

Rapid Remote Sensing Assessment of Impacts from Hurricane Iota on the Coral Reef Geomorphic Zonation in Providencia

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Abstract

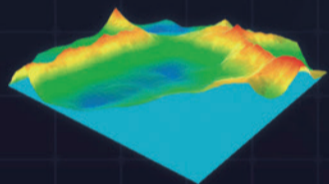
This study assesses Hurricane Iota's impact on Providencia island's reef environments, using Google Earth Engine, Satellite Derived Bathymetry, and machine learning to calculate a supervised classification process to delineate six geomorphic reef units. Results reveal dynamic changes, including erosion in the Lagoon unit (4.47% pre-Iota, 2.27% post-Iota), loss on the Back Reef (38.14%), and Rock Terrace (6.15%). Reef Ridge showed minimal change, acting as an effective wave barrier. Back Reef and the deep Rock Terrace experienced significant erosion (-3 to -14m) to the northeast, with sedimentary dynamics observed in deeper units (up to 22m). The high thematic accuracies found (Kappa 99%) illustrate the effectiveness of the assessment to i) map the reef rapidly, ii) provide tools for long-term monitoring of changes over time and iii) improve management strategies and decision-making.

Keywords: Remote sensing. Google Earth Engine. Hurricane impacts. Geomorphic changes. Providencia island.

Interactions

DURING A HURRICANE

BOTTOM INTERACTION



SPATIAL ANALYSIS



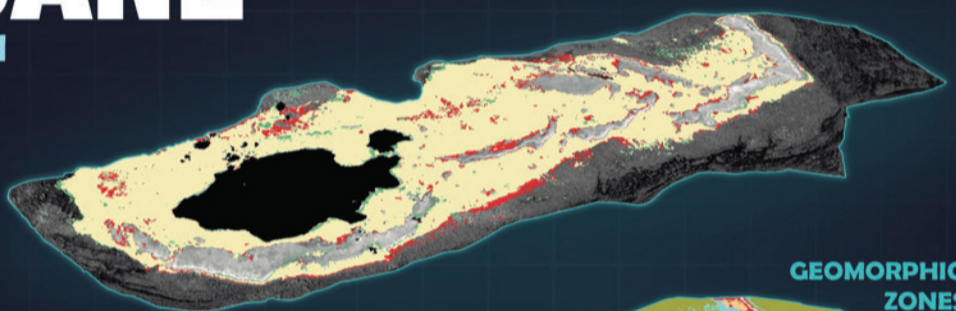
MACHINE LEARNING



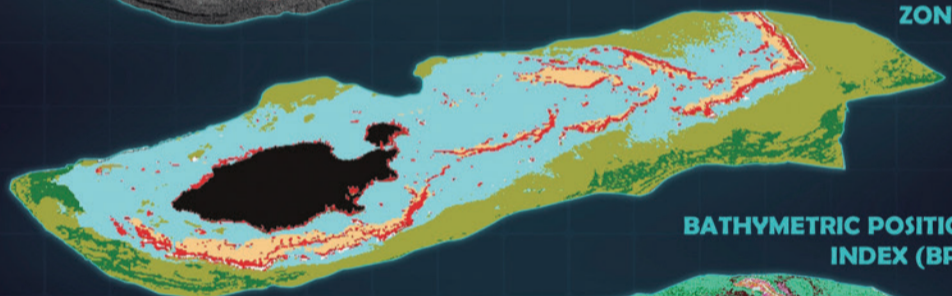
CLOUD COMPUTING

GOOGLE EARTH ENGINE

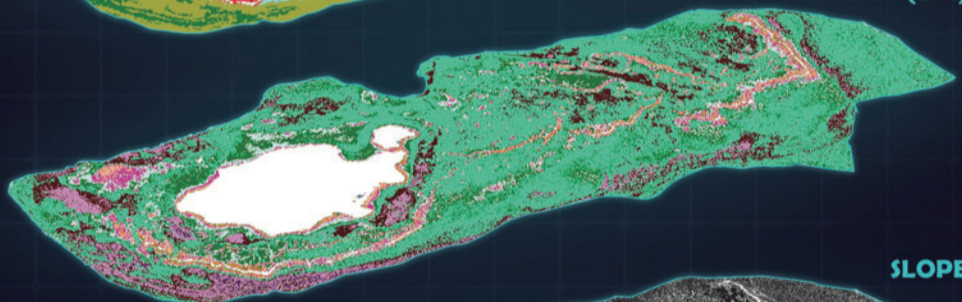
GEOMORPHIC COVER GAIN AND LOSSES POST-HURRICANE IOTA



GEOMORPHIC ZONES



BATHYMETRIC POSITION INDEX (BPI)



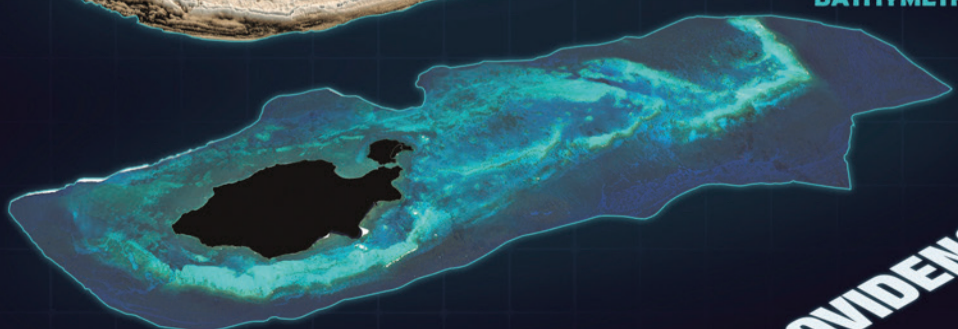
SLOPE



DIGITAL TERRAIN MODEL



SATELLITE DERIVED BATHYMETRY



PROVIDENCIA