IMPACT OF FRINGING REEF AND UPPERBEACH VEGETATION STATE ON STORM RUNUP IN A CARIBBEAN CONTEXT

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INTRODUCTION

Caribbean coastal ecosystems acts as a physical barrier against waves and can play a major role in reducing the impact of coastal hazards for small islands communities (Ferrario et al., 2014). 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 and consequently their protection effect is declining (e.g. Harris et al., 2018). Therefore, there is a growing interest for management interventions that may restore or enhance the coastal protection value of these ecosystems. The objective of this study is to provide quantitative indications on the effect of major storms with different ecosystem configurations and thus alert on the consequences of a further destruction or on the potential benefits of a natural regeneration or a human restoration.

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 caprae*, *Coccoloba uvifera*) and hexogen species (mainly coconut trees, *Cocos nucifera*). 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).

INSTRUMENT AND METHODOLOGY

Offshore wave conditions are extracted from spectral wave model (WW3) simulations provided through the MARC platform (https://marc.ifremer.fr/). Sea level conditions are extracted from the tide gauge of Pointe à Pitre (https://data.shom.fr/). Xbeach experiment was calibrated and validated with on-site measurements for wave propagation trough the reef and a low-cost Solarcam® video monitoring system for the runup. Then a set of hypothetic storm event was simulated with identified return period. Simulations were reproduced with several ecosystems states, materialized in the model by different reef height and bottom friction and different drag coefficient for the vegetation.

RESULTS AND DISCUSSION

First results evidence the relative effect of both ecosystems health status on the runup elevation, and the subsequent coastal flooding. Reef morphology appears to be the most protective ecosystem against coastal flooding, as it has a direct impact on wave transformation and propagation to the coast. However, an enhanced vegetation cover clearly reduces the runup, even if its resilience during the most energetic hurricanes is unlikely. All simulation scenarios and results will be presented and discussed in the extended abstract to better document coastal protection by combined effect of both ecosystems.

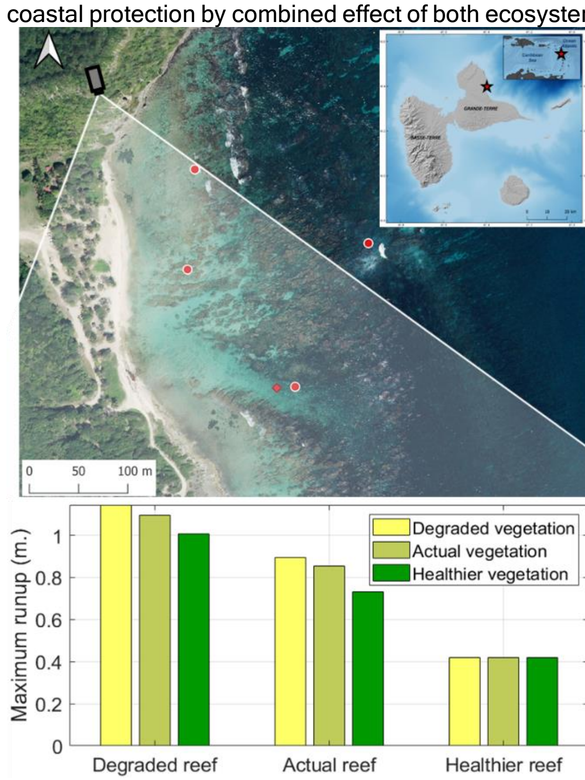

Figure 1 – Anse-Maurice beach map with sensors location (red markers), camera location (grey rectangles) and field of view (white area). Example of maximum runup for the same storm with different ecosystem states

REFERENCES

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