OBSERVATION OF SHORELINE AND UPPERBEACH VEGETATION EVOLUTION BY VIDEO: FIELD ASSESSEMENTS IN THE CARIBBEAN

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1. Introduction

Caribbean coastal ecosystems such as coral reefs, mangroves, seagrasses or upper beach vegetation acts as a physical barrier against waves and can play a major role in reducing the impact of coastal hazards for small islands communities. However they are highly impacted by human activities and global changes and their coverage is dropping in the Caribbean as well as in the rest of the world. Consequently, the protection effect is declining as the ecosystems deteriorates or dies. Therefore, there is a growing interest for management interventions that may restore or enhance the coastal protection value of these ecosystems based on research in the last decades related to physical processes that govern these systems. Nevertheless, upper beach vegetation is not as well-investigated and a very few studies examine their effect on erosion and run-up dampening, especially in a tropical context. The aim of this paper is to assess upperbeach vegetation/shoreline evolution using high frequency video imagery.

2. Field site

Anse-Maurice is a narrow beach located on the eastern shore of Grande-Terre Island in Guadeloupe Archipelago (France) in the Lesser Antilles. The beach consist of a small lagoon bounded by a narrow chaotic fringing reef. The reef is characterized by an assembly of mainly dead colonies of *Acropora Palmata* with an algae cover, though the bottom subtract remain very complex. The upper beach vegetation is composed by an association of indigene species (i.e. *Ipomoea pes capre*, *Coccoloba uvifera*) and hexogen species (mainly coconut trees). This ecosystem is impacted by human trampling and goat grazing which motivated the ONF (The French Forestry Agency) to implement a nature-based solution by establishing revegetation enclosures. The site is exposed to strong Atlantic swells during the winter season (from December to March) and episodically during the cyclonic season (from July to November).

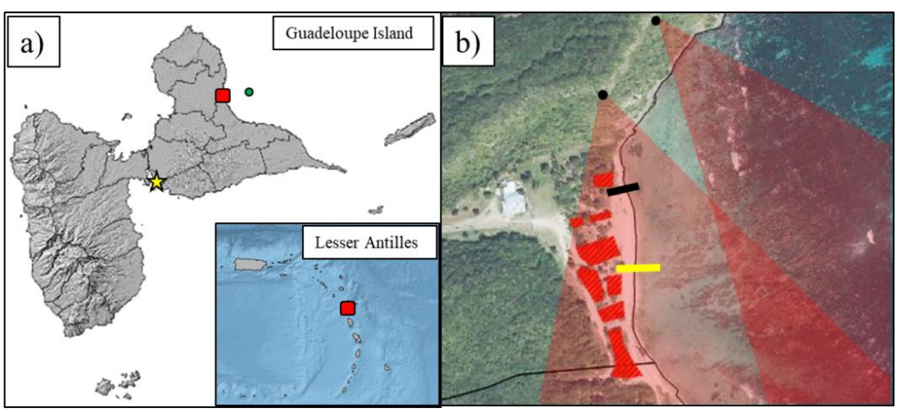

Figure 1. a) Geographic location of the field site (red square), swell (green point) and sea level (yellow star) data extraction points, b) overall map of the field site with revegetation enclosure position in red polygons and camera positions in black points. Black and yellow lines indicate the position of presented cross-shore profiles (resp. fig 2 c and d).

3. Instruments and methodology

Two low-cost Solarcam® videos monitoring systems had been installed to provide a full range of view from the incident ocean waves to the upper beach. Those devices take a picture every 10 minutes. "Timestacks" were generated, which represent the evolution over time of a specific pixel line on a picture. In our case, after a georectification process (see Holland et al., 1997) at mid/long term scales, this technique allows for shoreline and upperbeach vegetation monitoring. This is possible because of the sharp colorimetric difference between water and sand on the one hand, and sand and vegetation in the other. Wave conditions for the period Hs, Tp and Dp are extracted from spectral wave model (WW3) simulations provided through the MARC platform (https://marc.ifremer.fr/). From Hs and Tp, wave power is calculated and presented in figure 2a. Sea level conditions are extracted from the tide gauge of Pointe à Pitre (https://data.shom.fr/).

4. Results and discussion

The figure 2.c) and d) represent 591 days of monitoring. Preliminary results show several periods of vegetation progression and regression as well as shoreline change. However, while the vegetation limit is stable overtime, the shoreline is in net retreat. Excluding the anthropic vegetation removal on the 13/11/19, rapid vegetation and shoreline changes are correlated with extreme swells events. Whereas progressive changes (over several months) seems to be partially linked to the sea level meso-cycle. Indeed, Furthermore extreme swell events have a greater impact when associated with high sea level (on the 05/08/ or 18/09/20 for example) while events with relatively low sea level (on the 13 and 20/01/20 for example) do not induce important changes. Analyses are ongoing to evaluate the role of seasonal trends in sea levels and wave direction on shoreline evolution, and assess the role of *Sargassum* beaching in these tendencies.

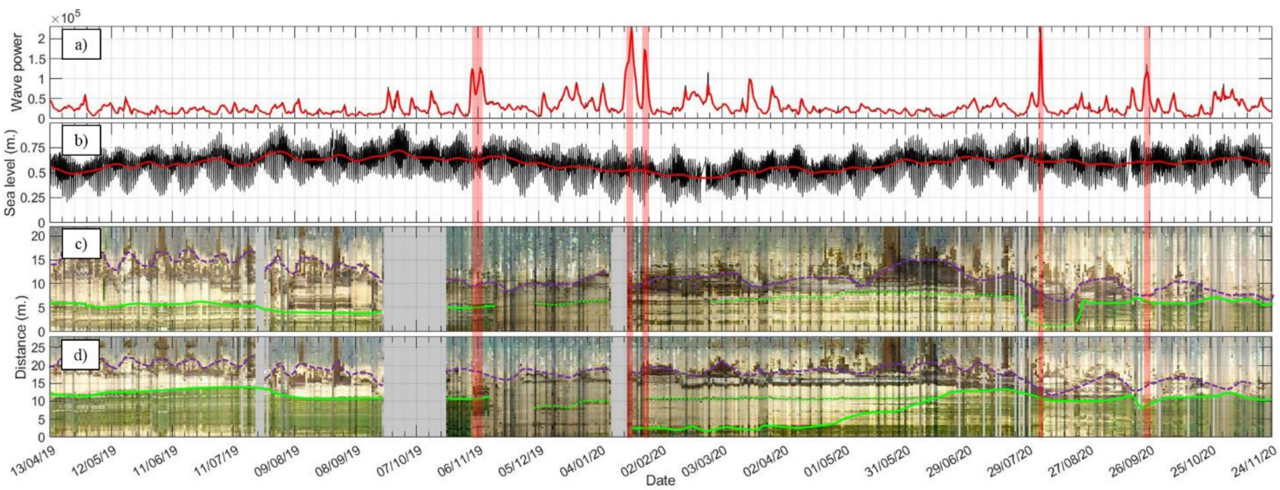

Figure 2. a) Significate wave height evolution, b) sea level evolution, c) timestack evolution of the black line in fig.1.b) d)) timestack evolution of the yellow line in fig.1.b).

Acknowledgements

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