

Analysis of coastline changes from 1963 to 2003 using remote sensing, Mujeres Beach, Mona Island

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Mujeres Beach in Mona Island, Puerto Rico shows a dramatic pattern in the magnitude of short-term beach-sand volume transportation. The purpose of the study is documenting coastline changes in Mona Island Beaches (Mujeres Beach in this case) as solicited by the Department of Natural and Environmental Resources of Puerto Rico (DRNA). In September of 2007, 10 permanent stations were established as reference points in Mujeres Beach. Beach profiles were measured and sand volume movement calculated monthly to measure sediment transport along the entire coastline. The project also included (this presentation) image analysis to determine changes along the coastline at “longer” time scales (decades). Aerial photographs from 1963, 1977 and 1992, and an ICONOS image from 2003 were analyzed. Photos and images were geo-referenced with GPS points and ICONOS imaging. In each photograph a line was traced to identify the position of the coastline. Changes in the position of the coastline (relative to the permanent stations fixed points) were compared to determine the changes in the coastline (40 years). The overall 40 years change shows the classical coastal pattern of erosion of promontories (located at the northwestern and southeastern extremes of the beach) and beach deposition in the embayment (at the center of the beach). In 1992 the coastline suffered a net removal of sand in all stations probably due to an atmospheric event (storm). Continuous movements of high volumes of sand were detected from 1963 to 2003 moving from one extreme to the other along the coastline. Mujeres Beach is located in the southwest of the island, and is not influenced by fringing reefs or artificial man-made structures. The continuous displacement of beach sand along the beach does not include station M10, located at the southeastern extreme of the beach. This station seems to be outside the “Mujeres Beach Littoral Cell”.