrating landward as mud has gained ground, resulting in shortening of the beach. As the chenier migrated inland over back-beach stands of Avicennia germinans mangroves, it left in its wake a muddy foreshore with subsisting mangroves that were part of the muddy mangrove-colonized muddy plain. The southern sector also comprised two segments: a narrow, strongly eroding 1.7 km-long reflective beach, and a relatively large, accretionary 0.6 km-long downdrift beach segment that constituted the downdrift sink for sand transferred alongshore. The multi-decadal to recent evolution of Braamspunt beach thus shows a classical chenier beach that depends essentially on sand supply from the Maroni, but transport is not direct and continuous as one would expect on a classical open-ocean beach because the sand from the Maroni source transported alongshore by wave-induced drift is partially sequestered over more or less long periods of time (multi-decadal) by mud banks migrating westward towards Guyana. Sand availability is, thus, neither constant nor perennial on Braamspunt beach. In other words, this chenier beach does not function as a classical through-put source-to-sink (Maroni-Suriname) sediment cell, but as a potentially fragmented temporally and alongshore-variable cell. This has serious implications for the overall sediment budget of the beach and its sustainability. It also implies that sand mining, practised on a large-scale on this beach, which also serves as a major marine turtle-nesting site in Suriname, could endanger the future existence of this chenier beach.