

Remote sensing of hurricane impact and early vegetation recovery in the mangrove of Fort-de-France Bay (Martinique, FWI)

M. Claden¹, A. Begue¹, B. De Gaulejac², D. Guiral³, D. Imbert⁴, P. Laune⁵, M. Morell⁶ & M. Herteman²

¹CIRAD Avenue Agropolis, 34398 Montpellier cedex 5. E-mail: agnes.begue@teledetection / <http://www.cirad.fr/>

²Impact-Mer, 90 rue Pr Didier, 97200 Fort de France, Martinique F.W.I. E-mail: degaulejac@impact-mer.fr / mherteman@impact-mer.fr / <http://impact-mer.fr/>

³IRD Montpellier, 911, Av. Agropolis - BP 64501 - 34394 Montpellier cedex 5. E-mail: daniel.guiral@ird.fr / <http://www.france-sud.ird.fr/>

⁴Université Antilles-Guyanes Fouillol - BP 250 - 97157 Pointe-à-Pitre Guadeloupe. E-mail: Daniel.Imbert@univ-ag.fr / <http://www.univ-ag.fr/fr/index.html>

⁵Parc Naturel Régional de Martinique, domaine de Tivoli - BP 437 97200 Fort-de-France cedex. E-mail: mssp-pnrm@wanadoo.fr / <http://www.parcs-naturels-regionaux.fr/>

⁶IRD Martinique, BP 8006 97256 Fort-de-France Martinique. E-mail: marc.morell@ird.fr / <http://www.martinique.ird.fr/>

Abstract

The CARIBSAT project aims at conceiving and implementing an instrument to monitor the environment in the Lesser Antilles based on an online geographic atlas supplied by the acquisition and analysis of satellite images, ground environmental data as well as hydro-meteorological reports. More specifically, it is targeted towards the preservation of biodiversity in terrestrial and marine ecosystems, the mitigation of risks associated to natural disasters and the adaptation to climate change. Hurricane Dean (2007) severely impacted mangrove forests along the Bay of Fort-de-France (Martinique, FWI). This event provided an opportunity to assess mangrove resistance and early recovery following hurricane disturbance, both of these processes being yet poorly understood in mangroves worldwide. For this purpose, three sequential maps of mangrove vegetation around the Bay have been implemented by means of satellite image analyses (IKONOS 2006 and 2008, SPOT 5 2006 and 2010) and field measurements. The first vegetation map described 5 pre-hurricane ecological units based on vegetation structure and dominant species. The second map outlined hurricane disturbance using three levels of vegetation damage (weak, medium and strong). It was found that Hurricane Dean impacted 52% of the study area at a medium or strong level. *Avicennia germinans* stands were the most heavily damaged, whereas dwarf *Rhizophora mangle* stands were the most resistant. It appeared that, in addition to wind damage, a massive and long-lasting increase of the water table due to freshwater flow impediment caused massive mortality among *A. germinans* stands. On the map of early (3 years) vegetation recovery, corresponding areas (13 % of the whole mangrove area) appeared as freshwater marsh vegetation. These results will serve to implement a mangrove observatory in Martinique Island, based on remote-sensing survey and vegetation monitoring on reference areas.

Keywords

recruitment, hurricane, disturbance, Caribbean mangrove, teledetection