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| **Repeat GEDI footprints enable the measurement of moderate-scale tropical forest disturbance** |
| **Introduction/Aim:**  More of the Amazon rainforest is disturbed each year than completely deforested, but the impact of these disturbances on the carbon cycle remains poorly understood. Recent algorithmic advances using optical and radar remote sensing have improved detection of disturbances at fine spatiotemporal resolution, but quantifying changes in forest structure and biomass associated with these detected disturbances has proven challenging. **Methods:** The Global Ecosystem Dynamics Investigation (GEDI), a novel spaceborne LiDAR system, has captured billions of 25-meter diameter footprints measuring forest height, plant area, and understory structure since it began collecting data in 2019. Though it has no guaranteed repeat cycle, GEDI often measured nearby locations several times; some of these near-coincident footprints happen to fall before and after a detected disturbance. In this work, we develop a general-purpose open-source pipeline for identifying these locations and use it to find over 13,700 near-coincident footprint pairs with intermediate disturbance events across the Amazon basin. We also identify a control set of ~65,000 coincident footprint pairs from disturbed areas but without intermediate disturbance events.**Results:** Analysis of this continent-scale dataset demonstrates that GEDI can measure statistically significant canopy height and biomass deficits following non-deforestation disturbances as small as 30 m wide. We find varied effects of different disturbance types, including areas where the upper canopy retains most of its original height, but the understory suffers substantial losses. Finally, we model the relationship between a disturbance intensity index based on Landsat alone and GEDI-estimated percent biomass loss.**Conclusion:** This work represents an important step towards the development of a pan-tropical, spatially explicit system for tracking carbon losses and structural changes arising from forest disturbance. |

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