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| **Exploring Ecuador's Mangrove Forests: Mapping and Monitoring with the MANGLEE Tool** |
| **Introduction/Aim:** Mangrove ecosystems maintain ecological equilibrium and support the socioeconomic welfare of coastal communities. Renowned for them, these ecosystems are highly productive and provide a wide range of ecosystem services, including provisioning of resources, coastal protection, and fostering social and cultural connections. Despite mangroves are facing a concerning decline worldwide, their cover continues to decrease due to land use transformations into urban, agricultural, and aquaculture exploitation. To safeguard mangroves, various restoration and conservation programs have been initiated, albeit with varying degrees of success. However, the lack of control and monitoring by local authorities, particularly in developing countries, are among the reasons for the dilution or failure of those programs. Remote sensing technology offers an effective means to track changes in mangroves, with recent advancements enhancing mapping efficiency and cost-effectiveness. Nonetheless, the implementation of remote sensing techniques is often limited in developing countries due to economic, administrative, and technical factors. To address this problem, our aim has been to develop an accessible, intuitive and multi-purpose tool, MANGLEE (Mangrove Mapping and Monitoring Tool in Google Earth Engine), that leverages remote sensing data and machine learning to facilitate sustainable mangrove management.**Methods:** MANGLEE comprises three independent modules. The first module prepared Synthetic Aperture Radar (SAR) and optical data from Sentinel missions, creating a SAR and optical composites and calculates SAR and spectral indices. Module two integrated SAR and optical composites, makes a supervised classification based on the Random Forest algorithm to obtain binary maps of Mangrove – Non-Mangrove and calculates the measure of accuracy in the results. Finally, module three detects the changes and catalogues them into degradation or improvement. Considering user interaction, each module is a notebook connected to Google’s Collab and available in Git Hub. The performance of MANGLEE was tested in the mangroves of Guayas, Ecuador, region historically threatened by shrimp farming. We analyzed changes over two time periods 2018-2020 and 2020-2022. Additionally, to ensure the use of the tool, we held training sessions for local staff.**Results and Conclusion:** The practical application of MANGLEE tool has unveiled a concerning trend: despite legal protections, mangrove-covered areas in Guayas continue to experience deforestation processes. Our analysis indicates a substantial loss exceeding 2900 hectares. The primary drivers behind this loss are the expansion of infrastructure and the maintenance of the aquaculture industry. These findings underscore the pivotal role of MANGLEE in effectively monitoring mangrove ecosystems, even in the face of challenges such as cloud cover. Furthermore, local training becomes the perfect medium for disseminating results, including both tool usage and coverage maps, serving as key tools for sustainable mangrove management. |