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MODELING TREE STRUCTURE OF A MANGROVE USING LIDAR IMAGERY

Abstract

Mangrove forests are ecosystems of great economic and environmental importance that are threatened by human activities around the world. Mexico is among the countries with the highest mangrove area and, at the same time, among the countries with the highest mangrove deforestation rates.

The structural information of these forests must be quantified in order to monitor and evaluate the conservation status of this ecosystem. However, the acquisition of this data over extensive areas might be a very-high time-consuming activity due to the sampling effort and its complexity. Remote-sensing methods have showed the potential to generate vegetation structural information quickly. Among these methods, the use of a LiDAR (Light Detection and Ranging) imagery stands out because of its ability to generate very detailed vertical information per area unit. Therefore, the goal of this study was to evaluate the potential of LiDAR data to model the structure of a mangrove community. Individual structural measures from all plants with a diameter at breast height >= 10 cm were obtained from ten field-plots (2500 m^2 each). Structural community attributes were calculated using this set of data (e.g., basal area and the sum of crown cover). Using the LiDAR point cloud, different statistical variables, such as the mean and the standard deviation, were calculated. Finally, linear models were constructed to evaluate the potential of LiDAR information to describe the structural attributes of the plant community.

Our results indicate that LiDAR data can accurately model the structural attributes of a mangrove forest. Therefore, this type of information has great potential to study and monitor the structural information of mangroves, and at the same time quantify some of its ecosystem services.