ASSESSMENT OF WORLDVIEW-2 AND LIDAR DATA COMBINATION FOR MANGROVE COMPOSITION MAPPING

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Abstract: Recent development of remote sensing and image processing allow us to explore various types of image datasets as well as mapping techniques to map mangrove vegetation composition. Among of this advancement are the commercially available WorldView-2 (WV-2) image data and the emerging LiDAR technology. WV-2 dataset has promising spectral and spatial properties for mangrove mapping, while the discrete return of LiDAR pulse has ability to reveals information on vegetation structures (i.e. canopy height). The aim of this study is (1) to utilise the advantages of both datasets together to discriminate and map mangrove composition, and (2) to assess whether this approach improves the ability to differentiate between different vegetation compositions. The study site is located in the *Avicennia marina* mangrove community at Whyte Island, Moreton Bay, Brisbane, Australia, where different vegetation structural zonations is apparent from the coastline to the saltmarsh area. We use eCognition Developer 8.7 to derive vegetation elevation layer from LiDAR, and combine the result with pan-sharpened WV-2 in the image segmentation routines. The segmentation result shows that the inclusion of vegetation elevation data enhances the discrimination of the mangrove structural composition, compare to using the optical data only. The validation of the results were conducted through field visit, mainly for the structural information (e.g. canopy height, stem type, and stem density); and interpretation of a very high resolution aerial photograph (~7cm pixel size) for measurement of the spatial dimension (e.g. boundary and size) of the mangrove objects. Our results show that this approach successfully identify different mangrove structural compositions within the same species community in this area, ranging from open-scrub, low-closed forest, to closed-forest. The finding of this study corroborates the advantage of utilizing different sensors in a synergetic manner. Despite the success, further work should be done to test the applicability and consistency of this approach into different mangrove environmental setting.

Keywords: Mangroves, composition mapping, OBIA, WorldView-2, LiDAR.

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Providing mangrove information at multiple scales is essential to support any conservation and management actions in this environment. In any of remote sensing applications, addressing the right problem at the right scale is paramount to the successful implementation of the mapping and monitoring activities, including in the mangrove ecosystems. One of the advantages of remote sensing is its ability to deliver data or information at multiple scales. However, study focusing on the variation of mangrove information able to be extracted from remote sensing data across different spatial scales is limited. This study is an exploratory study to implement the multi-scale approach applied on WorldView-2 to map mangrove structural features (e.g. tree canopy, gaps, formation, etc.) at different spatial scales. To enable comparison of different spatial scales (i.e. pixel sizes), the image data was resampled into 6 different pixel sizes (0.5, 1, 2, 4, 8 and 10 m) using pixel averaging filter. We used object-based image analysis (OBIA) approach to extract multi-dimension mangrove features based on the original and resampled WorldView-2 images. Our preliminary results show that information within mangrove stands can only be mapped using pixel size of 2 m or smaller, including single shrub crown, foliage clumping, canopy gaps, and single tree crown; whereas at pixel sizes larger than 2 m are more appropriate for larger features dimension, such as vegetation formation or community. The results provide help to determine the optimum image pixel size to map a specific mangrove feature.