National Aeronautics and Space Administration

NASA Carbon Monitoring System

UNIVERSITY OF MARYLAND

Beyond MRV: High-resolution forest carbon modeling for climate mitigation planning over Maryland, USA

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Science Questions

- How can we accurately monitor current forest cover and carbon stocks to aid policy efforts aimed at reducing deforestation and degradation as well as increasing afforestation and reforestation for climate mitigation?
- How can ecological modeling quantitatively estimate future carbon sequestration potential in response to land-use and management decisions?

Analysis

The study presents a new forest carbon monitoring and modeling system that combines high-resolution remote sensing of forest height, field data, optical remote sensing and ecological modeling (Ecosystem Demography model). We estimate contemporary above-ground forest carbon stocks, and project future forest carbon sequestration potential for the state of Maryland at 90 m resolution, over approximately 3.2 million grid cells. This is nearly 100,000 times the resolution at which global carbon models are run.

Results

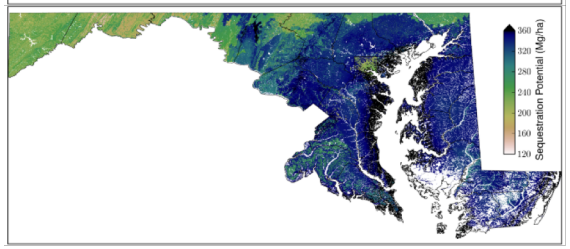
In Maryland, the contemporary above-ground carbon stock was estimated to be 110.8 Tg C (100.3-125.8 Tg C). The forest above-ground carbon sequestration potential for the state was estimated to be much larger at 314.8 Tg C, and the forest above-ground carbon sequestration potential gap was estimated to be 204.1 Tg C, nearly double the current stock. The time needed to reach this potential, or carbon sequestration potential time gap was estimated to be 228 years statewide, with 50% of the gap being realized in 80 years. These results imply a large statewide potential for future carbon sequestration from afforestation and reforestation activities.

Significance

With this approach, it is now possible to quantify both the forest carbon stock and future carbon sequestration potential over large policy relevant areas with sufficient accuracy and spatial resolution to significantly advance planning. These data products are now being used by the state of Maryland to plan for the Greenhouse Gas Reduction Act (GGRA). With the launch of NASA-GEDI mission, these analyses can be scaled to national, continental and global domains.

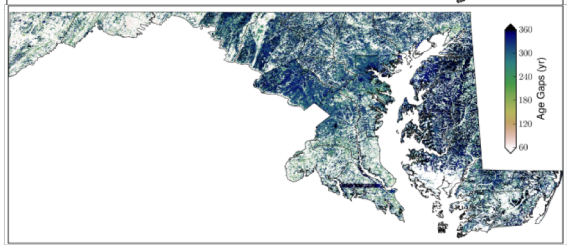
(a)

(b)



(c)

(d)



a) AGB Spatial pattern of 90-m biomass estimated by Lidar-initialized ED
b) CSP Map of carbon sequestration potential estimated by Lidar-initialized ED
c) CSPG Map of gap to carbon sequestration potential estimated by Lidar-initialized ED
d) CSPTG Map of carbon sequestration potential time gap estimated by Lidar-initialized ED