|  |
| --- |
| **Local Calibration of GEDI L4A Data with Lao National Forestry Inventory for Improved Above-Ground Biomass Estimation** |
| NASA’s Global Ecosystem Dynamics Investigation (GEDI) presents an unprecedented opportunity for cost-effective estimations of Above-Ground Biomass Density (AGBD) using Light Detection and Ranging (LiDAR) technology from space. Yet the current performance of the GEDI Level 4A (L4A) AGBD product can significantly vary across different regions, subject to model choice and availability of calibration data. Here, we identified systematic biases in the current GEDI L4A AGBD product compared to National Forest Inventory (NFI) data for the Southeast Asian country of Laos, with absolute bias values ranging from -54.24 Mg/Ha to 106.23 Mg/Ha across different forest types, underscoring the limitation of using global models in specific local and regional contexts. Since the use of alternative L4A AGBD models was still not able to fully remove these biases, we optimised the GEDI L4A AGBD model configurations for natural forests in Laos and calibrated them with ancillary variables. Our approach significantly mitigated biases across various forest classes, with an average bias reduction of 42.2 Mg/Ha in absolute terms after calibration and the greatest reduction from an initial bias of 129.05 Mg/Ha to -13.33 Mg/Ha in the evergreen forests. The calibrated GEDI footprints were aggregated into a hexagonal grid overlain over Laos to create an AGBD map, with each cell of the grid having a diameter of 600m and aligning with the spatial scale of NFI survey plots to facilitate analysis. The approach also enabled the updating of national-level estimates of average AGBD stock for each forest class in Laos using a model-assisted estimator complementary to the existing NFI design-based estimator. Results highlight the importance of localised calibration in remote sensing applications used in estimating forest biomass, and not only enhance understanding of variations in biomass of different natural forest types in Laos but also offer a replicable framework for more accurate and efficient forest biomass estimation in other regions with limited availability of ground data and/or extensive, remote areas of forest. |